



SRNT|25

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ABSTRACTS

The peer-review process for SRNT's annual meeting entails review by society members of abstract submissions. Criteria for acceptance/rejection are based upon methodological rigor and not the funding resource or research findings. The views expressed by conference presenters are the author's own and do not necessarily represent that of SRNT.

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SRNT Notes



NOTES SRNT



SRNT Notes



2019 SYMPOSIA

SYM1

FDA CENTER FOR TOBACCO PRODUCTS: AN UPDATE ON FDA'S COMPREHENSIVE PLAN FOR TOBACCO AND NICOTINE REGULATION

Mitch Zeller, JD, Director, FDA Center for Tobacco Products; Deirdre Lawrence Kitner, PhD, MPH, Deputy Director, Office of Science; Gem Benoza, Supervisory Health Communications Officer, Office of Health Communications and Education, FDA Center for Tobacco Products

Announced by the FDA Commissioner in 2017, the Comprehensive Plan for Tobacco and Nicotine Regulation places nicotine, and the issue of addiction, at the center of the Agency's tobacco regulatory activities. During this SRNT session, Center for Tobacco Products (CTP) speakers will address the multi-year roadmap to better protect youth and help addicted adult smokers quit; significantly reducing tobacco-related disease and death in the U.S. in the years to come. Topics to be covered include Regulatory Policies on Addiction, Appeal, and Cessation; Science-Based Review of Tobacco Products; and the Youth Tobacco Prevention Plan. Regulatory Policies on Addiction, Appeal, and Cessation will address seeking evidence and public comment on potential FDA regulations; increasing access to, and use of, medicinal nicotine products to help people quit; and educating the public and correcting misperceptions about nicotine. Science-Based Review of Tobacco Products will include an update on Modified-Risk Tobacco Product Applications and research to inform FDA's regulatory activities and decisions. Data from CTP funded studies, including the PATH Study, will be presented highlighting recent findings to inform specific regulatory areas. The Youth Tobacco Prevention plan will address three main strategies: 1) preventing youth access, 2) curbing the marketing of products, and 3) educating youth and their families. This session will also address the changes to FDA's tobacco and nicotine policy framework announced in November 2018 that focuses on flavored tobacco products including ENDS products marketed to youth, flavored ENDS products, flavored cigars, and menthol in combustible products, including cigarettes and cigars.

SYM2

'BACK TO SCHOOL WITH JUUL': UNDERSTANDING EMERGING TRENDS IN VAPORIZED NICOTINE PRODUCTS

Maciej Lukasz Goniewicz, PhD, PharmD. Roswell Park Comprehensive Cancer Center, USA.

E-cigarette design has evolved over the past decade, from the small devices that resembled tobacco cigarettes (cig-a-likes) to larger tank systems (mods). Pods, the newest generation of these vaporized nicotine products, have increased in popularity in recent years, most notably with the product JUUL. Use of JUUL products ('juuling') among youth in the U.S. has led to concerns among parents, teachers and the general public. However, some adult cigarette smokers view the product as a viable cessation aid. During this multi-disciplinary symposium, we will explore factors that may explain why these new products are so appealing to young people and adult smokers. First, Dr King (Co-chair) will present retail sales data assessing the meteoric rise in e-cigarette dollar sales in the U.S. during 2013-2017. Since these increasingly popular pods contain nicotine salt solutions, they appear to be easier to inhale, as users report less respiratory irritation when compared with other products containing high nicotine concentrations. To address this topic, Dr Goniewicz (Co-chair) will present results from chemical analysis of pod products, including all JUUL pods. Pods are also available in a wide range of flavors. To explore these health implications, Dr Rahman will discuss potential respiratory consequences of inhaling flavored aerosols generated from pod systems. Additionally, while youth often do not identify nicotine as a reason for choosing these products, nicotine likely plays a role in the continued use of e-cigarettes. Therefore, Dr Boykan will present novel data on nicotine exposure and signs of addiction in adolescents using pods. Finally, although clinicians, regulators, and public health professional must be aware of the risks of these products among young people, it is also important to consider the potential benefits of using pod products for smoking cessation. Accordingly, Dr Caponnetto will present results from a prospective study assessing effects of JUUL use on smoking displacement in adult smokers with schizophrenia. Dr Benowitz (Discussant) will lead a discussion on implications of the presented data for public health policy, planning, and practice.

SYM2A

THE RISE OF THE POD MOD: TRENDS IN E-CIGARETTE SALES IN THE UNITED STATES, 2013-2017

Brian King, PhD, MPH¹, Doris Gammon², Ellen M. Coats², Kristy Marynak¹, Brett Loomis², Todd Rogers³. ¹Centers for Disease Control and Prevention, USA, ²RTI International, USA, ³RTI International, USA, Research Triangle Park, NC, USA.

Significance: The tobacco product landscape has diversified to include a variety of electronic products, including recently introduced 'pod mod' e-cigarettes. Population-based surveys traditionally provide annual estimates of tobacco product use. However, e-cigarettes are a rapidly evolving product class, and retail sales data can complement population-based surveys and identify sub-annual, emerging trends. This study assessed e-cigarette dollar sales in the U.S. during 2013-2017. **Methods:** E-cigarette retail sales data were licensed from Nielsen for convenience, club, and discount stores, mass merchandisers, supermarkets, pharmacies, and military commissaries. Sales data reflect all documented sales in the assessed store types; Internet and 'vape shop' sales are not captured. Data came in 4-week aggregates, from December 16, 2012 through January 8, 2018, for the 48 contiguous states and D.C. Dollar sales were assessed for the five top-selling manufacturers based on 2017 sales and brand ownership. All other manufacturers were grouped into an 'other' category. **Results:** In early 2013, 'other' manufacturers had the highest e-cigarette dollar sales; however, sales rapidly increased corresponding to the introduction of new products by Imperial Tobacco (blu) in mid-2013, Altria (MarkTen) and British American Tobacco (Vuse) in mid-2014, and JUUL Laboratories in mid-2015. In 2013, Imperial Tobacco held 41% of total e-cigarette sales. From mid-2014 through mid-2017, British American Tobacco held 34% of total sales. During 2016-2017, JUUL Laboratories' sales increased 701%, from \$42 million to \$337 million, giving it the greatest proportion of total e-cigarette dollar sales by December 2017 (50%). **Conclusions:** E-cigarette dollar sales were volatile in the U.S. during 2013-2017, with increased sales corresponding to new product introductions by manufacturers. By late 2017, JUUL Laboratories held the greatest portion of e-cigarette sales, which was due to a 'pod mod' e-cigarette called JUUL. Given e-cigarettes' potential to both benefit and harm the public's health, continued monitoring of e-cigarette sales and use is critical to inform public health policy and practice.

FUNDING: Federal

SYM2B

CHEMICAL CHARACTERIZATION OF 'POD' PRODUCTS

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Significance: E-cigarette design has evolved over the past few years, from the small devices that resembled conventional tobacco cigarettes ('cig-a-likes') to larger tank systems ('mods'). 'Pods', the newest generation of these vaporizer devices, have soared in popularity in the past year, most notably, one brand, JUUL. Pods are compact, lightweight, ultra-portable, and easy to use inconspicuously. **Methods:** We measured total nicotine concentration in pod products, purchased online, that were popular among youth. We also measured total nicotine yields in aerosols generated from these products using a smoking machine and standardized laboratory puffing protocol (70 ml puff volume; 2 sec puff duration; puff intervals of 10 sec). We used gas chromatography-mass spectroscopy to identify type of nicotine salt, humectants, and flavoring chemicals used in pod products. **Results:** All tested products contained high nicotine concentrations, from 21.8 to 56.2 mg/ml in a form of salt with benzoic acid (nicotine benzoate) or levulinic acid (nicotine levulinate) dissolved in a mixture of propylene glycol and vegetable glycerin. The average pH of e-liquids used in pod systems was 5.8 ± 0.3 . We estimated that users of prefilled pod systems (JUUL, Bo, Phix) may inhale with 10 puffs from 0.77 to 0.85 mg of nicotine, considerably higher than previously reported in older generations of e-cigarettes (0.02-0.51 mg/10 puffs). Mass spectroscopy analysis of pod products commonly used by youth revealed the presence of numerous flavoring chemicals, including several respiratory irritants like benzaldehyde, vanillin, and amyl acetate. **Conclusions:** Results from product testing presented above suggest that pods give users cigarette-like nicotine delivery. Toxic compounds, as detailed above, have been identified in aerosols from pods and the risks of repeated inhalation of high doses of nicotine salts are unknown. Although the exact physiological mechanisms of nicotine



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salts have not been studied in detail, these compounds are believed to increase the amount and rate of nicotine uptake in e cigarette users, effectively increasing the dose of nicotine delivered to the central nervous system.

FUNDING: Federal

SYM2C

EXPOSURE TO JUUL FLAVORS GENERATES REACTIVE OXYGEN SPECIES, POTENTIALLY ELICITING DIFFERENTIAL CYTOTOXIC AND INFLAMMATORY RESPONSES

Irfan Rahman, PhD, Thomas R. Lamb, Thivanka Muthumalage. University of Rochester, USA.

Background: The health effects caused by the constituents of JUUL is currently unknown. We hypothesized that JUUL constituents, primarily the flavoring agents, will have similar toxic effects as observed in e-juices. **Materials and Methods:** In order to determine if JUUL flavoring agents have potential toxic effects, acellular and cellular experiments were conducted. To determine the reactive oxygen species (ROS) levels found in JUUL vapors, different JUUL flavors, cool mint, crème brûlée, fruit medley, and Virginia tobacco, were bubbled through a fluorescent dye, DCFH-DA based on vaping topography, and the generated ROS levels were expressed as hydrogen peroxide equivalents. The potential to cause oxidative stress by these JUUL flavors was assessed by the depletion of total glutathione (GSH) concentrations. Cellular effects by acute exposure to JUUL was measured in lung epithelial cells, Beas 2B, and in macrophages, U937. Cytotoxicity and the inflammatory response was measured by assessing the cell viability and the inflammatory cytokine levels such as interleukin 8 (IL-8). **Results:** All JUUL flavors produced significantly increased levels of ROS in a dependent manner compared to the control air exposed group, with cool mint producing the highest levels of ROS. JUUL flavors also had differential effects on total GSH concentration, depleting GSH levels significantly compared to the control air exposed group. The tested flavors did not cause a significant decrease in cell viability, but induced differential IL-8 levels in the exposed cells compared to unexposed counterparts. **Conclusions:** Our data has shown that different JUUL flavors produce varying amounts of ROS and are capable of decreasing the total GSH levels. Hence, it can be deduced that JUUL can cause oxidative stress and induce an inflammatory response. Our data suggest that exposure to JUUL vapors is not a risk-free method of vaping and may have comparable health effects caused by exposure to other ENDS and e-juices. Currently, we are conducting further validation experiments *in vitro* as well as *in vivo* using surrogate mouse models.

FUNDING: Federal; Academic Institution

SYM2D

NICOTINE EXPOSURE AND SIGNS OF ADDICTION IN ADOLESCENTS USING PODS: AN IMPERATIVE FOR CLINICIANS TO ACT NOW!

Rachel Boykan, MD¹, Catherine R. Messina¹, Maciej L. Goniewicz². ¹Stony Brook University, USA, ²Roswell Park Comprehensive Cancer Center, USA.

Background: Adolescent use of high content nicotine vaporizers, 'pods', has risen dramatically in the past year. Little is known about the nicotine exposure from these products in teenagers. **Methods:** Adolescent patients, ages 12-21, were recruited from three Stony Brook Children's Hospital outpatient clinics (Long Island, NY), between 4/2017-4/2018. Participants completed a 60-item anonymous questionnaire about their use of e-cigarettes, including specific product types and brands, and provided a spot urine sample. We estimated nicotine exposure in our participants who reported exclusive use of pods (i.e., no combusted tobacco use) by measuring cotinine in collected urine samples. **Results:** Of 506 participants, 7.3% (n=37) reported current daily or someday use of pods (PU). Mean age of PU was 16.7±1.7 years. The most popular pod brands were JUUL (79.7% of PU), Bo (36.4%), Phix (18.2%), and Sourin (12.1%) (multiple answers allowed). Preferred flavors were menthol/mint (24.2%), fruit (21.2%), and candy, desserts/other sweets (18.2%). We compared PU (n=37) with non-pod using e-cigarette users (ECU) (n= 54). Almost half of PU (46.9%) used their devices several times/day, compared with 2.9% of ECU; while more than half of ECU (58.9%) used their devices between once/week and once/month compared with 21.8% of PU (p<0.001). More PU than ECU had used within the past day (74.1% vs 30.3%; p=0.001). Respondents reported that abstaining from vaping made them angry/irritable (25.7% of PU vs 3.9% ECU; p= 0.003); stressed (22.9% of PU vs 7.8% ECU; p=0.048). Significantly more PU reported wanting to vape upon awakening (25.7% PU vs 2.0% ECU; p=0.001). Mean urinary cotinine concentrations were higher in PU than in

ECU: 534.1±703.4 vs 100.4±289.0 ng/ml (p=0.001). There were no differences between the groups' reported use of cigarettes, dip and marijuana. **Discussion:** 'Pod' usage patterns and high urinary cotinine levels raise concerns about the potential for significant nicotine addiction in teens. Pediatricians must address pod usage with their teenage patients and their families, and must advocate for measures to decrease availability of these products to adolescents.

FUNDING: Federal; Academic Institution

SYM2E

ROLE OF A NEW GENERATION ELECTRONIC CIGARETTE ON SMOKING DISPLACEMENT IN SMOKERS WITH SCHIZOPHRENIA: A PROSPECTIVE 3-MONTH FEASIBILITY STUDY

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Significance: Globally people with schizophrenia smoke disproportionately more than the general population, have a more difficult time quitting, and subsequently carry the burden of cigarette smoking related morbidity and mortality. Currently marketed smoking cessation products demonstrate limited efficacy among smokers with schizophrenia as compared to the general population. **Aims:** To observe cigarette use behavior and impact among cigarette smokers with a schizophrenia spectrum disorder diagnosis who smoked tobacco cigarettes daily, did not intend to reduce or quit smoking, and were invited to use JUUL e-cigarettes. **Design:** A prospective observational 3-month feasibility study including in-person study visits at weeks 4, 8, and 12 using convenience sampling. Participants were given free JUUL e-cigarettes and 5% nicotine cartridges/pods. Assessments included Blood Pressure (BP), Heart Rate (HR), body weight, carbon monoxide in exhaled breath (eCO), e-cigarette use, Fagerstrom Test for Cigarettes Dependence, Scale for the Assessment of Negative Symptoms of Schizophrenia, Scale for the Positive Symptoms of Schizophrenia. **Setting:** Centro per Prevenzione e Cura del Tabagismo (CPCT) Università di Catania at the Policlinico Vittorio Emanuele, Catania, Italy. **Participants:** Forty Caucasian smokers in out-patient treatment for schizophrenia spectrum disorders not motivated to quit smoking (>20 CPD). **Results:** Smoking cessation, reductions in CPD and eCO were observed at each study visits. At week 12, there were 16/40 (40%) quitters in total. 50% reduction in the number of CPD at week-12 was found in 21/40 (52.5%). Taking the cohort of participants as whole, an overall 75% reduction in median CPD from 25 to 6 was observed by the end of the study (p<0.001). The observed difference in eCO between baseline and 12-week follow-up was significant at <.001. **Conclusions:** In smokers with schizophrenia spectrum disorders not motivated to quit, the use of JUUL e-cigarettes, determined complete smoking cessation, decreased cigarette consumption and elicited improvements in BP, HR and eCO without causing significant side effects and changes in Symptoms of Schizophrenia.

FUNDING: Unfunded; Academic Institution

SYM3

PAIN, NICOTINE, AND TOBACCO SMOKING: TRANSLATIONAL RESEARCH TO IDENTIFY MECHANISMS AND INFORM THE DEVELOPMENT OF NOVEL INTERVENTIONS

Emily L. Zale, PhD, Binghamton University.

Pain and nicotine dependence are highly comorbid conditions, and the prevalence of tobacco smoking among persons with pain is approximately double that observed in the general population. The collective economic and public health impact of comorbid pain and smoking is substantial, and of increasing interest to researchers and clinicians from across the medical and behavioral sciences. An evolving reciprocal model posits that pain and nicotine self-administration interact in the manner of a positive feedback loop, resulting in greater pain and the maintenance of addiction. Multidisciplinary translational research that applies findings from basic science and preclinical studies to inform the development of novel interventions for this major health disparity population is sorely needed. This symposium presents multidisciplinary findings from studies across the spectrum of translational pain-nicotine/tobacco research. First, Dr. Damaj will present preclinical data showing that mice experience greater nicotine withdrawal and are at risk for escalating nicotine intake in the context of chronic neuropathic pain. Second, Ms. LaRowe will present longitudinal findings that co-occurring pain predicts poor outcomes across a range of smoking cessation milestones, including initiation, lapse, and relapse. Third, Dr. Zale will present data showing that a brief intervention tailored



to address smoking in the context of pain increased motivation to quit and subsequent engagement of cessation treatment among smokers with chronic pain. Fourth, Mr. Rogers will present proof of concept case series data from a new integrated treatment that addresses pain-related anxiety (a transdiagnostic vulnerability factor implicated in the maintenance of nicotine dependence) among smokers with chronic low back pain. Finally, Dr. Bevins will discuss these findings and how future translational work can aid in the identification of clinically-relevant mechanisms in complex pain-nicotine/tobacco interactions. This symposium was contributed by the Basic Science Network.

SYM3A

NEUROPATHIC PAIN IMPACTS NICOTINE DEPENDENCE IN MICE

M. Imad Damaj, PhD, Yasmin Alkhalif. VA Commonwealth University.

Population-based studies support a high co-occurrence of chronic pain and smoking dependence. There is also evidence that nicotine can induce acute analgesia, and that nicotine abstinence/withdrawal can induce hyperalgesia. Recently, evidence from Ditre and Brandon (2008) suggested that pain can be a potent motivator of smoking. However, preclinical investigations modelling this interaction between nicotine dependence and pain are lacking, thus providing a major obstacle to studying the mechanisms of pain-related nicotine dependence. To address this deficit in preclinical models, the present study examines nicotine withdrawal and reward using the conditioned place preference (CPP) test in two mouse models of chronic neuropathic pain: chemotherapy-induced peripheral neuropathy (paclitaxel-induced neuropathy) and HIV-induced neuropathy (mice conditionally expressing HIV Tat1-86 protein) mice. Nicotine withdrawal somatic and affective signs increased in intensity in both models of neuropathy. In addition, nicotine CPP was reduced in paclitaxel-induced neuropathy model in a time-dependent manner. Plasma nicotine and cotinine levels were not significantly changed in these models of neuropathy. Taken together, these findings showed that mice are more susceptible to nicotine withdrawal and possibly more susceptible to escalations in nicotine intake when undergoing chronic neuropathic pain.

FUNDING: Federal

SYM3B

PAIN STATUS AS A PREDICTOR OF SMOKING CESSATION INITIATION, LAPSE, AND RELAPSE

Lisa R. LaRowe, MS¹, Joseph W. Ditre¹, Jessica M. Powers¹, Bryan W. Heckman². ¹Syracuse University, ²Medical University of SC.

Pain and tobacco cigarette smoking are both highly prevalent and co-occurring conditions. Despite accumulating evidence that the experience of pain can undermine smoking cessation, we are not aware of any previous work that directly tested prospective associations between pain status and smoking cessation milestones. The first aim of this longitudinal study was to examine past two-week pain status (yes/no) as a predictor of initiating a quit attempt and achieving 7-day point prevalence abstinence (PPA), among a sample of 301 smokers who were motivated to quit. The second aim was to examine past two-week pain status as a predictor of lapse and/or relapse to smoking, among a separate sample of 242 former smokers who had initiated a quit attempt within the past 5 weeks. Data were collected online, with pain status assessed at baseline and cessation outcomes assessed biweekly over a two-month follow-up period. Cox proportional hazards models and logistic regressions controlled for relevant sociodemographic and smoking characteristics. Aim 1 results indicated that smokers who did not endorse past two-week pain were 2 times more likely to make a quit attempt, nearly 4 times more likely to achieve 7-day PPA, and 10 times more likely to report 7-day PPA at two-month follow-up ($p < .01$). Aim 2 results indicated that former smokers who endorsed past two-week pain were 9 times more likely to report a lapse, and nearly 22 times more likely to report a relapse to smoking over the course of two months ($p < .05$). Moreover, former smokers who did not endorse pain were 75 times more likely to report 7-day PPA at two-month follow-up ($p < .01$). This is, to our knowledge, the first study to demonstrate that the presence of co-occurring pain prospectively predicts poor outcomes across a range of important smoking cessation milestones. Discussion will address clinical implications, directions for future research, and the utility of considering pain in the context of smoking cessation.

FUNDING: Academic Institution

SYM3C

A NOVEL INTERVENTION TAILORED FOR SMOKERS WITH CHRONIC PAIN INCREASED MOTIVATION TO QUIT AND SUBSEQUENT CESSATION TREATMENT ENGAGEMENT

Emily L. Zale, PhD¹, Lisa R. LaRowe², Jesse D. Kosiba², Joseph W. Ditre². ¹Binghamton University, ²Syracuse University.

Tobacco cigarette smokers are at increased risk for developing chronic pain and poorer pain treatment outcomes. Smokers with co-occurring pain tend to report greater difficulty and less confidence in quitting, face unique cessation challenges, and may benefit from tailored interventions. We tested the effects of a novel motivational intervention aimed at increasing knowledge of pain-smoking interrelations, motivation to quit, and cessation treatment engagement among smokers with chronic pain. Intervention components included personalized feedback and pain-smoking psychoeducation to help develop discrepancy between continued smoking and desired pain outcomes. Non-treatment seeking daily cigarette smokers with chronic pain ($N = 76$, 58% Female, 42% Black/African American, $M_{CPD} = 18$) were randomized to either the tailored pain-smoking intervention or a 3As control treatment. Results indicated that the tailored intervention (relative to control) increased knowledge of pain-smoking interrelations ($p < .001$) and multiple indices of cessation motivation (contemplation ladder, desire to quit, expected success in quitting, and willingness to learn about cessation treatment options, intention to engage cessation treatment; $p < .01$). Increased knowledge of pain-smoking interrelations mediated effects of the tailored intervention on willingness to learn about cessation treatments. At one-month follow-up, treatment gains in knowledge of pain-smoking interrelations were maintained ($p = .009$), and participants who received the tailored intervention were 4 times more likely to report having subsequently talked to their doctor about quitting ($p = .034$). These data suggest that smokers with co-occurring pain are amenable to pain-smoking psychoeducation and may benefit from treatments that have been tailored to address smoking in the context of pain. These findings further suggest that smokers may become more motivated to engage cessation treatment as they become increasingly aware of how continued smoking may exacerbate their pain or impede recovery.

FUNDING: Federal

SYM3D

INTEGRATING GRADED PAIN EXPOSURE INTO STANDARD COGNITIVE BEHAVIORAL THERAPY FOR SMOKING: A PROOF-OF-CONCEPT CASE SERIES

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Cigarette smoking is the leading cause of death and disability in the United States (U.S.), contributing to over 480,000 deaths each year. Smokers with chronic pain represent a highly prevalent major health disparity population in the U.S. whose unique healthcare needs are not being met. Tobacco cigarette smoking has been identified as a unique causal factor in the onset and progression of chronic low back pain (CLBP), the most common source of chronic pain among U.S. adults. Indeed, there is a pressing public health need to develop an integrated intervention that can reduce cigarette smoking among smokers with comorbid chronic pain to offset cancer and related disease burden in this high-risk group. Yet, targeted therapeutic tactics are absent for smokers with chronic pain. Such neglect is unfortunate, as pain symptoms and chronic disorders, frequently co-occur in smokers, are among the most common groups of psychosomatic disorders, and share common (transdiagnostic) vulnerability processes implicated in the etiology of smoking (e.g., pain-related anxiety). We therefore seek to build upon our past work by developing a new treatment protocol (Pain-Anxiety Smoking Cessation Treatment; PASC-ST) that integrates standard smoking cessation treatment (ST) strategies and nicotine replacement therapy with therapeutic tactics to reduce pain-related anxiety. This new treatment integrates standard cognitive behavioral therapy for smoking with Graded In-Vivo Pain exposure to target pain-related fear in the context of cigarette use. We illustrate this integrated treatment on a case series of smokers with chronic low back pain. Results indicated a significant reduction in pain-related anxiety and biochemically verified cigarette abstinence at 2 month follow-up.

FUNDING: Unfunded



SRNT 2019 SYMPOSIA

SYM4

POLICY RESEARCH NETWORK SYMPOSIUM: ADVANCING THE TOBACCO ENDGAME

Joanna E. Cohen, PhD. Johns Hopkins Bloomberg School of Public Health

The tobacco endgame describes the ultimate goal of ending the global burden of tobacco use. Achieving this aim requires significant and lasting changes to the structural, political, and social dynamics that fuel the epidemic. This session will include presentations of new research on the tobacco endgame and a facilitated discussion, led by Dr. Joanna Cohen, about the implications of this evidence in the context of developing and enhancing tobacco endgame strategies. Dr. Cohen will briefly introduce the session and moderate discussion of the work presented. Dr. Smith of the Medical University of South Carolina will present research relevant to the proposed U.S. policy mandating a reduction in the nicotine content in cigarettes. Specifically, this study examined compensatory behaviors of smokers using very low nicotine cigarettes in a controlled environment. From here, panelists will discuss endgame goals and strategies in the international context. Dr. Richard Edwards of the University of Otago, Wellington will examine key facilitators of and barriers to achieving endgame goals in six countries that have adopted government-endorsed endgame strategies. Dr. David Timberlake of the University of California, Irvine, will describe the plan to end tobacco use in Finland, and the prospect of achieving this aim with the country's proposed measures. Finally, Drs. Geoffrey Fong and Robert Schwartz from the University of Waterloo and University of Toronto, respectively, will describe how scientific evidence is informing the Canadian endgame strategy of achieving a tobacco use prevalence of less than 5% by 2035. Dr. Fong will present findings from a 2016 survey of 3,215 adult smokers in Canada regarding their support for a variety of endgame policies while Dr. Schwartz will focus on the role of research in supporting endgame initiatives as well as identifying limitations. Together, these presentations will provide insight into several specific endgame strategies, and elucidate the role of research in defining and supporting future policy efforts.

SYM4A

THE IMPACT OF EXCLUSIVE USE OF VERY LOW NICOTINE CIGARETTES ON COMPENSATORY SMOKING

Tracy T. Smith, PhD¹, Eric Donny², Joseph Koopmeiners³, Cassidy White⁴, Rachel L. Denlinger-Apte⁵, Lauren R. Pacek⁶, Dorothy K. Hatsukami³, Neal L. Benowitz⁷, Matthew J. Carpenter¹. ¹Medical University of South Carolina, ²Wake Forest School of Medicine, ³University of Minnesota, ⁴Wake Forest School of Medicine, Winston Salem, NC, USA, ⁵Brown University School of Public Health, Providence, RI, USA, ⁶Duke University School of Medicine, ⁷University of California San Francisco.

Background: The FDA is considering a federally mandated reduction in the nicotine content of cigarettes. One critical concern is whether this policy would result in compensatory smoking. Published clinical trials on nicotine reduction have shown a decrease, rather than an increase, in smoking behavior. However, most participants use non-study normal nicotine content (NNC) cigarettes despite instructions to exclusively use the very low nicotine content (VLNC) cigarettes provided to them. Thus, it is unknown whether smokers would engage in compensatory smoking if they were unable to access NNC cigarettes. The present study uses an innovative design to investigate the impact of nicotine reduction when smokers are unable to access NNC cigarettes. **Methods:** In a within-subjects crossover design, a cohort of daily smokers completed two four-night hotel stays, in which either VLNC or NNC are exclusively available for "purchase" using a study bank. To mimic a real-world regulatory environment, participants were told the nicotine content of their assigned cigarette each week. **Results:** Six daily cigarette smokers have completed the study protocol. Compared to the NNC week, there was a temporary increase (of at least 10 percent) in cigarettes smoked per day (CPD) during the VLNC week for three participants, but by the final day these participants showed comparable CPD across conditions. Two participants showed an early decrease (of at least 10 percent) in CPD during the VLNC condition, which persisted across all days. Data collection for an additional cohort is ongoing, with a final sample size of 20 participants. Outcomes will be presented on changes in CPD, expired carbon monoxide, puff topography, withdrawal, craving, and more. **Conclusions:** Using an innovative method to control access to tobacco products, we can rigorously assess compensatory smoking. These data will provide critical information about the potential for compensatory smoking in a post-regulation marketplace where only VLNCs are available for legal purchase.

FUNDING: Federal

SYM4B

EVIDENCE AND THE ENDGAME: OPPORTUNITIES AND CHALLENGES

Robert M. Schwartz, PhD¹, Michael Chatton². ¹Ontario Tobacco Research Unit, ²University of Toronto.

The Ontario Tobacco Research Unit (OTRU) seized on two opportunities to anchor endgame proposals in evidence from research. 1) In 2016, a collaborative of not-for-profit and academic organizations created Canada's National Endgame Initiative which culminated in a 100 person summit based on a background report that laid out policy alternatives for reaching less than 5% tobacco use by 2035. 2) In 2017, the Ontario Minister of Health and Long-term Care appointed representatives from not-for-profit and academic organizations to the Executive Steering Committee for the Modernization of Ontario's Tobacco Control Strategy. The Committee adopted an Endgame framing and produced an evidence informed roadmap for reaching less than 5% tobacco use by 2035. Researchers played key roles in providing several lines of evidence to inform the Endgame blueprints emanating from these initiatives, including: 1) SimSmoke modeling demonstrating the need for dramatic additional measures; 2) morbidity, mortality and costs modeling demonstrating savings at decreasing tobacco use; 3) reviews of reviews and individual studies on the impacts of different levels of implementing known tobacco control interventions; 4) extrapolations of potential impacts of novel endgame measures for which there is no tobacco control evidence. A key challenge was the lack of strong evidence about the potential impact of supply-side oriented Endgame measures such as: imposing quotas on the amount of tobacco to be made available for sale, payer pays initiatives, and decreasing availability through retail restrictions. Environmental changes, including in the market for alternative tobacco and nicotine products and the legalization of recreational cannabis, make it particularly difficult to assess the impact of tobacco control measures moving forward. These examples demonstrate the vital role of evidence in supporting Endgame initiatives as well as limitations. There is a need for researchers to exercise caution and not to over-promise on what existing evidence demonstrates. There is a need to develop robust systems for predicting the impact of large scale environmental and supply side Endgame interventions.

FUNDING: Unfunded

SYM4C

ASSESSING CANADIAN SMOKERS' SUPPORT FOR TOBACCO ENDGAME MEASURES: A CASE STUDY OF ITC RESEARCH AND DISSEMINATION TO ADVANCE ENDGAME POLICIES IN CANADA

Geoffrey T. Fong, PhD, Janet Chung Hall, Pete Driezen, Lorraine V. Craig. University of Waterloo.

Since 2002, the International Tobacco Control Policy Evaluation Project (the ITC Project) has conducted longitudinal cohort surveys across 29 countries covering over two-thirds of the world's tobacco users. A central objective of the ITC Project is to evaluate the behavioral and psychosocial impact of national-level tobacco control policies of the WHO Framework Convention on Tobacco Control (FCTC) and to disseminate research findings that support governments in making effective tobacco control policy decisions. In 2015, the ITC Project was invited to collaborate with leading health and policy experts to explore novel ideas on how to achieve a tobacco endgame in Canada. To respond to the evidence needs for a presentation and informed discussions on endgame options at the 2016 Canadian Tobacco Endgame Summit, the ITC Project expanded the content of its surveys of smokers in Canada, the US, Australia, and the UK (in the 2016 ITC Four Country Smoking and Vaping Survey). New survey questions were added to broaden measures to assess smokers' support for a variety of endgame policies, including tobacco marketing and sales bans; restrictions on the contents of tobacco products; restrictions on access to tobacco products/alternative nicotine products; and restrictions on e-cigarette youth access, content, use in smoke-free places, and promotion. This presentation will discuss findings from the 2016 survey of 3,215 current smokers (18+ years) in 10 Canadian provinces on levels of support for 14 endgame policies and key predictors of support. The data show that the majority of Canadian smokers favour novel policies to reduce tobacco use. More than half of smokers support making cigarettes less addictive by lowering nicotine levels, and increasing access to alternative nicotine products. The presentation will describe how the research findings have been disseminated to inform policy efforts by the Canadian government to achieve an endgame target of less than 5% tobacco use prevalence by 2035.

FUNDING: Federal



SYM4D

EMERGING LESSONS FROM COUNTRIES WITH TOBACCO ENDGAME GOALS. FINDINGS FROM THE INSPIRED PROJECT

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Significance 'Endgame' thinking is increasingly influential in international tobacco control. Six countries (Canada, Ireland, Finland, New Zealand, Scotland and Sweden) adopted government-endorsed endgame goals between 2010 and 2018. We present an overview of the emerging lessons, based on the current status and experiences of these countries. **Methods** We collected data using a structured template on the nature of the endgame goal and context, current status, activities and learnings from each country. The template was completed iteratively through review of relevant documents by the New Zealand coordinating team and through information gathered from in-country key informants (tobacco control experts, researchers, advocates and policy-makers). Data were analysed and synthesised to identify key lessons learnt, including enablers and barriers for achieving endgame goals. **Outcomes** The nature of the endgame goal varied greatly, for example in the target date and approach to non-smoked tobacco products and e-cigarettes. Finland's endgame goal, for example, is unique in its aim to eventually eliminate all nicotine products. The goals of the other countries are focused on tobacco products. The six countries have fully or partially implemented most core tobacco control interventions, and five countries have a national tobacco control strategy. However, other than some restrictions on additives to tobacco products, none of the countries has implemented, or has plan to implement, radical proposed endgame strategies such as major reductions in supply of tobacco products or mandated denicotinised cigarettes. Key enablers for the endgame goals identified included public and political support, government commitment, strong NGOs and NGO advocacy, and high levels of cross-sector collaboration and supporting structures. Major barriers included competing political priorities, limited resources and capacity, lack of unity in the tobacco control sector, and tobacco industry tactics and interference. Progress on reducing disparities in smoking was a major challenge for all six countries. **Conclusions** Learning from the experience of countries with endgame goals has importance globally. The findings will help other countries decide whether to adopt an endgame goal for smoking, and provide useful, evidence-informed information for how best to achieve such a goal.

FUNDING: Academic Institution

SYM4E

CAN FINLAND ACHIEVE THE GOAL OF ITS TOBACCO ENDGAME WITH EFFECTIVE BUT CONVENTIONAL MEASURES

David Timberlake¹, Ulla Laitinen², Jaana Kinnunen², Arja Rimpela². ¹University of California, Irvine, Irvine, CA, USA, ²University of Tampere, Finland, Tampere, Finland.

Significance: Finland boldly legislated the end of tobacco use in its 2010 Tobacco Act. This step was heralded by the international press as a pioneering initiative, raising the question "Can Finland spark a tobacco-free world?". In 2014, Finland's Ministry of Social Affairs and Health published its Action Plan to achieve the endgame goal, which included comprehensive but conventional measures to prevent tobacco initiation, promote cessation, and protect against exposure to secondhand smoke. The current study aimed to assess the reasons for excluding novel strategies and the prospect of achieving Finland's endgame goal with proposed conventional measures. **Methods:** Study participants were selected through snowball sampling based on their expertise in either policy or practice of tobacco control (n=32). Semi-structured interviews, conducted in 2017 and 2018, covered a host of topics ranging from consensus among stakeholders to Finland's ranking on the 2016 Tobacco Control Scale. The framework method was chosen for analyzing the content of the interviews. **Results:** Reasons for excluding novel, endgame strategies included practical limitations (e.g., political/legal barriers); endorsement of the stepwise approach to policy; and stymied innovation arising from Finland's prior success in tobacco control. The objective of nicotine- vs. smoke-free Finland had almost unanimous support, challenged by contrarians who opined for an internal discussion on harm reduction. Themes pertaining to the barriers to achieving the endgame goal included the de facto role of NGOs in tobacco control; the effect of institutional practices on tobacco disparities; lack of consensus on mobilizing the populace against tobacco through mass media; and organizational deficiencies in smoking cessation. **Conclusions:** Finland has instituted a number of progressive measures through policy (e.g., display ban), but, may need emerging leaders to institute a bold,

robust measure to achieve its endgame goal. Otherwise, Finland will need to improve integration of NGOs into the healthcare system, develop a unified media strategy, and systematize smoking cessation services.

FUNDING: Academic Institution; Nonprofit grant funding entity

SYM5

ADVANCES IN SMARTPHONE AND SMARTWATCH APPLICATIONS FOR CESSATION

Jonathan B. Bricker, PhD. Fred Hutchinson Cancer Research Center.

Symposium Summary: With two thirds of the 38 million US smokers owning smartphones, there are now over 500 mobile apps for smoking cessation ("apps") downloaded over 8 million times per year. Similarly, with over 53% of the 360 million smokers in China owning smartphones, smoking cessation apps in China are growing in popularity. In addition, there is emerging potential for smartwatches to impact cessation: 18% of the US population own a smartwatch and there are at least 6 apps now developed for smoking cessation. Given their growing reach, the potential population level impact of smartphone and smartwatch apps is high. Responding to these trends and their potential impact, over the past five years, there has been rising interest among tobacco control researchers to develop and test smoking cessation apps. Indeed, NIH total funding for research on smoking cessation apps has exponentially increased from \$1 million USD in 2013 to \$18 million USD in 2018. The burgeoning activity of tobacco control researchers in this domain have yielded major technological advances to address a longstanding problem with all mobile-delivered interventions that severely limits their effectiveness: low user engagement. This symposium shows five diverse and novel approaches to increase smartphone and smartwatch app user engagement in the cessation process. Dr. Bricker will first present the design and development of the iCanQuit app, which uses a virtual coach to create a therapeutic relationship and gamification to increase progression through the program. Dr. Sridharan will present an mhealth intervention that applies Dr. Carol Dweck's growth mindset theory to smokers' beliefs about addiction as a new approach to engaging in smoking cessation treatment. Dr. Businelle will present the Smart-T app which uses ecological momentary assessment to assess risk for imminent relapse along with tailored messaging to prevent the lapse. Dr. Bullen will present the Chinese SCAMPI app, which runs on the WeChat social media platform (reaches 1 billion Chinese annually), that combines the COM-B and Behavior Change Techniques models to engage male Chinese smokers. Dr. Sherry McKee will present outcomes from an RCT evaluating a just-in-time smartwatch app intervention utilizing wearable biosensors which detect wrist movement in 3-D space. Each of these talks will present recruitment, baseline, retention, and user engagement data from the randomized trials testing each of these five new smoking cessation apps. Dr. Erik Augustson will synthesize the talks and their implications for the field.

SYM5A

DESIGN OF THE ICANQUIT APP FOR SMOKING CESSATION AND UPDATE ON ITS EVALUATION IN A LARGE US RANDOMIZED CONTROLLED TRIAL

Jonathan B. Bricker, PhD, Noreen Watson, Kristin Mull, Jaimee Heffner. Fred Hutchinson Cancer Research Center.

Significance: As current standard mhealth interventions are limited by low user engagement, we designed the iCanQuit app with a goal of boosting user engagement. This presentation describes the methods that yielded the iCanQuit app for smoking cessation and a progress update on the large RCT testing the app. **Methods:** A comprehensive user-centered design framework included review of results from previous trials of mhealth apps, surveys and in-person interviews of smokers, consultation with app developers, and internal team review. We conducted eight rounds of user testing to develop and prototype potential core features with 5 smokers in each round (total N = 40). After initial development of iCanQuit, we conducted a 7-day diary study of 7 smokers to identify technical issues and final changes. Following incorporation of diary study findings into the app, we launched the iCanQuit randomized trial in July 2017. **Trial design:** randomize a national sample of 2500 adult daily smokers (at least 30% minority) wanting to quit to either iCanQuit or a current standard app, the NCI's QuitGuide app (branded "iCanQuit" for blinding), and cessation outcome survey follow-ups at 3, 6, and 12 months. **Results:** User testing showed that three core features were most engaging: (1) virtual coach, (2) gamification, and (3) on-demand urge help. Regarding the RCT, to date, 11,605 were screened, 6,424 eligible, and 2,460 randomized. **Baseline characteristics:** Mean age = 38.2 (11.8), 70% female, 35% minority, 42% high school or less education, Mean cigarettes/day = 18.0 (14.0). There were no imbalances across arms for any baseline variables (all p > .05). To date, the 3, 6, 12-month cessation outcome survey follow-up



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rates are 87.4%, 88.5%, and 85.0%, respectively, with no imbalances by treatment arm (all $p > .05$). Conclusions: iCanQuit is a comprehensive research-engineered app with features aimed at increasing engagement. Trial enrollment and retention have been a success, and have minimized potential bias from missing outcome data—which is problematic in mhealth studies. RCT intervention engagement results will be available at the presentation and cessation results in 2020.

FUNDING: Federal

SYM5B

DOES A GROWTH MINDSET INTERVENTION ENHANCE ENGAGEMENT AND EFFECTIVENESS OF A SMARTPHONE APP FOR SMOKING CESSATION? A PILOT RANDOMIZED CONTROLLED TRIAL

Vasundhara Sridharan, PhD¹, Yuichi Shoda², Jaimee Heffner¹, Jonathan Bricker¹.
¹Fred Hutchinson Cancer Research Center, ²University of Washington.

Significance: There is need for innovative theory-driven approaches with the potential to enhance the engagement and effectiveness of smartphone apps for smoking cessation. One novel approach is to apply growth mindset theory to smokers' beliefs about the permanence of addiction. The current study investigated whether the addition of a growth mindset intervention for addiction would enhance engagement and cessation rates of an established smartphone app for smoking cessation. **Methods:** Nationally recruited current daily smokers ($N = 398$) were randomly assigned to receive either a web-delivered growth mindset intervention plus a validated smoking-cessation smartphone app (SmartQuit) or the smartphone app alone. The primary outcome was engagement: number of logins to the quit smoking app. The secondary outcome was cessation: 30-day point prevalence abstinence at two-month follow-up. **Results:** The two-month outcome data retention rate was 92% (364/398). The two arms did not differ on number of logins to the quit-smoking app ($p = .38$). The growth mindset plus app arm had cessation rates which trended higher than the app only arm (17% vs. 13%; $p = .10$). The per-protocol analysis showed that the growth mindset plus app arm had significantly higher cessation rates (21% vs 13%; $p = .03$) but not higher engagement than the comparison arm ($p = .55$). **Conclusions:** The addition of a growth mindset intervention for addiction might increase cessation rates of an established smartphone app for smoking cessation, thought it does not appear to enhance the app's engagement. A fully powered randomized trial with long term follow-up is now needed to further validate the findings of this pilot trial.

FUNDING: Nonprofit grant funding entity

SYM5C

RANDOMIZED CLINICAL TRIAL OF AN AUTOMATED SMARTPHONE BASED SMOKING CESSATION TREATMENT

Michael S. Businelle, PhD, Emily T. Hebert, Darla Kendzor, Damon J. Vidrine, Oklahoma Tobacco Research Ctr., Univ. of Oklahoma.

Significance: Smartphone apps could overcome many of the barriers that have hampered use of traditional empirically-based smoking cessation treatments by offering easily accessible, highly tailored, and intensive interventions at a fraction of the cost of traditional smoking cessation counseling. We have shown that momentary changes in key variables can be tracked using ecological momentary assessments (EMA), and used to initiate just-in-time adaptive interventions (JITAI). **Methods:** This 3-armed pilot randomized clinical trial (RCT) aimed to assess the initial utility of an automated smartphone-based smoking cessation intervention (Smart-T2) relative to standard in-person smoking cessation clinic care and the free NCI QuitGuide app. The Smart-T app uses EMAs to assess risk for imminent smoking lapse, and tailors treatment messages based on risk of lapse and reported symptoms. The Smart-T app also advises participants to chew a piece of nicotine gum when risk for smoking lapse is elevated. Smokers who attended a clinic based tobacco cessation program were randomized to groups and followed for 13 weeks (1 week pre-quit through 12 weeks post-quit). All participants were asked to complete EMAs on study provided smartphones for 5 weeks. **Results:** On average, participants ($N=84$) were 49 years old and smoked 22 cigarettes per day at baseline. Participants were 49% female, 68% White, 18% Black, and 8% Native American. To date, 64 participants have reached the 12 week post-quit follow-up visit. A total of 26% of Smart-T, 14% of QuitGuide, and 21% of in-person participants have achieved biochemically confirmed 7-day point prevalence abstinence at the 12 week post-quit visit. All Smart-T participants have reported that the tailored messages were helpful and 86% reported that they used a piece of nicotine gum, at least "sometimes," when

advised to do so by the app. App design (e.g., which variables were intervened upon and when, on demand and prompted intervention content), engagement with app features, and final study outcomes will be discussed. **Conclusions:** Dynamic smartphone-based JITAI's may increase user engagement and exposure to treatment related materials.

FUNDING: Academic Institution

SYM5D

SCAMPI: A WECHAT-BASED APP TO SUPPORT CHINESE MEN TO QUIT SMOKING

Chen Jinsong, MPH¹, Elsie Ho². ¹University of Auckland, Auckland, New Zealand, ²University of Auckland.

Significance: Half of all men in China smoke tobacco but reaching them with support to quit smoking is challenging. We sought to reach and engage them with a program (SCAMPI), that operates within the most widely used social media app in China, WeChat (1.04 billion subscribers; 200 million regular users). **Methods:** Using a program development questionnaire based on reviewing smoking research literature in China's male smokers and on smoking behaviour change models (specifically, Michie's COM-B model and Behaviour Change Theories), we conducted an iterative, collaborative prototype app development process with 20 male smokers in China, participating remotely using WeChat. We elicited their preferences for smoking cessation app user interface and user experience features and incorporated them into the final app design. We then commenced a digital randomised controlled trial ($N=320$), with participants being recruited, randomised and followed up weekly over 3 months, exclusively via WeChat. Control participants receive information about smoking cessation care available in China, and all participants receive micro-incentive payments for providing data on their smoking throughout the trial. **Results:** In one month of collaborative development, the SCAMPI prototype app recorded 948 visits, 272 mentions in WeChat users' conversations, and 80 social media shares on WeChat. Engagement was optimised by the interactive, iterative development process with potential end-users and integration within the widely used WeChat platform. Cessation outcomes from the RCT will be available at the presentation in February, 2019. **Conclusions:** It is feasible to engage smokers to co-develop a theory-based culturally adapted cessation app and conduct a fully digital RCT of the app within the WeChat social media platform. If the results for efficacy are supportive, this program will be available to millions of Chinese men who smoke and use WeChat, at no cost.

FUNDING: Academic Institution

SYM5E

RANDOMIZED CLINICAL TRIAL OF A JUST IN TIME INTERVENTION BASED ON WEARABLE BIOSENSORS DETECTING SMOKING GESTURES

Sherry McKee, PhD¹, Abhinav Parate, PhD², Akshaya Shanmugam, PhD², Deepak Ganeshan, PhD³. ¹Yale School of Medicine, New Haven, CT, USA, ²Lumme Inc, Amherst, MA, USA, ³University of Massachusetts, Amherst, MA, USA.

SIGNIFICANCE: Technological advances in wearable biosensors and advanced machine learning algorithms have made it possible to wirelessly and passively detect smoking in real time. With such hardware and software innovations, we are now able to build treatment platforms that are seamlessly integrated into smokers' lives. In this presentation, outcomes from an NCI-funded SBIR grant will be presented reporting on the development and efficacy of the Lumme platform. **METHODS:** The Lumme platform continuously monitors smoking behavior using an energy-efficient and highly accurate gesture recognition algorithm which utilizes the inertial sensors in commercially available smart watches with 98% accuracy. After smokers wear the system for 2 weeks passively capturing smoking behavior and related contextual information (e.g., activity, social context, location, and time of day), the system can predict future smoking episodes with a 6-minute prediction window. We developed an 8-week just-in-time intervention based on this technology where smokers received personalized motivational and skill-based text messages when they are in high-risk situations. To evaluate the efficacy of the system, we recruited $n=140$ daily smokers (>10 CPD) from across the United States to complete a double-blind randomized control trial comparing the Lumme just-in-time intervention with the NCI-supported text message platform Smokefree TXT. Participants had a 2-week count-down to quit, and following the quit day, had a 6-week intervention period. **RESULTS:** Analysis examining end-of-treatment point prevalence demonstrated significant differences in rates of quitting. Rates of quitting with the Lumme system were 49.2% and rates of quitting with the Smokefree TXT platform were 30.2%. Rates



of treatment completion were similar across conditions. CONCLUSIONS: Results to date are highly promising and support that just-in-time interventions are now possible. Tobacco smoking continues to be the leading cause of preventable morbidity and mortality and such interventions have the potential to be easily scalable to address this public health concern.

FUNDING: Federal

SYM6

MULTIPLE ROLES FOR NICOTINE IN REINFORCEMENT AND ADDICTION

Matthew Palmatier. East TN State University, Johnson City, TN, USA.

Uncertainty about the role of nicotine in tobacco dependence has historically centered on its weak primary reinforcing effects in non-human animals. Nicotine maintains low rates of self-administration in rats and non-human primates, which is inconsistent with the robust self-administration of nicotine in human smokers. However, over the past 15 years preclinical research has demonstrated another effect of nicotine that may resolve this uncertainty - nicotine potently increases responding for non-nicotine rewards. This effect of nicotine can lead to high rates of operant behavior, a pattern that is much more consistent with human smoking. The goal of this symposium is to bring together an interdisciplinary group of scientists to present new, translational findings on the interactions between nicotine and non-nicotine stimuli, the variety of circumstances under which the interactive effects are observed, and the potential long-term impact of these effects on behavior. Dr. Matt Palmatier will present findings showing the long-term effects of nicotine on Pavlovian conditioned approach and the impact of nicotine-enhanced conditioned stimuli on subsequent cocaine-seeking behavior. Dr. Paul Clarke will present the results of new studies showing that the reinforcement enhancing effects of nicotine are observed at low blood concentrations, and are independent of habituation to responding for the non-nicotine reward. Dr. Scott Barrett will present new research investigating the enhancing effects of nicotine on alcohol reinforcement and the essential value of alcohol in rats. Dr. Ken Perkins will present findings showing that the reinforcement enhancing effects of nicotine are also observed in humans when nicotine is administered via tobacco cigarettes and, to lesser extents (possibly due to dosing), via electronic cigarettes, nicotine patch, and nasal spray. Dr. Bevins will summarize the work presented, and discuss new avenues for research on these effects of nicotine. This symposium was contributed by the SRNT Basic Science Network.

SYM6A

NICOTINE INCREASES SIGN TRACKING BUT NOT GOAL TRACKING: EFFECTS ON SUBSEQUENT REWARD SEEKING

Matthew I. Palmatier, Ph. D., Chloe T. Majors, Amanda L. Smith. East Tennessee State University.

Nicotine increases Pavlovian conditioned approach (PCA) to reward associated cues ('sign-tracking'), suggesting that nicotine enhances the attribution of incentive salience to reward-predictive stimuli. The goal of the present studies was to investigate whether nicotine effected an enduring change in incentive salience of the stimulus. Rats were randomly assigned to nicotine (NIC, 0.4 mg/kg) or saline (SAL) PCA groups (n=15/group). Rats were injected subcutaneously with their assigned solution 15 min before each PCA test. During PCA sessions a conditioned stimulus (CS, 15s lever-extension and cue-light illumination) was paired with sucrose (20% w/v in a liquid dipper/receptacle). During acquisition (29 PCA sessions), the NIC group showed a significant bias toward the sign relative to the SAL group; lever contacts and presses were increased and latency to contact the lever was reduced. Rats were then separated into two experiments – saline substitution (n=12/group), or IV cocaine self-administration (CSA; n=3/group). In the saline substitution experiment, nicotine pre-treatments (NIC group) were replaced with saline. However, the NIC group maintained their approach to the CS across all 9 test sessions; lever contacts and presses were significantly higher than the SAL group throughout testing. In the CSA experiment, IV cocaine infusions (0.125 mg/kg/inf) were delivered for meeting the schedule of reinforcement on the CS lever from PCA sessions. IV cocaine infusions were accompanied by 15 s presentation of the cue light from PCA tests. The NIC group had significantly higher rates of operant responding and cocaine intake on the first test, relative to the SAL group. These findings confirm that nicotine can potentially increase the salience of non-nicotine stimuli that predict reward. The increased salience imparted by nicotine is enduring, and this enduring change in salience may promote maladaptive behaviors in other contexts.

FUNDING: Academic Institution

SYM6B

REINFORCEMENT ENHANCEMENT BY NICOTINE IN ADULT RATS: PHARMACOLOGICAL AND BEHAVIOURAL ASPECTS

Paul Clarke, Ph. D., Annie Constantin, Jennifer M. Wright, Suelyn Ren, Tsz Man Vanessa Chan, Doran Satanove. McGill University.

Nicotine has been shown to enhance the impact of several primary and conditioned reinforcers. However, nicotine doses used in animal studies have often exceeded smoking-associated levels of exposure, and reinforcement enhancement has not always been differentiated from a more generalized behavioural activation. In addition, whether nicotine enhances non-nicotine reinforcers via a habituation-related mechanism has been little explored. In all experiments, adult male rats pressed an "active" lever to produce a reinforcing visual stimulus (brief cue light illumination), during daily 60-min sessions. Pressing on either the active or inactive lever retracted both levers for 60 s. Nicotine was tested in a range of doses (0.025-0.2 mg/kg), given either by continuous intravenous (IV) infusion, or in regularly-spaced IV pulses (of 3-s or 30-s duration), or pre-session subcutaneous (SC) injection. In other experiments, the acute effects of nicotine and d-amphetamine were directly compared, and we also determined whether reinforcement enhancement by nicotine could be prevented by acute systemic injection of various receptor antagonists. We found that nicotine selectively increased responding for the light cue, confirming previous reports. This effect occurred reliably at doses as low as 0.1 mg/kg SC or IV, corresponding to measured serum levels of around 25 ng/ml. Intravenous nicotine was equally effective whether delivered by continuous infusion or in a pulsatile fashion. Nicotine and d-amphetamine were similarly effective, and neither drug appeared to slow habituation to the visual reinforcer. In tests with receptor blockers, reinforcement enhancement by nicotine was abolished by the broad-spectrum nicotinic antagonist mecamylamine and by a D1 dopaminergic antagonist. In conclusion, reinforcement enhancement by nicotine was evident across several modes of drug delivery, and occurred even at serum levels lying within the daytime range of moderate cigarette smokers. Furthermore, the reinforcement enhancing effect of nicotine was as large as that produced by d-amphetamine, occurred independent of habituation, and depended on dopaminergic transmission.

FUNDING: Federal

SYM6C

EXTENDING THE REINFORCEMENT-ENHANCING EFFECTS OF NICOTINE TO ALCOHOL REINFORCEMENT THROUGH BEHAVIORAL ECONOMICS

Scott T. Barrett, Ph. D.¹, Brady M. Thompson¹, Jessica R. Emory¹, David A. Kwan¹, Chris E. Larson¹, Rick A. Bevins². ¹University of Nebraska-Lincoln, ²University of NE-Lincoln.

Nicotine-dependence and alcohol-dependence are highly correlated: up to 80% of alcohol-dependent persons in the US are regular smokers, and risk of alcohol-dependence is four times higher among people who are nicotine-dependent. Additionally, there are differences in the prevalence and nature of nicotine- and alcohol-dependence between the sexes. Research indicates that nicotine produces reinforcement-enhancing effects on the value of sensory and appetitive reinforcers, and this may extend to alcohol reinforcement. Additionally, many effective smoking cessation pharmacotherapeutics have also been demonstrated to produce enhancement effects comparable to those of nicotine, which may partially account for their efficacy in treatment. We present a series of behavioral economic investigations of the role of the reinforcement-enhancing effects of nicotine in facilitating alcohol self-administration using reinforcer demand methods. In separate studies, the effects of nicotine dose, biological sex, reinforcer quality, and administration of smoking cessation pharmacotherapeutics (bupropion, varenicline and sazetidine-A) were evaluated. In each of these studies, male and female Wistar rats were trained to self-administer alcohol using a brief sucrose-fading procedure. Subsequently, lever-pressing was maintained by 12-15% ethanol solution in brief self-administration sessions. Over blocks of several sessions, the response requirement per ethanol-dipper presentation was systematically increased, during which injections of saline or nicotine (also bupropion, varenicline, or sazetidine-A, in one study) were administered within each cost-condition. Ethanol consumption as a function of the response-cost to obtain ethanol was analyzed using an exponential reinforcer demand model, and the effects of biological sex and drug administration to alter these demand functions was evaluated. Together, these studies indicate the nicotine (and some smoking cessation pharmacotherapeutics) enhances the reinforcement value of alcohol by decreasing the effect of increasing response-cost to constrain alcohol self-administration.

FUNDING: Federal; State; Nonprofit grant funding entity



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SYM6D

NICOTINE ENHANCES THE REINFORCING EFFECTS OF NON-DRUG REWARDS IN HUMANS

Kenneth Perkins, Ph. D.¹, Joshua Karelitz². ¹WPIC University of Pittsburgh, ²University of Pittsburgh.

Preclinical research documents that, aside from the direct primary and secondary reinforcing effects of nicotine, nicotine also acutely enhances the reinforcing efficacy of other reinforcers ("rewards") not directly associated with stimuli tied to drug intake itself. Study of these effects in humans has largely been overlooked, but recent findings suggest they may have clinical implications for more fully understanding the persistence of tobacco dependence. This presentation describes methods and results from the limited controlled research specifically assessing nicotine's acute reinforcement enhancing effects in humans, particularly as they relate to such effects in non-human models. Within-subject designs compared nicotine vs. placebo effects on responding reinforced by different non-drug rewards vs. no reward control, and procedures were explicitly based on those from preclinical studies. Reinforcement enhancing effects have been found in nicotine administered via tobacco cigarettes and, to lesser extents (possibly due to dosing), via electronic cigarettes and nicotine medications of patch and nasal spray. This research indicates that nicotine per se increases responding in humans that is reinforced by some rewards (auditory stimuli via music, visual stimuli via video) but perhaps not by others (e.g. money). This pattern of findings could suggest differential dose-dependency of nicotine's reinforcement enhancing effects across available types of rewards. These effects, seen in dependent and non-dependent smokers, reflect positive reinforcement due to nicotine, not negative reinforcement due to withdrawal relief. After detailing these relatively few human studies, we address potential consequences of these effects for dependence and tobacco cessation efforts, including the possibly similar effects of non-nicotine cessation medications in quitting smokers. Future clinical research should examine factors determining which types of rewards are (or are not) enhanced by nicotine, consequences of the loss of these nicotine effects after quitting smoking, and potential individual differences in these effects.

FUNDING: Federal

SYM7

LEVERAGING EPIDEMIOLOGICAL, ECOLOGICAL, AND CLINICAL DATA TO IMPROVE SMOKING CESSATION RATES AMONG HEAVY DRINKING SMOKERS

Sarah S. Dermody, PhD. Oregon State University.

Cigarette use is prevalent in heavy drinkers. Furthermore, heavy drinking smokers have a substantially lower cessation rate than non-heavy drinking smokers. This symposium will present and integrate data on how to promote smoking cessation among alcohol users, emphasizing heavy drinkers. Data will be presented from multiple levels of analysis, including epidemiological, ecological, and clinical laboratory-based investigations of the complex associations between alcohol and tobacco use during smoking cessation. The clinical implications of results will be discussed. First, Dr. Weinberger will present epidemiological data of the associations of problematic alcohol use (e.g., alcohol use disorder, heavy alcohol use) with cigarette smoking and quit rates over time. Next, focusing on ecological momentary associations, Dr. Dermody will share results from smokers who drink to show that the association between alcohol use on smoking lapses changes over the course of a smoking cessation attempt. Dr. Kaye will then present findings from a smoking cessation comparative effectiveness trial of varenicline vs nicotine patch vs combo-NRT concerning the influence of baseline alcohol use on smoking cessation outcomes and how those associations vary as a function of treatment condition. Using data from the same trial, Dr. Johnson will focus on the associations between alcohol and other drug use disorders on cessation success, withdrawal and nicotine dependence, and response to treatment. Then, Dr. Fucito will discuss findings from a 16-week clinical trial of varenicline in combination with medical management and support for changing drinking in order to examine predictors of early response to varenicline in smokers with alcohol use disorder. Lastly, using data from the same trial, Dr. Bold will present longitudinal post-treatment alcohol and smoking outcomes (12 month follow-up) in smokers with alcohol use disorder, and discuss how these effects may differ by sex. The discussant, Dr. McKee, will end the symposium by synthesizing the results from the five presentations and discussing the implications of these data for improving smoking cessation among heavy drinking smokers.

SYM7A

RELATIONSHIPS BETWEEN PROBLEMATIC ALCOHOL USE AND CIGARETTE SMOKING AMONG INDIVIDUALS IN THE UNITED STATES: EPIDEMIOLOGICAL INVESTIGATIONS

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Alcohol and tobacco use are two of the leading causes of morbidity and mortality in the United States (US) and globally. Alcohol and cigarette use are commonly linked and individuals who use both alcohol and cigarettes experience greater health risks than those who use either substance alone. The prevalence of cigarette smoking has decreased and cigarette smoking quit rates have increased over time in the general US population. However, there is evidence that smoking remains higher, and quit rates remains lower, for some subgroups such as persons with problematic alcohol use (e.g., heavy alcohol use, alcohol use disorders). Epidemiologic investigations can identify subgroups of smokers who are disproportionately impacted by smoking behavior and who would benefit from targeted research and treatment efforts. This talk will present results from a series of epidemiologic investigations into the relationship of problematic alcohol use and cigarette smoking in representative samples of the US adult population using data from the National Survey on Drug Use and Health (NSDUH) and the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). Specifically, data will be presented on trends in cigarette smoking prevalence and smoking quit rates over time by alcohol use status as well as the relationship between smoking behavior and alcohol use and alcohol use disorders among persons with past alcohol use disorders. To summarize, persons with problematic alcohol use demonstrate persistently higher prevalences of smoking and lower cigarette quit rates than persons without problematic alcohol use over time. Further, cigarette smoking is associated with alcohol use and alcohol use disorder relapse among persons with past alcohol use disorders. Individuals with problematic alcohol use may need additional resources and interventions to help reduce the prevalence of smoking and increase quit rates. Reducing the prevalence of smoking among persons with problematic alcohol use may help reduce the negative consequences of smoking as well as improve alcohol treatment outcomes.

FUNDING: Federal

SYM7B

THE TIME-VARYING EFFECT OF ALCOHOL USE ON CIGARETTE SMOKING RELAPSE RISK

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Background: Ecological momentary assessment (EMA) data suggest that 2 of 5 smoking lapses occur when drinking alcohol. Our analyses aimed to identify when in the quitting process alcohol leads to lapses and strong temptations to smoke. Methods: Using EMA, intensive data was collected from 159 daily smokers (mean age=43.90 (SD=10.41), 56.60% female) who drink with respect to the timing of smoking lapses, temptations to smoke, and recent (past 15 minutes) alcohol use. A logistic time-varying effect model (TVEM) modeled lapses during the 4 weeks following a successful quit attempt (i.e., quit >24 hours) as a function of concurrently-assessed recent alcohol use. Analyses controlled for weekend/weekday, gender, and time to first cigarette (more dependent <5 vs less dependent >5 minutes). Time was continuous, based on the day/time of electronic diary completion. Analyses were repeated with temptation to smoke as the outcome for observations when smoking did not occur. Results: Recent alcohol use was associated with smoking lapse for less nicotine dependent individuals only, and the association was time-varying. Alcohol use became a significant predictor of lapse by the end of the first day quit. Then, the association increased in strength until day 7. This association subsequently decreased such that alcohol use was no longer associated with lapse risk by the end of day 20 of the quit attempt. There were no gender differences. Alcohol use was positively associated with temptation to smoke for women from the first day quit until day 17, after which the association decreased and became non-significant. A similar time-varying pattern was seen for less dependent individuals. Alcohol use was unrelated to temptation to smoke for men and more dependent individuals throughout the quit attempt. Conclusions: The association between drinking and smoking temptations and lapses varies over time, peaking early in abstinence and declining thereafter. This could reflect progressive relapse of most vulnerable individuals or habituation to alcohol as a smoking cue. Interventions to prevent alcohol-related lapsing are most relevant early in the quit period.

FUNDING: Federal



SYM7C

SMOKING CESSATION OUTCOMES FOR HEAVY DRINKING SMOKERS USING VARENICLINE, NICOTINE PATCH, OR COMBINATION NICOTINE REPLACEMENT THERAPY

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SIGNIFICANCE: A sizeable group of smokers also drink heavily. Heavy drinking smokers are at particular risk for a wide array of health concerns and are less likely to successfully quit smoking relative to moderate drinkers. Preliminary evidence suggests that varenicline may be particularly useful in aiding heavy drinking smokers to quit smoking. We performed secondary data analysis of a large comparative effectiveness trial of smoking cessation pharmacotherapies to: 1) evaluate the relations between baseline alcohol use patterns (heavy drinker, moderate drinker, and non/infrequent drinker) and point-prevalence abstinence at 26 weeks, and 2) explore whether different pharmacotherapies are especially effective for heavy drinkers. **METHODS:** Smokers motivated to quit (N = 1086) were randomized to receive varenicline, nicotine patch, or combination nicotine replacement therapy (C-NRT; nicotine patch + nicotine lozenge) in a 12-week open-label smoking cessation trial. **RESULTS:** Results showed that 27% of participants were classified as heavy drinkers (>1 binge/month in past year), 39% as moderate drinkers (>1/day/month in past year but did not meet criteria for heavy drinking), and 34% as non/infrequent drinkers (<1/month in past year). Heavy drinkers reported the lowest 6-month abstinence rates (21%), compared to moderate (27%) and non/infrequent (25%) drinkers, but this did not reach statistical significance (p=.057). Unexpectedly, heavy drinkers using varenicline reported the lowest rate of abstinence (18%), followed by C-NRT (21%) and patch (24%). Moderate drinkers, on the other hand, reported the lowest rates of abstinence when using patch (25%), followed by varenicline (26%) and C-NRT (29%). Non/infrequent drinkers were also most likely to benefit from using C-NRT, followed by varenicline and then patch (28%, 24%, 19%, respectively). **CONCLUSION:** Results suggest that drinking status may moderate the effectiveness of smoking cessation pharmacotherapy. Additional research is needed to develop and enhance targeted interventions for smokers who drink heavily.

FUNDING: Federal

SYM7D

THE RELATIVE IMPACT OF ALCOHOL, SUBSTANCE, AND COMORBID USE DISORDERS ON SMOKING CESSATION SUCCESS AND RELATED CONSTRUCTS

Adrienne L. Johnson, PhD, Timothy B. Baker, Megan E. Piper. University of Wisconsin.

Psychiatric comorbidity is both prevalent and problematic in terms of cigarette smoking and cessation success. Dual alcohol and tobacco use rates are particularly high, and are associated with decreased smoking cessation success as well as increased nicotine dependence and withdrawal symptoms. Further, pathological alcohol (i.e., Alcohol Use Disorder [AUD]) and substance (i.e., Substance Use Disorder [SUD]) use are associated with greater tobacco use and nicotine dependence. Despite the co-occurrence and negative impact of these disorders, limited research has evaluated the independent effects of AUD and/or SUD on smoking cessation success within large, rigorous cessation trials. This study examined the relative impact of past-year and lifetime AUD and SUD on early and sustained smoking cessation success as well as nicotine withdrawal and dependence. Adult daily smokers (n=1051; 52.5% female) participated in a randomized, comparative effectiveness smoking cessation trial. Participants completed a structured clinical interview (CIDI) and were categorized into: 1) no lifetime history of AUD/SUD (n=405), 2) only AUD (n=292), 3) only SUD (n=102), and 4) comorbid AUD/SUD (n=252). Results indicated that, compared to smokers with no history of AUD/SUD, smokers with comorbid lifetime SUD/AUD were significantly more likely to be smoking at 8 weeks post-quit (OR=1.4; p=.04), but this difference did not remain significant at 6 months. There were no significant differences between the remaining groups at either time point. Conversely, for past year diagnoses, only smokers with SUD (n=34) were significantly more likely to be smoking at 6 months compared to those without any AUD/SUD history (n=405; OR=3.8; p=.04). Cessation findings remained unchanged after controlling for gender, race, and treatment condition. Smokers with past year SUD and lifetime AUD/SUD also reported higher nicotine dependence and withdrawal symptoms one week post-quit (p's<.05). Findings suggest that past-year SUD and lifetime comorbid AUD/SUD diagnoses negatively affect long- and short-term cessation success, respectively, as well as nicotine dependence and withdrawal.

FUNDING: Federal

SYM7E

EARLY PREDICTORS OF RESPONSE TO VARENICLINE IN INDIVIDUALS WITH ALCOHOL USE DISORDERS AND CO-MORBID SMOKING

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Significance: Smoking rates are disproportionately elevated among individuals who drink heavily. The two behaviors combined are associated with greater harm and poorer treatment outcomes than either alone. Thus, developing and optimizing treatments for this important co-morbidity is imperative. Varenicline, a tobacco pharmacotherapy, also has potential as a treatment for alcohol use disorders (AUD) but its effects on both behaviors are not fully understood. **Objective:** This study examined early responses as predictors of end of treatment improvements in smoking and drinking in individuals with AUD and co-morbid smoking seeking alcohol treatment. **Methods:** Secondary analysis of a randomized, double-blind, parallel group, placebo-controlled, 2-site, 16-week trial of varenicline in combination with medical management. Eligible participants (N=131) were 18-70 and met alcohol (i.e., current alcohol dependence and = 2 heavy drinking days/week) and tobacco criteria (i.e., smoke = 2 days/week). Early changes in drinking (i.e., percent heavy drinking days), smoking (i.e., cigarettes per smoking day), mood, alcohol/tobacco subjective effects, and alcohol/tobacco craving were examined as predictors of end of treatment drinking and smoking reductions. **Results:** Varenicline significantly enhanced mood and attenuated alcohol and tobacco reinforcement early in treatment. Improvements in mood, however, did not predict outcomes. However, greater early reductions in tobacco reinforcement and smoking predicted greater smoking decreases by the end of treatment among all participants. Likewise, greater reductions in alcohol reinforcement and drinking early in treatment predicted greater success reducing heavy drinking by the end of treatment, irrespective of condition assignment. We also observed interactions of treatment, sex, and early reductions in reinforcement. **Conclusions:** Early reductions in alcohol/tobacco use and/or reinforcement may provide useful clinical decision-making tools for patients seeking treatment for either behavior. Treatment could be tailored for patients who do not show these early benefits. Future studies of this personalized medicine approach are warranted.

FUNDING: Federal; State

SYM7F

LONGITUDINAL FINDINGS FROM A RANDOMIZED CLINICAL TRIAL OF VARENICLINE FOR ALCOHOL USE DISORDER WITH COMORBID CIGARETTE SMOKING

Krysten W. Bold, PhD¹, Allen Zweben², Lisa M. Fucito¹, Mary E. Piepmeier², Srinivas Muvala¹, Ran Wu¹, Ralitsa Gueorguieva¹, Stephanie S. O'Malley¹. ¹Yale University School of Medicine, New Haven, CT, USA, ²Columbia University, New York, NY, USA.

Significance: This study is the first to examine longitudinal post-treatment outcomes of a placebo-controlled trial of varenicline for alcohol use disorder with comorbid cigarette smoking. **Methods:** Participants were 131 adults (n=39 female) from a randomized, double-blind, parallel group, placebo-controlled, 16-week multi-site trial of varenicline combined with medical management (O'Malley et al., 2018). Timeline follow-back assessments of alcohol and smoking behavior were conducted at the end of treatment (4 months), with follow-ups at 6, 9, and 12 months. Outcomes were percent heavy drinking days (PHDD), no heavy drinking days (NHDD), cotinine-confirmed prolonged smoking abstinence (PA), and good clinical outcome (GCO) on either NHDD or PA. **Results:** Treatment improvements were maintained post-treatment. Over 45% of the sample taking varenicline achieved a good clinical outcome on either alcohol or smoking at the 12-month follow-up. For the sample overall, PHDD or NHDD did not differ significantly by treatment condition (ps>.13), but varenicline produced higher rates of PA vs. placebo at 4, 9, and 12 months (p<.05). Significant differences were observed by sex. Males had higher rates of NHDD with varenicline (28.8%) vs. placebo (6.4%) at the end of treatment (p=.004), and these effects were maintained at 12 months (varenicline: 40.0% vs. placebo: 19.2%, p=.02). Higher rates of PA were seen for varenicline in both males (8.8%) and females (21.0%) vs. placebo (males/females: 0%) at the end of treatment (p=.05), and this effect was maintained at 12 months for females (varenicline: 21.0% vs. placebo, 0.0%, p=.05). **Conclusion:** Varenicline treatment combined with medical management appears to have enduring benefits for patients with co-occurring alcohol use disorder and cigarette smoking, and these effects may differ by sex.

FUNDING: Federal; State



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SYM8

EXAMINING AND ADDRESSING COMMUNICATION INEQUALITIES IN TOBACCO CONTROL

Andy Tan, PhD, MPH, MBA, MBBS. Dana-Farber Cancer Institute.

Communication inequalities in tobacco marketing and countermarketing exposure, attention, and information processing among vulnerable populations are important factors that influence tobacco-related health disparities. It is therefore important to examine whether communication inequalities are present among populations disproportionately harmed by tobacco use and to minimize these communication inequalities, if present. This symposium presents population-based research from the U.S., Canada, Australia, and Mexico that examine the presence and effects of communication inequalities associated with tobacco-related health disparities utilizing a variety of research methods. Andy Tan, chair, will introduce the symposium and present an overview of a conceptual framework of communication inequalities in tobacco control research and practice drawing from the Structural Influence Model of Communication and the NCI Monograph on Socioecological Approach to Addressing Tobacco-Related Health Disparities. Meghan Moran will present results from a large online survey among U.S. youth and young adults demonstrating differences in the appeal of various tobacco marketing tactics (e.g., branding, promotional tactics, advertising themes) across socioeconomic status (SES), race/ethnicity and LGBTQ status. Kelvin Choi will present findings from 12 focus group discussion among U.S. young adult smokers from lower SES and different racial/ethnic backgrounds to compare their reactions to recent anti-smoking messages including the Tips from a Former Smoker (TIPS) and Every Try Counts (ETC) campaigns. Third, Emily Brennan will present an evaluation study utilizing a rolling cross-sectional survey design to assess the reach and impact of a media campaign strategy targeted at low SES smokers in Australia. James Thrasher will present data from experimental studies comparing the effects tobacco package inserts and graphic warning labels across population subgroups in Canada and Mexico, respectively. Jessica Rath, discussant, will synthesize these results and discuss implications on future research and practice to reduce communication inequalities among vulnerable populations.

SYM8A

CONCEPTUAL FRAMEWORK OF COMMUNICATION INEQUALITIES IN TOBACCO CONTROL RESEARCH AND PRACTICES

Andy SL Tan, PhD, MPH, MBA, MBBS. Dana-Farber Cancer Institute.

This presentation outlines a conceptual framework of the determinants and effects of communication inequalities in the context of tobacco control research and practice. The conceptual framework is informed by the Structural Influence Model of Communication and the NCI Monograph 22 (A Socioecological Approach to Addressing Tobacco-Related Health Disparities). Communication inequalities are defined as differences in the ability to generate, manipulate, and distribute information as well as to access, process, and act on that information among social groups. They are hypothesized as important mediators through which social determinants influence tobacco-related knowledge, attitudes, beliefs, and behaviors. Communication inequalities occur at the individual and systems or institutional levels. For instance, at the individual-level, chronic stresses due to discrimination, lower socioeconomic position, and belonging to racial, ethnic, sexual and gender minority groups are linked with targeted tobacco industry marketing and have higher exposure to pro-tobacco product messaging, which is in turn associated with higher susceptibility and uptake of tobacco products in certain vulnerable groups. At the systems or institutional level, lack of social support and availability of culturally-appropriate community-bases resources for tobacco treatment may mean that certain groups are disadvantaged in accessing treatment information, leading to disparities in successful tobacco cessation. Tobacco control policies including tobacco packaging warning labels, anti-tobacco media campaigns through social media, and reliance on digital technology to deliver tobacco cessation treatment may further exacerbate existing tobacco-related health disparities if vulnerable populations are less likely to be exposed to anti-tobacco information or perceive these information as less relevant for them through these channels. This framework provides a useful model to develop testable research hypotheses of the role of communication and generate intervention efforts to minimize communication inequalities and ultimately eliminate tobacco related health disparities in vulnerable populations.

FUNDING: Unfunded

SYM8B

DISPARITIES IN THE APPEAL OF CIGARETTE ADVERTISING FEATURES BY RACE, SOCIOECONOMIC STATUS AND SEXUAL ORIENTATION

Meghan Moran, PhD. Johns Hopkins Bloomberg School of Public Health.

Background: There are well-established disparities in exposure to cigarette marketing by socioeconomic status, race/ethnicity and LGBTQ status. However, the mechanisms through which exposure to this marketing might contribute to these disparities in cigarette use are less clear. The current study sought to identify differences in the appeal of various tobacco marketing tactics (e.g., branding, promotional tactics, advertising themes) across socioeconomic status, race/ethnicity and LGBTQ status. **Methods:** An online survey was given to a national sample of 2,619 12-17 and 2,625 18-24 year-olds. Participants were shown and reported perceptions of a cigarette ad randomly selected from a set of 50 ads. Ads were content coded and seven commonly used tactics were identified: coupons, sweepstakes, outdoors themes, environmental themes, fun themes, flora imagery and outdoors settings. Liking and curiosity about the advertised product were the primary outcomes of interest. Mixed effects logit models with ad identifier as a random effect and participant and ad characteristics as fixed effects were conducted. Models included interaction terms between ad features and sociodemographic variables to test for differences across groups. To examine the effect of ad brand on liking, participants were asked if they had a favorite tobacco ad and the brand of the ad. **Results:** Sweepstakes was associated with increased ad appeal across all groups. Outdoors themes (AOR=.51) and settings (AOR=.64) were less likely to appeal to non-white (vs. white) youth. Swisher Sweets was more likely to be named as a favorite ad among black and Hispanic youth and LGBT youth. Among black youth, Newport and Black & Mild were more likely to be named as the brand of favorite ad, while Marlboro, Camel, and American Spirit were less likely to be named as favorite. Newport was more likely to be named as favorite ad among lower SES youth. **Conclusions:** Understanding the brands and advertising strategies that appeal to different sub-groups of youth can inform countermarketing campaigns and marketing restrictions.

FUNDING: Federal

SYM8C

REACTIONS TO TWO RECENT NATIONAL ANTI-SMOKING MESSAGES AMONG LOWER-SOCIOECONOMIC HISPANIC, NON-HISPANIC BLACK, AND NON-HISPANIC WHITE YOUNG ADULT SMOKERS

Kelvin Choi, PhD, MPH. National Institute on Minority Health and Health Disparities.

Background: Anti-smoking campaigns are an important strategy to promote smoking cessation. We explored how lower socioeconomic status (SES) young adult smokers of different racial/ethnic backgrounds react to recent anti-smoking messages. **Methods:** Lower SES (<college education and <median household income) Hispanic, non-Hispanic Black, and non-Hispanic White young adult smokers (aged 18-29) from the Washington, DC metropolitan area participated in 12 focus group discussions (n=75). Participants commented on the print advertisements from Tips from a Former Smoker (TIPS) and Every Try Counts (ETC) campaigns. Discussions were audio-taped, transcribed, and analyzed. **Results:** Few participants recalled seeing these messages. TIPS Campaign: Participants commented that messages showing negative effects of smoking (e.g., amputation, tooth loss) elicited fear and grabbed their attention. Some non-Hispanic White participants felt that the fear was too strong, and they would withdraw from the messages. Hispanic and non-Hispanic Black participants found these messages exaggerated and questioned if the negative effects were caused only by smoking. Half of the Hispanic and non-Hispanic White participants said the messages motivated them to quit smoking, while most of the non-Hispanic Black participants said they were not motivating. ETC Campaign: Participants understood that the campaign aimed to encourage smokers to quit smoking. However, participants found these messages "dull" and "boring," and the exemplars did not look like former smokers. Some Hispanic participants expressed that these messages made them feel treated like children and made them angry. Participants, especially Hispanics and non-Hispanic Whites, stated that the message "you aren't smoking right now" made them crave cigarettes. Most of the non-Hispanic Black and White participants found these messages not motivating, while half of the Hispanics stated the same sentiment. **Conclusions:** Recent anti-smoking messages did not seem to motivate young adult smokers to quit smoking. Reactions to these messages also varied by race/ethnicity. A more culturally tailored approach may enhance message effectiveness.

FUNDING: Federal



SYM8D

HOW TO DESIGN AND DELIVER MASS MEDIA CAMPAIGNS TO AVOID COMMUNICATION INEQUALITIES IN TOBACCO CONTROL: EVIDENCE FROM AUSTRALIA

Emily Brennan, PhD. Cancer Council Victoria.

Background: Despite substantial progress in reducing smoking prevalence in Australia, people living with social and economic disadvantage continue to be more likely to smoke. Mass media campaigns have played a central role in Australia's comprehensive tobacco control program. Given evidence of differences by socioeconomic status (SES) in the reach of certain media channels and the impact of certain message types, these campaigns need to be carefully implemented to avoid exacerbating existing disparities. In the state of Victoria, Australia, the campaign strategy has included: formative research and message pre-testing with lower SES smokers; development of highly emotional messages known to work well with lower SES smokers; and targeting media buys towards those channels most frequently used by lower SES smokers. In this study, we examined the success of this strategy in reaching and influencing smokers across SES groups.

Methods: A weekly cross-sectional telephone survey was conducted among 7,841 Victorian adult smokers between 2012 and 2015. Logistic regression analyses examined associations between exposure to anti-tobacco advertisements categorised as being predominantly fear-, sadness-, combined negative emotion-, or hope-evoking, and advertisement recall, quitting-related thoughts, confidence, intentions and social norms. Interaction terms tested whether these associations varied by SES (low; mid; high; defined using a combination of individual-level education and area-level disadvantage).

Results: Broadcast of predominantly fear-evoking advertisements led to the highest levels of advertisement recall, increased quitting thoughts, confidence, intentions, and perceived disapproval and embarrassment about being a smoker. Effects were consistent across smokers from low, mid and high SES groups. Effects for other emotive-evoking advertisements were mixed or null and showed no variation across SES groups.

Conclusions: Careful design and implementation can ensure that tobacco control mass media campaigns do not exacerbate existing SES disparities. Campaigns that predominantly evoke fear are most effective for all SES groups.

FUNDING: Federal

SYM8E

ASSESSING THE HEALTH EQUITY IMPACT OF CIGARETTE WARNING POLICIES: RESULTS FROM LONGITUDINAL STUDIES OF ADULT SMOKERS IN CANADA AND MEXICO

James Thrasher, PhD. University of SC.

BACKGROUND: Prominent pictorial warning labels (PWLs) promote smoking cessation; yet their potential health equity impact has been assessed mostly in brief experimental studies. This study assessed whether smokers' responses to PWLs and inserts vary by socioeconomic status (SES) in Mexico and Canada, the only country whose PWL policy includes package inserts with cessation tips and benefits.

METHODS: Data were analyzed from online cohorts of adult smokers in Canada (n=3,506) and Mexico (n=3,801) who responded to at least 1 of 7 surveys from 2012 to 2014. Generalized estimating equation (GEE) models regressed attention to PWLs and, for Canada, to inserts on SES indicators (i.e., education=high school or less, some college, university or more; and income=tertiles). GEE models also regressed self-efficacy and risk perceptions on attention variables and SES, testing for interactions between them. Finally, GEE models regressed quit attempts and sustained quit attempts (30 days or more without smoking) from subsequent surveys (t+1) on attention variables, SES, and interactions, as assessed at the prior survey (t). All models adjusted for covariates (age, sex, smoking intensity, quit intentions, quit attempts), with additional covariates in cessation models (self-efficacy, risk perceptions).

RESULTS: In models for attention in Canada and Mexico, the only significant SES correlate was higher income's positive association with attention to inserts in Canada. In Canada and Mexico, self-efficacy was unassociated with SES, but those with stronger risk perceptions had higher income in both countries and higher education in Mexico. In Canada, cessation outcomes were associated with greater attention to inserts, but not with attention to PWLs or with SES, except for a positive association between quit attempts and education. In Mexico, quit attempts were associated with greater attention to PWLs and lesser income. Interactions between SES and attention were not significant in any models.

CONCLUSIONS: PWL policies appear to have similar effects among smokers at different SES levels. Future research should assess opportunities to reduce disparities with specific PWL policies.

FUNDING: Federal

SYM9

THE HEAT IS ON: STATE OF THE SCIENCE ON HEATED TOBACCO PRODUCTS AND CONSIDERATIONS FOR FUTURE RESEARCH

Maciej L. Goniewicz, PhD, PharmD. Roswell Park Comprehensive Cancer Center, Buffalo, NY, USA.

With the introduction of the 'Heat-not-Burn' (HnB) products, the landscape of tobacco product exposure has changed yet again. Claims of lowered risk or health benefits for heated tobacco products compared to conventional cigarettes are based almost exclusively on industry-funded research, and except limited number of product testing studies, independent research is not available to support these claims as of 2018. In December 2016, Philip Morris International (PMI) submitted an application to the US FDA for his HnB product (IQOS) to be authorized as a modified risk tobacco product (MRTP). During this multi-disciplinary symposium, we will present novel data from independent research to provide a balanced view on the potential public health impact of emerging HnB products. First, Dr Fong will discuss the relative harmfulness perceptions of HTPs and of e-cigarettes in Japan. Concerns have been raised that novel HnB tobacco products may be appealing to youth. To address this topic, Dr Hammond will present data from the first two waves of the ITC Youth Tobacco and E-cigarette Survey on awareness, interest, and use of IQOS among youth in Canada, England, and USA. Although IQOS is currently not available in the US, the safety of this product might be potentially tested in the laboratory settings using products of the same brand purchased from other countries. To explore these research implications, Dr Goniewicz will discuss results of the study that aimed to determine and compare amounts of tobacco-specific toxicants in HnB products purchased from six different countries. Additionally, since in the operation of the HnB product an aerosol stream is formed, Dr Destaillats will present results of the study that evaluated volatile emissions generated from the IQOS product. Finally, Dr Thanavala will present novel data on the impact of acute inhalation exposure to emissions from HnB products and compare the outcome of pulmonary inflammation and damage to tobacco smoke and aerosols from e-cigarettes (including JUUL). Dr Cummings (Discussant) will lead a discussion on implications of the presented data for public health policy, product regulation, and future research.

SYM9A

BELIEFS ABOUT THE RELATIVE HARMFULNESS OF HEATED TOBACCO PRODUCTS AND E-CIGARETTES VS. CIGARETTES: FINDINGS FROM ITC PROJECT SURVEYS IN JAPAN AND 21 OTHER ITC COUNTRIES

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Significance: The introduction of heated tobacco products (HTPs) in Japan has been accompanied by an enormous decline in cigarettes. Research on beliefs of the relative harmfulness of HTPs vs cigarettes and how they relate to the use of HTPs and transitions to/from cigarettes can inform regulations of such products. This paper presents findings from Wave 1 (2018) of the ITC Japan Survey on the relative harmfulness perceptions of HTPs and of e-cigarettes in Japan and comparing them to the e-cigarette perceptions across 21 other ITC countries.

Methods: The ITC Japan Survey is a national cohort web survey of cigarette smokers (n=3,306), HTP users (= weekly, n=207), dual users (n=555), and non-users (n=583). Measures were perceptions of harmfulness of HTPs vs cigarettes on overall harmfulness, harmfulness to others, and addictiveness; parallel measures of harmfulness of e-cigs vs cigarettes were also assessed.

Results: A high percentage of respondents believed HTPs and e-cigs to be less harmful than cigarettes. Cigarette-only users were less likely to believe that HTPs are less harmful than cigarettes (44%) than to believe that e-cigs were less harmful than cigarettes (44% vs 60%), compared to HTP-only users (89% vs 86%) and dual users (72% for both). Non-users did not differ in their perceptions of HTPs vs e-cigs (51% vs. 55%). Perceptions of relative harmfulness of HTPs to others showed the same pattern. Beliefs that HTPs were less addictive than cigarettes were lower, with HTP-only users and dual users being more likely to believe this (51% & 47%) than cigarette-only (21%) and non-users (22%). Smokers in Japan were most likely of 22 ITC countries to believe that e-cigs were less harmful than cigarettes (57%); HTP beliefs ranked 7th.

Conclusion: Relative harmfulness beliefs of HTPs may be both a cause and an effect of their popularity in Japan, fueled by marketing efforts. Ongoing analyses will relate these beliefs to reasons



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for using HTPs, and, with future cohort data, transitions to/from HTPs and cigarettes. Favorable perceptions of e-cigarettes may suggest that, if not for the ban on nicotine, e-cigarettes would have also shown substantial growth in Japan.

FUNDING: Federal

SYM9B

AWARENESS, INTEREST, AND USE OF IQOS AMONG YOUTH IN CANADA, USA, AND ENGLAND

David Hammond, PhD¹, Christine Czoll², Jessica Reid¹, Richard J. O'Connor³, Maciej L. Goniewicz³. ¹University of Waterloo, Canada, ²University of Ottawa, Canada, ³Roswell Park Comprehensive Cancer Center, USA.

Significance: Tobacco products that are vapourized rather than burned (heated tobacco products) have been introduced in a growing number of international markets. For example, PMI has introduced IQOS heat sticks in dozens of markets, including Canada and England, and has submitted an application to the FDA for IQOS as a modified risk tobacco product. To date, there is little evidence regarding youth perceptions of HnB products, including among non-smokers and vapers. **Methods:** Data was analyzed from the first two waves of the ITC Youth Tobacco and E-cigarette Survey, an online survey conducted in July/August 2017 with youth aged 16-19 recruited from consumer panels (n=13,468) in Canada, England, and USA, and repeated in August 2018, with replenishment for respondents lost to follow-up. Respondents were shown an image of the IQOS products and asked about their awareness, use, likelihood of trying if offered, and perceptions of harm and addiction. Additional items presented four products (Marlboro, blu, JUUL, and IQOS) and asked which one people their age would be most like to use to quit smoking, and to use with friends. All 2018 estimates are based on analysis of unweighted data. **Results:** In 2018, approximately 5% of youth reported awareness of IQOS, similar to 2017 levels. Use of IQOS was reported by less than 2% of respondents in 2018. In both waves, awareness was greater among those with smoking experience (current, former, or experimental smokers) compared to those who had never smoked. Given the choice of Marlboro, blu, JUUL or IQOS, approximately 5% of respondents selected IQOS as the product 'most likely to be used to quit smoking', and only 2% as the product 'most likely to be used with friends'. Perceptions of IQOS harm and addictiveness were similar to vaping products, and substantially lower than for cigarettes. Associations with smoking and vaping, as well as country differences, will also be examined. **Conclusions:** Awareness and interest in IQOS among youth in Canada, England and USA was stable between 2017 and 2018, and concentrated primarily among smokers. Perceptions of IQOS are more similar to e-cigarettes than combustible tobacco.

FUNDING: Nonprofit grant funding entity

SYM9C

NICOTINE AND TOXICANTS IN EMERGING HEAT-NOT-BURN TOBACCO PRODUCTS: A CROSS-COUNTRY STUDY

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Background: IQOS is a brand of Heat-not-Burn (HnB) system manufactured by the Phillip Morris International (PMI). PMI has applied to the US FDA for marketing authorization of their product. Although IQOS is currently not available in the US, the safety of this product might be potentially tested in the laboratory settings using products of the same brand purchased from other countries. **Aim:** The aim of this study was to determine whether IQOS sticks (HEETS) are standardized globally by determining and comparing the amounts of tobacco, moisture, and concentrations of nicotine and four tobacco-specific nitrosamines (TSNAs) in sticks purchased in various countries. **Methods:** HEETS were purchased from six different countries: Canada, Israel, Italy, Poland, South Africa, and the United Kingdom. All products were examined for total tobacco weight and moisture using standardized gravimetric methods. Nicotine and TSNAs concentrations were analyzed using various chromatography methods. **Results:** Tobacco content in HEETS of the same type (e.g., Amber, Menthol) was on average 0.26 ± 0.1 g in a single stick and did not differ significantly across countries ($p > 0.05$). However, various types of HEETS purchased within same country differed significantly in tobacco content. Products from Poland showed the highest moisture content (on average $19.8 \pm 2.0\%$ /g). HEETS purchased from various countries differed in nicotine concentration: the highest nicotine concentration (16.5 ± 1.2 mg/g) was observed in products purchased from South Africa and the lowest concentration (14.0 ± 1.2 mg/g) was detected in products from Canada. All four major TSNAs showed significant differences between countries; products purchased from Canada contained the highest concentrations of NNK (7.5 ± 0.2 ng/g), NNN

(56.3 ± 2.5 ng/g), NAT (17.2 ± 1.3 ng/g), and NAB (1.1 ± 0.9 ng/g). **Conclusions:** Significant differences in composition of HEETS between countries suggest that different tobacco is used between countries and that these products are not standardized. Caution needs to be taken when interpreting and generalizing findings about HEETS from studies done in different countries.

FUNDING: Federal

SYM9D

CHARACTERIZING MAINSTREAM AND SIDESTREAM VOLATILE EMISSIONS FROM HEAT-NOT-BURN PRODUCTS

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This study evaluated volatile emissions generated from the IQOS heat-not-burn cigarette. Three different "heatsticks" were used inside a 200-L Teflon-coated environmental chamber following the Health Canada Intense (HCI) protocol. A broad range of volatile organic compounds (VOCs) present in mainstream and sidestream emissions were collected using sorbent tubes, which were subsequently analyzed by GC/MS with a thermal desorption inlet. Volatile carbonylic compounds were captured into dinitrophenylhydrazine (DNPH)-coated silica cartridges, subsequently extracted with acetonitrile and analyzed by HPLC. A total of more than 70 VOCs were identified in mainstream emissions, and more than 100 VOCs in sidestream emissions. The delivery yield of these VOCs was compared with our previous determinations for electronic cigarettes. At the same time, IQOS yield was compared with data reported in the literature for conventional (combustion) cigarettes. In general, IQOS yields of carbonyls, aromatic compounds and amines (except for nicotine) were between one and two orders of magnitude lower than yields of combustion cigarettes, but relatively similar to those of e-cigarettes. In addition, emissions from one of the heatsticks, a mentholated product, were also characterized at different incubation temperatures in the range 180 – 220 °C using a GC/MS with a headspace inlet. The incubation temperatures were consistent with those measured during IQOS operation. An increase in the emission levels of VOCs, together with changes in the relative concentrations of the principal species, was observed as the incubation temperature increased. The observed sensitivity with respect to the heating temperature suggests that emissions could vary significantly due to different smoking regimes, aging and soiling of the heating blade. The potential impact on secondhand exposures was evaluated by predicted indoor concentrations under various scenarios using measured sidestream VOCs and an estimate of exhaled mainstream emissions.

FUNDING: State; Academic Institution

SYM9E

THE EFFECTS OF IN VIVO EXPOSURE TO EMISSIONS FROM HEAT-NOT-BURN PRODUCT, E-CIGARETTE AEROSOLS AND TOBACCO SMOKE ON PULMONARY INFLAMMATION AND DAMAGE

Yasmin Thanavala, PhD, Tariq Bhat, Suresh Kalathil, Noel Leigh, Maciej L. Goniewicz. Roswell Park Comprehensive Cancer Center, USA.

Significance: Although combustible tobacco cigarettes (TC) remain the most popular nicotine-containing product in the United States, non-cigarette products are evolving rapidly. Over the last 10 years electronic cigarettes (EC) have gained considerable popularity, especially among youth. Further, EC designs have evolved and the newest generation of EC, have soared in popularity, most notably, one brand, Juul. With the introduction of the 'Heat-not-Burn' (HnB) products, the landscape of tobacco product exposure has changed yet again. Our experiments are designed to study the impact of acute inhalation exposure to emissions from different products namely HnB, ECs, and Juul, and compare the outcome of pulmonary inflammation and damage to inhalation of smoke from TC. **Methods:** In order to evaluate if short term in vivo exposure to HnB aerosols has the potential to recruit immune cells into the lung, we exposed mice (both male and female) for 2 weeks (5hrs/day, 5d/wk) to emissions from: IQOS device, eGO EC tank, Juul pods, Marlboro cigarettes, or to air (control). After 2-week exposure, lung tissue was analyzed for total white blood cell count, the phenotype of myeloid cells and lymphocytes. We measured albumin leak in the BAL as a surrogate of epithelial cell damage. **Results:** We have made the novel observation that there is a hierarchy in the inflammatory response as characterized by the numbers of CD4+, CD8+, IL-17+ T cells, B cells, macrophages and neutrophils in the lung following exposure to the different



products. We have observed that host sex influences several outcomes. We noted statistically significant increases in albumin levels in the BAL of mice of both sexes exposed to both HnB and EC aerosols when compared to air exposure. Lung epithelial cell damage caused by exposure to HnB aerosols and TC smoke were equivalent in male mice. Conclusions: Our studies reveal, for the first time, important insights into the contribution of emissions from different nicotine-containing products to increased inflammatory pathology and injury.

FUNDING: Federal

SYM10

TRANSLATING FROM BRAIN MECHANISMS OF INHIBITORY CONTROL TO TREATMENT DEVELOPMENT FOR SMOKING CESSATION

Brett Froeliger, PhD. MUSC.

Substance use disorders (SUDs) are evidenced by significant disruptions to multiple forms of executive function and the extant literature implicates dysregulated inhibitory control (IC), one specific form of executive function, as a transdiagnostic indicator of relapse vulnerability across substances of abuse. In the context of SUD, smokers, as compared to non-smokers, exhibit significant performance deficits on IC tasks; and among smokers, smoking abstinence further disrupts IC. Moreover, a smoker's performance on IC tasks predicts smoking relapse and the capacity to resist ad lib smoking in a laboratory setting. Despite compelling evidence of IC deficits contributing to the maintenance of tobacco use disorder (TUD), there is little support for the therapeutic value of Varenicline—the most effective first-line smoking cessation medication in treating IC deficits in TUD. Therefore, mechanistic research is needed to identify the associations between IC and TUD and evaluate new strategies for treating the pathophysiology of IC deficit. This symposium will examine mechanisms undergirding inhibitory control deficits in nicotine addiction. First, Dr. Rob Cole will present work on inhibitory control deficits present in nicotine dependent animals and the circuitry and genomic alterations underpinning these effects. Next, Dr. Jared Young will present work on identifying receptor mechanisms underlying IC deficits during nicotine withdrawal. Then, Cheyenne Allenby will discuss findings from fMRI research on the effects of abstinences on neural smoking cue reactivity in brain regions implicated in inhibition of craving. Lastly, Dr. Brett Froeliger will present work on using fMRI and theta burst transcranial magnetic stimulation to modulate IC in smokers. Following the presentations, the discussant will describe how these advances in understanding inhibitory control mechanisms impact therapeutic development for TUD and benefit smoking cessation treatments. This panel is sponsored by the SRNT Basic Science Network. Discussant: Jill Turner

SYM10A

ABERRANT PREFRONTAL PLASTICITY AND NICOTINE WITHDRAWAL-INDUCED COGNITIVE DEFICITS

Robert Cole, PhD, Pavel Ortinski, Jill Rebecca Turner. USC.

Background: Despite being a leading cause of preventable death worldwide, nicotine use continues to be a prevailing health issue. Nicotine consumption disrupts several executive functions, including impulsivity and cognitive control, and nicotine withdrawal-related cognitive symptoms can predict relapse. These cognitive functions heavily rely on intact prefrontal circuitry in order to engage and transition to adaptive decision making. Our results show that nicotine administration, as well as nicotine withdrawal, impact cellular mechanisms that perturb prefrontal function and lead to impaired cognitive function. Methods: Adult mice treated with saline, nicotine, or nicotine withdrawal were trained in operant tasks to either test impulsivity (behavioral inhibition) or cognitive flexibility (behavioral set-shifting). PFC tissues used for electrophysiological, proteomic, and transcriptomic experiments to examine cellular mechanisms involved in nicotine induced-cognitive deficits. Results: Nicotine administration impaired performance on the go/no-go task. Mice treated with nicotine exhibited impaired ability to monitor the two behavioral strategies. Moreover, these deficits were driven by a nicotine-induced switch from LTP to LTD in the PFC. Additionally, mice undergoing nicotine withdrawal took substantially longer to acquire strategy set-shifting as compared to the saline-treated mice. Error analysis show that nicotine withdrawal animals committed higher perseverative errors as well as strategy maintenance errors. Discussion: Our data suggests that cognitive deficits during nicotine use and withdrawal can be attributed to aberrant prefrontal plasticity. During nicotine administration, nicotine alters plasticity in the PFC from LTP to LTD. This switch in plasticity possibly contributes to decreases in attention observed in our go/no-go task. Additionally, our data illustrate that robust impairments

in strategy switching observed in nicotine withdrawal mice resulted from a generalized behavioral disinhibition. Moreover, withdrawal-related affective dysfunction may in part account for some of the observed deficits in cognitive flexibility. R01-DA-044311 (JRT)

FUNDING: Federal

SYM10B

INVESTIGATING THE NEURAL BASIS OF NICOTINE WITHDRAWAL-INDUCED ATTENTIONAL DEFICITS

Jared Young, PhD. UCSD.

Background: Smoking remains the leading cause of preventable death in the United States and is a huge drain on economic resources. During attempts to quit smoking, cognitive dysfunction predicts relapse. Improving cognition during withdrawal is a key target in aiding quit attempts. Given nicotinic links to attention - and withdrawal-induced inattention - we explored potential mechanisms underlying nicotine withdrawal-induced inattention. The alpha7 nicotinic acetylcholine receptor (nAChR) is a major target of nicotine in the brain. We: 1) Established withdrawal-induced deficits in C57BL/6J mice performing the mouse 5-choice continuous performance test (5C-CPT); then 2) Determined whether such deficits would be seen in mice lacking the alpha7 nAChR [knockout; KO], vs. wildtype (WT) littermate mice in this task. Methods: Mice were trained in the 5C-CPT, counter-balanced, then implanted with osmotic minipumps filled with saline or nicotine (14 or 40 mg/kg/day). After 28 days, the minipumps were removed and 5C-CPT performance challenged 4, 28, and 52 hrs later. Results: Withdrawal from nicotine impaired attention in C57 mice in the 5C-CPT ($F(1,25)=4.1$, $p<0.05$), driven by increased false alarm rates (FAR; $F(1,25)=3.1$, $p<0.001$) and in the mutant mice ($F(1,39)=3.6$, $p<0.05$) also driven by elevated FAR ($F(1,39)=7.3$, $p<0.02$) irrespective of genotype. Interestingly however, a genotype x drug interaction on missed trials ($F(1,39)=6.6$, $p<0.02$) revealed that withdrawal elevated omissions in WT mice, but not KO mice. Interestingly, reduced dopamine D4 receptor (Drd4) expression was seen during withdrawal in C57 mice. Conclusion: Withdrawal from chronic nicotine treatment impaired attention driven by elevated FAR and increased misses – the latter of which was absent in alpha7 nAChR KO mice. Interestingly, reduced Drd4 expression was seen during withdrawal in C57 mice, which has previously been associated with deficits in IC (FAR). Importantly, similar attentional deficits have been observed in smoking withdrawal humans in the 5C-CPT. Hence, antagonists of the alpha7 nAChR or an agonist of Drd4 may block nicotine withdrawal-induced cognitive deficits.

FUNDING: Federal

SYM10C

DISSOCIABLE EFFECTS OF THETA BURST TRANSCRANIAL MAGNETIC STIMULATION ON INHIBITORY CONTROL IN SMOKERS.

Brett Froeliger, PhD. MUSC.

Tobacco use disorder (TUD), like other drugs of abuse, is associated with deficits in prefrontal mediated inhibitory control (IC)—the ability to stop pre-potent behavioral responding. We recently reported findings in JAMA Psychiatry showing that IC task-based functional connectivity (tbFC) between the right inferior frontal gyrus (r.IFG) and thalamus (corticothalamic circuit) mediated the association between IC task performance (i.e. successful trial inhibition) and smoking relapse vulnerability: both in a smoking cessation study and delaying to initiate ad lib smoking in the laboratory. Those findings form the basis of our current work examining brain stimulation strategies to strengthen corticothalamic tbFC, improve IC and increase the odds of smoking abstinence among smokers. Theta burst stimulation (TBS), a form of repetitive transcranial magnetic stimulation effecting areas stimulated and associated networks, is administered in two forms: a) Intermittent TBS (iTBS) which induces long-term potentiation—putatively strengthening network activity, and b) Continuous TBS (cTBS) which induces long-term depression—putatively dampening network activity. We will discuss findings from a crossover pilot study with smokers (N=12) that underwent a baseline fMRI visit while performing an IC task that was then used to functionally guide stimulation in two subsequent TBS experimental visits: 1) iTBS and 2) cTBS. The study results will be discussed in the context of using TBS to treat corticothalamic mediated inhibitory control deficits and smoking relapse vulnerability. NIDA R01DA033459 (BF), NIDA R01DA038700 (BF) and Support Grant NCI P30CA138313 (Leone)

FUNDING: Federal



SRNT 2019 SYMPOSIA

SYM10D

NEURAL CUE REACTIVITY DURING ACUTE WITHDRAWAL PREDICTS SHORT TERM SMOKING RELAPSE

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In smokers, neural responses to smoking cues can be sensitive to acute withdrawal, but the degree to which withdrawal-related cue reactivity contributes to relapse is not fully understood. This study addressed this question in a sample of 75 smokers who were motivated to quit smoking. Participants underwent blood oxygen level dependent (BOLD) functional magnetic resonance imaging (fMRI) during presentation of visual smoking and neutral cues on two occasions: once during smoking satiety and once following 24-hour abstinence (order counter-balanced). Following the imaging sessions, participants received brief smoking cessation counseling prior to a short-term (7-day) quit attempt. The primary outcome was biochemically confirmed 7-day quit status. Participants who showed a greater smoking cue-induced increase in activation in anterior cingulate cortex (ACC) during acute withdrawal (compared to smoking) were more likely to relapse (OR=2.10 per standard deviation increase in percent signal change [abstinence minus smoking satiety], 95% CI: 1.05 to 4.20, $p=0.036$). Greater withdrawal-induced change in ACC activation also predicted fewer total days abstinent ($\beta=0.63$, 95% CI=0.43 to 0.66, $p<0.0001$). This study provides the first evidence that changes in cue reactivity in the ACC during acute withdrawal predict smoking relapse, thereby improving our understanding of the neurobiology of smoking cessation. **Clinical trial registry identifier:** NCT02837510

FUNDING: Federal

SYM11

UNDERSTANDING SMOKING IN PATIENTS WITH CANCER: FROM PREVALENCE TO A PLACEBO-CONTROLLED TRIAL

Kristen McCarter, PhD. University of Newcastle, Australia

Continued smoking in cancer patients is associated with adverse outcomes including reduced treatment efficacy and poorer survival. Quitting smoking has been shown to significantly improve health-related quality of life in some patients with specific cancer types. However, the high prevalence of continued smoking in this population reflects the many barriers to quitting; from the individual (such as variable motivation and confidence and high levels of negative affect and nicotine dependence) to the clinician and service level (such as provision of evidence-based treatment). This symposium integrates epidemiological and clinical research, contributing to our understanding of continued smoking in cancer patients. The first presentation will describe the smoking rates of patients with head and neck cancer from four radiotherapy departments in Australia. This data includes smoking history and smoking status during and after treatment. The second presentation will describe quality of life data, specifically depression, pain and fatigue, over time as a function of smoking status in patients with a wide range of cancers. The third will present data from an ongoing study that describes key components in the cancer patient's efforts to quit smoking; intention and confidence to quit. The fourth presentation will provide the results of a placebo-controlled randomized clinical trial comparing 12 weeks vs. 24 weeks (extended) of varenicline for cancer patients who smoke. Cessation and safety outcomes and the importance of medication adherence will be discussed. The fifth presentation will describe the feasibility and effectiveness of a sustained telehealth delivered model of tobacco treatment in oncology settings. These projects contribute to our understanding of the smoking patterns of cancer patients, elucidate key components of quitting, and impact of quitting on quality of life, as well as demonstrate the success of novel tobacco treatment interventions for cancer patients. As discussant, Dr Glen Morgan will synthesize the results from these presentations and discuss their implications for our understanding of and interventions for smoking in cancer patients.

SYM11A

SMOKING RATES DURING AND AFTER TREATMENT FOR HEAD AND NECK CANCER

Kristen McCarter, Bachelor of Psychology, PhD (Clinical Psychology)¹, Amanda L. Baker¹, Ben Britton¹, Gregory Carter¹, Christopher Wratten², Judith Bauer³, Alison Beck¹, Erin Forbes¹. ¹University of Newcastle, Australia, ²Calvary Mater Newcastle Hospital, Australia, ³University of Queensland, Australia.

Continued smoking in cancer patients has been associated with adverse outcomes including second primary tumors, increased side effects from radiotherapy (RT) and decreased survival. Previous research suggests between one-third and 75% of head and neck cancer (HNC) patients continue to smoke after diagnosis. The aim of the present study was to examine the smoking rates of HNC patients during and after RT. Participants were 307 patients with HNC who participated in a stepped-wedge randomized controlled trial evaluating the effectiveness of a dietitian delivered intervention designed to reduce malnutrition. Patients were assessed at Week 1 of RT, 4 and 12 weeks post-RT. Self-report and expired carbon monoxide (CO) biochemical verification ($>=4$ CO PPM = current smoking) provided current smoking status. Patients were also sent a follow up health behaviour survey between 3 and 4 years post treatment (due to the stepped wedge nature of the trial) that assessed current smoking. The CO test indicated that 34%, 25% and 22% of patients who completed biochemical verification were current smokers at Wk 1 of RT, 4 weeks post-RT and 12 weeks post-RT respectively. However, only 14% of those who completed biochemical verification measures self-reported being current smokers at each of these time points. Of those that self-reported quitting smoking in the 6 months prior to RT, and were CO verified as non-smokers at Wk 1 of RT, 29% (10/34) were CO verified as smokers (i.e. having relapsed) by 12 weeks post-RT. 72 patients completed the follow up surveys and 10% reported themselves to be current smokers (between 3 and 4 years post RT). This was the first Australian study to biochemically verify self-report of smoking in HNC patients about to undergo RT. Given the discrepancy between self-report and CO, it appears that some patients misrepresented their smoking status. The proportion of those who had recently quit (within 6 months prior to RT) and relapsed by 3 months post-RT warrants consideration for relapse prevention smoking cessation interventions in this group.

FUNDING: Federal; Academic Institution

SYM11B

DOES SMOKING ABSTINENCE PREDICT CANCER PATIENTS' QUALITY OF LIFE OVER TIME?

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Previous studies indicate that quitting smoking significantly improves health-related quality of life (QOL) in patients with lung and head and neck cancer. However, few prospective studies have investigated the role of smoking status on QOL across patients diagnosed with a wide range of cancers. The aim of the present study was to examine quality of life (depression, pain, and fatigue) changes over time as a function of smoking status. Participants were 332 cancer patients (e.g., gynecological, breast, thoracic, head and neck, genitourinary, hematological, cutaneous) who reported smoking abstinence within the previous 120 days. Smoking status (i.e., number of days abstinent) and QOL (depression, pain, and fatigue) were assessed at baseline, 2, 6, and 12 month follow-ups. Within a Structural Equation Modeling (SEM) framework, growth curve models with number of days abstinent as a time varying covariate were employed to examine the effect of total number of days abstinent upon change in QOL measures over time. Baseline demographics (e.g., sex, income) and smoking history (e.g., nicotine dependence) were used as time-invariant covariates. Models with both time-varying covariates and time-invariant covariates were good-to-excellent fit with the data. The results indicated that the number of days abstinent was positively associated with lower depression at all follow-ups and with lower fatigue at the 12 month follow-up. However, the number of days abstinent was not significantly associated with pain. Overall, quality of life improved among cancer patients who quit smoking. Interestingly, findings suggest different trajectories in symptom improvement among specific QOL indices. For example, patients who reported more days abstinent exhibited lower depression at all time points. However, this association was observed only at the final follow-up for fatigue. Finally, pain levels decreased over time, but the improvement was not associated with number of days abstinent. The results highlight the importance of encouraging patients to quit smoking after cancer diagnosis.

FUNDING: Federal



SYM11C

A CLOSER LOOK AT THE INTERSECTION OF INTENTION, CONFIDENCE, AND ATTEMPTS TO QUIT AFTER A TOBACCO-RELATED CANCER DIAGNOSIS: RESULTS FROM A DAILY ASSESSMENT STUDY

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Cancer diagnosis could be a “teachable moment” for smoking cessation, but the whirlwind cancer experience carries with it barriers to quitting (e.g., distress, fatigue). Thus, it is possible motivation and confidence to quit wax and wane in the early phase of cancer survivorship. Understanding the naturalistic course of smoking cessation after cancer diagnosis is critical as patients who use tobacco are at increased risk for poor clinical outcomes including reduced survival. This ongoing longitudinal study is among the first to provide details about efforts to quit after cancer diagnosis. Smokers with a first primary head/neck or cervical cancer diagnosis are asked to complete brief assessments each day for 30 days; they report their smoking behavior the prior day and their intention and confidence to avoid smoking the next day (n=41). On average, participants completed 23 assessments. Data were primarily captured via telephone-based interactive voice response system, but paper assessments were possible. Participants (M, SD=56.1, 8.0 yrs old) were largely White non-Hispanic (95.1%), with good representation of females (39.0%). Across time, intention to quit was medium-to-high (M, SD=6.6, 2.4 on 0-9 scale) and confidence to quit was medium (M, SD=5.5, 2.8 on 0-9 scale). These variables were positively correlated ($p < .05$) and did not change over time. Nearly everyone (95.1%) made a 24-hour quit attempt during the 30-day observation, but only 31.7% reported 7-day floating abstinence and even fewer (7.3%) reported 30-day continuous abstinence. Both intention ($r = .48$, $p < .001$) and confidence ($r = .55$, $p < .001$) to quit were associated with number of days abstinent. This study shows comparatively higher intention than confidence to quit shortly after cancer diagnosis, with little fluctuation over time. Unfortunately for many cancer survivors, quit success—especially for any extended duration—was an elusive outcome that was closely tied to their intention and confidence. Findings underscore need for interventions that bolster motivation and confidence and prompt multiple quit attempts, with a heightened focus on relapse prevention.

FUNDING: Federal

SYM11D

A PLACEBO-CONTROLLED RANDOMIZED CLINICAL TRIAL OF 24-WEEKS OF VARENICLINE TO TREAT NICOTINE DEPENDENCE AMONG CANCER PATIENTS: CESSATION AND SAFETY OUTCOMES AND THE IMPORTANCE OF MEDICATION ADHERENCE

Brian Hitsman, PhD¹, Frank Leone², Jessica Weisbrodt², Anna Hitsman Veluz-Wilkins¹, Andrew Miele², Anita Hole², Nancy C. Jao¹, E. Paul Wileyto², Allison J. Carroll¹, Ravi Kalhan¹, Jyoti Patel¹, Corey Langer², Robert Schnoll². ¹Northwestern University, USA, ²University of Pennsylvania, USA.

Continuing to smoke after a cancer diagnosis adversely influences cancer patient prognosis. Yet, few studies have tested FDA-approved tobacco use medications in this population. Cancer patients report high levels of negative affect and nicotine dependence and a prolonged time-line for smoking relapse, which suggests the need to test extended use varenicline in this population. A placebo-controlled randomized clinical trial evaluated 12 weeks (standard) vs. 24 weeks (extended) of varenicline for cancer patients who smoke (N=207). Primary outcomes were 7-day, carbon monoxide confirmed abstinence (CO<10) at week 24 and week 52. Secondary outcomes were continuous abstinence from week 9 to week 24 and week 9 to week 52 (no self-reported smoking and CO<10 at the time-point). Varenicline adherence (>80% of the medication based on pill count) and treatment-related side effects (mean and total), adverse events and serious adverse events (number of events and number of participants with events), and blood pressure were assessed. Point prevalence and continuous abstinence quit rates at weeks 24 and 52 were not significantly different across treatment arms ($p > 0.05$). However, a significant treatment arm X varenicline adherence interaction was found for week 24 point prevalence (OR=2.31, [95% CI: 1.15-4.63, $p=0.02$]) and continuous (OR=5.82, [95% CI: 2.66-12.71], $p < .001$) abstinence. For both outcomes, the differences in quit rates between treatment arms were not significant for non-adherent participants, but adherent participants reported significantly higher week 24 point prevalence (60.5%) and continuous (44.2%) abstinence, vs. non-adherent participants (44.7% and 27.7%; $p < 0.05$). There were no significant differences between treatment arms on side effects, adverse and serious adverse events, and blood pressure ($p > 0.05$). Compared

to standard varenicline treatment, extended varenicline does not increase risks and increases tobacco cessation rates for patients who adhere to medication. Our findings highlight the need to identify effective methods to increase medication adherence among cancer patients to optimize their long-term cessation outcome with extended varenicline.

FUNDING: Federal; Pharmaceutical Industry

SYM11E

RESULTS FROM A RANDOMIZED CONTROLLED COMPARATIVE EFFECTIVENESS TRIAL OF TOBACCO TREATMENT IN CANCER CARE

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Despite the known benefits of cessation, the high prevalence of continued smoking and the availability of NCCN guidelines recommending tobacco use assessment and treatment as standard of quality cancer care, most cancer patients who smoke do not receive evidence-based tobacco treatment. As part of a two site comparative effectiveness trial, newly diagnosed cancer patients were screened for smoking status. Those who reported smoking at least a puff over the past 30 days were randomized to receive either 4 weekly telehealth-delivered counseling sessions and smoking cessation medication advice (ST: standard treatment) or 11 telehealth-delivered sessions with 12 weeks of free FDA-approved cessation medication of patient choice (IT: intensive treatment): NRT patch+lozenge, varenicline, or bupropion). The primary outcome was biochemically verified 7 day point abstinence at 6-months follow-up. 303 (70% of confirmed eligibles) patients enrolled. The most common reasons for refusal were preference for self-quitting and being too distressed to quit. Participants were 56% female; 82% were white non-Hispanic with a mean age of 58.3 years, and 60% were diagnosed with a smoking-related tumor. Overall adherence to the manualized IT protocol was excellent, with 57% receiving at least 7 telehealth-delivered counseling sessions. Medication uptake was also high, with 80% of IT patients accepting smoking cessation medication. Combination NRT was the most preferred medication option. Using intention-to-treat (86% retention), 6-month quit rates were 33% in the IT group vs. 19% in the ST group ($p < .02$). Among those abstinent at 6 months, 65% quit at 3 months (sustained quitters) and 35% quit at 6 months (late quitters). Among newly-diagnosed cancer patients, sustained telephone-delivered counseling and free cessation medication produced a higher 6-month biochemically confirmed quit rate than a briefer tobacco treatment model. Findings provide strong support for the feasibility and effectiveness of a sustained telehealth delivered model of tobacco treatment in oncology care settings.

FUNDING: Federal

SYM12

MEASUREMENT OF ENDS EXPOSURE

Kevin Walton, PhD. National Institute on Drug Abuse, National Institutes of Health*

With the introduction of Electronic Nicotine Delivery Systems (ENDS) in the US over the past decade, research into how the devices function and are used has rapidly grown. Much of this research focuses on what users are exposed to, based on laboratory analyses of the devices and measurement of biomarkers of user exposure. These studies often use design and reporting protocols developed for combustible cigarettes. However, ENDS do not have the long history of standardization evident in combustible cigarettes. For example, there is no consistent formulation for the eliquids in ENDS, or how the devices deliver the aerosolized constituents. Further, while the puffing protocols for combustible cigarettes are standardized, ENDS research shows that puffing topography can dramatically differ from cigarettes, with variation due to device differences and user behavior. The absence of protocol and analysis standards is reflected in the published literature, with substantial variation in the studies and reporting methods for ENDS research. Greater standardization in ENDS research would promote cross study comparison of devices and user exposure, enhancing our ability to understand their health implications. The presentations in this symposium focus on evaluation of ENDS contents and exposure, provide suggestions on how these should be studied, and give examples of their implementation. Each presenter will introduce the types of measurements they are discussing, provide their research as an example, and recommend an approach to measurement. Cliff Watson discusses techniques and validation approaches for ENDS eliquid and aerosol quantitative analyses. Risa Robinson presents technology and analysis of ENDS use behavior. Neal Benowitz presents protocols and analysis of nicotine exposure by users of different ENDS. Dorothy Hatsukami discusses how to use



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biomarkers in assessing exposure of both combustible cigarettes and ENDS. Danielle Smith presents data from PATH on dual use behaviors and the resultant biomarkers of exposure. Discussant: Irina Stepanov, University of Minnesota.

SYM12A

ANALYTICAL CHALLENGES ASSOCIATED WITH ELECTRONIC CIGARETTES

Joseph G. Lisko, M.S., Steve Pappas, Brian Hearn, Clifford Watson, Liza Valentin-Blasini. Centers for Disease Control and Prevention.

Many harmful and potentially harmful chemicals (PHHCs) in electronic cigarette liquid and aerosol have been reported. Unfortunately, scant information is available on the unique challenges posed by these products to obtain reliable quantitative information. We highlight and address several issues associated with the analysis of electronic cigarette products. We analyzed the liquid contents and aerosol particulate from 20 electronic cigarette products. Analyses of the liquid contents included nicotine, alkaloids, and polycyclic aromatic hydrocarbons (PAHs). Total particulate matter (TPM), carbonyls, and metals were measured in aerosol generated under standard machine generated conditions. Many methods that were originally developed for tobacco or tobacco smoke were evaluated to determine their applicability for quantitative analysis of e-cigarette liquids and aerosols. We targeted several key method variables including matrix effects, trapping, and quality control materials to evaluate reproducibility and reliability. Other variables that could impact accuracy and precision, such as product age, product performance, packaging, and manufacturer were examined. It is vital that data used to make health and exposure-related claims are accurate, reliable, and reproducible. Differences in product design, function, and testing should be considered as a crucial part of study design within or between studies. Ranges of relative standard deviations reductions from ca. 50% to 5% percent are possible depending on method and product type. Specifying the means and steps taken to validate methods and data collection in the study design improves confidence and is necessary when formulating public health and regulatory decisions.

FUNDING: Federal

SYM12B

A NEW APPROACH TO ASSESS YIELD DELIVERED TO THE MOUTH OF ENDS USERS BASED ON PRODUCT EMISSIONS AND NATURAL ENVIRONMENT TOPOGRAPHY

Risa J. Robinson, PhD, Edward C. Hensel. Rochester Institute of Technology.

Significance: The mass of TPM (total particulate matter) and nicotine delivered to the mouth or "yield" depend jointly upon puffing behavior and emission characteristics of the e-cig and e-liquid. In addition, users may exhibit product specific vaping behaviors and may evolve their behaviors over time. Laboratory based yield measurements alone are insufficient at capturing the interdependency of these multiple parameters, and will likely misrepresent actual exposure. We propose a new framework for measuring yield that accounts for the characteristics of each puff as a function of time taken in the natural environment, laying the ground work for new methods to examine the impact of product characteristics on use and exposure. **Methods:** Laboratory emission testing was conducted to characterize TPM and nicotine mass concentration (mg/mL) as a function of puff flow rate and duration across the operating range of a vape-pen device. Previously gathered topography for N=34 vape-pen users was analyzed in conjunction with the emissions results to estimate TPM and nicotine yield [mg] using the new framework. Yield was determined for each discrete puff; cumulative yield was found by integrating over 6 days. The wPUMTM vape-pen monitor was used. Nicotine levels included own choice either high ('H', 1.8%, N=20), medium ('M', 1.2%, N=7) or low ('L', 0.6%, N=7). **Results:** Yield varied widely within groups and was shown to be influenced by user topography, consumption and the emissions characteristic curve, which was a function of both puff flow rate and duration. Estimates of the group-average 6-day cumulative TPM yield (SEM) were 985 (223) mg for L, 455 (184) mg for M, and 980 mg (639) for H. Associated nicotine yields were 3.1 (0.7) mg for L, 2.9 (1.2) mg for M, and 8.8 (2.3) mg for H. **Conclusions:** This new framework illustrates the interdependency of use behavior and product characteristics and how measures of each can be exploited to provide TPM and nicotine yield for extended periods of use. Adopting the new framework will enable us to quantify the impact of use behavior and product characteristics on yield and lead to an improved understanding of exposure.

FUNDING: Academic Institution

SYM12C

NICOTINE CLINICAL PHARMACOLOGY STUDIES IN THE ASSESSMENT OF ELECTRONIC NICOTINE DELIVERY DEVICES (ENDS)

Neal L. Benowitz, MD¹, Gideon St. Helen¹, Natalie Nardone¹, Arit Harvanko¹, Maciej Goniewicz². ¹University of California San Francisco, ²Roswell Park Cancer Center.

Introduction: The potential therapeutic benefit as well as the abuse potential of ENDS are determined substantially by nicotine – including dose and the rapidity and site of absorption. Nicotine dose and absorption kinetics depend on vaping behavior, temperature of the coil and e-liquid composition. **Methods:** 36 dual users of e-cigarettes (EC) and conventional cigarettes (CC) were studied while confined on a research ward while using exclusively EC or CC. We examined nicotine pharmacokinetics (PK) during a scheduled standardized puffing bout and during ad libitum 24 hour use. We compared PK across EC devices and, within subjects, to CC use; and examined nicotine dose and titration in relation to device and liquid characteristics. We also compared subjective effects (e.g. satisfaction, withdrawal symptoms) during ad libitum use of EC vs CC. **Results:** With standardized puffing, plasma nicotine concentrations were generally lower with EC vs CC, with some exceptions; and there was considerable variability among users of the same device. During ad libitum use, daily nicotine intake was similar with EC vs CC for many users, particularly those who used advanced EC devices. Device and liquid characteristics that predict nicotine dose and the subjective effects nicotine during EC vs CC use will be presented. **Conclusions:** We present a laboratory approach that can be used to characterize nicotine delivery and effects from various ENDS, and which can be used as a first step in assessing potential therapeutic benefit and abuse liability of new ENDS products. Grant support – DA039264, from the National Institute on Drug Abuse

FUNDING: Federal

SYM12D

BIOMARKERS OF EXPOSURE: EFFECTS OF INSTRUCTIONS FOR ELECTRONIC CIGARETTE USE

Dorothy Hatsukami, PhD¹, Ellen Meier², Bruce Lindgren³, Richard J. O'Connor⁴, Peter G. Shields⁵. ¹University of Minnesota, Minneapolis, MN, USA, ²University of Wisconsin, ³University of Minnesota, ⁴Roswell Park Cancer Center, ⁵Ohio State University.

Introduction: Electronic cigarettes have the potential to significantly reduce exposures to harmful constituents associated with cigarette smoking. Prior studies have primarily focused on biomarkers of toxicant and carcinogen exposure (BoE) and have found a substantial reduction in biomarkers when smokers completely switched from cigarettes to e-cigarettes. These reductions are reflective of the constituent yields observed in e-cigarettes. However, most cigarette smokers tend to dual use with e-cigarettes. This presentation provides information on the sensitivity of various BoEs in detecting different e-cigarette use patterns compared to a group smoking conventional cigarettes and using nicotine replacement therapies. **Methods:** U.S. adult daily smokers (n = 292; 48.3% female; Mage = 47.0), uninterested in quitting immediately, were recruited from Minneapolis, MN, Columbus, OH, and Buffalo, NY and randomized to eight-weeks of instructions for: a) ad libitum use of e-cigarettes; 2) complete substitution of cigarettes with e-cigarettes; 3) complete substitution of cigarettes with nicotine gum or lozenge; and 4) continue smoking of usual brand cigarettes. Outcome variables were cigarette smoking rate and BoEs to carbon monoxide, nicotine, tobacco-specific nitrosamines, volatile organic compounds and polycyclic aromatic hydrocarbons. **Results:** To date, the data show that there is an effect by group for cigarettes per day and other biomarkers of exposure. Generally, the complete substitution with both e-cigarettes and NRT led to less exposures than the group that received ad libitum instructions or those who continued to smoke usual brand cigarettes and some biomarkers were more sensitive to detecting these differences. Funded by U19CA157345. The contents of this presentation do not necessarily reflect the views of NIH or the FDA.

FUNDING: Federal



SYM12E

Biomarkers of Exposure Among Dual Users of Tobacco Cigarettes and E-cigarettes Findings From Wave One of the Population Assessment of Tobacco and Health Study

Danielle Smith¹, Carol Christensen², Dana van Bemmel², Nicolette Borek², Bridget Ambrose², Gladys Ervies², Karen Konkel², Raymond Niaura³, Katy Edwards⁴, Cassandra Stanton⁴, Ben Blount⁵, Lanqing Wang⁵, Jun Feng⁵, Kathy Caldwell⁵, Dorothy Hatsukami⁶, Stephen Hecht⁶, Heather Kimmel⁷, Elizabeth Lambert⁷, Mark Travers¹, Andrew Hyland¹, Maciej Goniewicz¹. ¹Roswell Park Comprehensive Cancer Center, Buffalo, NY, USA, ²Center for Tobacco Products, Food and Drug Administration (FDA), Silver Spring, MD, USA, ³New York University, New York, NY, USA, ⁴Westat, Rockville, MD, USA, ⁵Center for Disease Control and Prevention, Chamblee, GA, USA, ⁶University of Minnesota, Minneapolis, MN, USA, ⁷National Institute on Drug Abuse, Bethesda, MD, USA.

Background: Dual use of tobacco cigarettes and electronic cigarettes (e-cigarettes) is the most common polytobacco use behavior in the United States. Little is known about the demographic profiles, patterns of tobacco product use, and toxicant exposure among dual users. **Methods:** We analyzed data from adult exclusive dual users of tobacco cigarettes and e-cigarettes (n=792) who participated in the PATH Study Wave 1 (2013-2014) and provided urine samples. Samples were analyzed for biomarkers of exposure to nicotine and selected toxicants including tobacco specific nitrosamine NNK (NNAL), lead, cadmium, naphthalene (2-naphthol), pyrene (1-hydroxypyrene), acrylonitrile (CYMA), acrolein (CEMA), and acrylamide (AAMA). Dual users were compared on demographic, behavioral, and biomarker measures to exclusive cigarette smokers (n=2,411) and exclusive e-cigarette users (n=247). Dual users were classified into "low" and "high" exposure subgroups based quartile splits of the observed distributions of each biomarker. **Results:** Most dual users reported daily smoking/non-daily e-cigarette use (70%), followed by daily smoking/daily e-cigarette use (13%), non-daily smoking/non-daily e-cigarette use (10%), and non-daily smoking/daily e-cigarette use (7%). Dual users exhibited demographic and behavioral profiles consistent with exclusive cigarette smokers reporting similar frequency of cigarette use. Geometric mean concentrations of biomarkers displayed a dose-response relationship consistent with self-reported smoking frequency, with daily smokers/daily e-cigarette users exhibiting the highest biomarker concentrations. Dual users who had low levels of biomarkers of exposure were more likely to be aged 18-24, male, and smoke non-daily. **Conclusions:** Most dual users still smoke cigarettes daily, use e-cigarettes occasionally, and have higher toxicant levels than daily exclusive cigarette smokers. Dual users who smoke less than daily show lower levels of toxicant exposure compared to exclusive daily cigarette smokers, but greater toxicant levels than exclusive non-daily cigarette smokers. Identifying differences between dual use subgroups can inform interventions to curb dual use.

FUNDING: Federal

SYM13

Evaluating the Effect of Menthол Flavor on Nicotine Use, Reinforcement, and Cessation: Findings From Preclinical, Experimental, and Epidemiological Studies

Neal Benowitz*, Krysten W. Bold, Ph.D. Yale University, New Haven, CT, USA.

Characterizing menthol flavor is found in combustible cigarettes and other tobacco products, including e-cigarettes. Understanding how menthol flavor additives influence the appeal and addictive potential of tobacco products may inform tobacco control efforts. The current symposium presents translational work across preclinical, experimental, and longitudinal cohort studies investigating the influence of menthol flavor on nicotine use, reinforcement, and smoking cessation. Dr. Brandon Henderson will present preclinical work evaluating menthol's effects on nicotine use and reinforcement in a mouse model. This research provides evidence that menthol plus nicotine produces greater reward-related behavior and greater upregulation of nicotinic acetylcholine receptor number and function on midbrain dopamine neurons than nicotine alone. Dr. Asti Jackson will present results from a human laboratory paradigm investigating the effects of e-liquid flavor on nicotine dose in young e-cigarette users. These findings provide evidence about how menthol (vs. fruit) flavored e-liquids influence the appeal of nicotine-containing e-cigarettes among youth. Dr. Krysten Bold will present results from an experimental paradigm designed to investigate the potential impact on smoking behavior if menthol additives were banned in cigarette products. This project identifies within-person changes in smoking behavior and nicotine dependence when adults who usually smoke menthol cigarettes are switched to using non-menthol cigarettes. Dr. Michael Chaiton will discuss the long-term impact of a tobacco control policy that

banned the sale of menthol tobacco products. This project uses longitudinal cohort data to document smoking cessation outcomes among menthol smokers after the implementation of the Ontario policy banning menthol cigarettes in January 2017. Dr. Neal Benowitz will discuss these findings and implications for research and policy.

SYM13A

Menthол and Other Tobacco Flavorants Enhance Nicotine Reward Through Changes in Midbrain Dopamine and GABA Neurons

Brandon J. Henderson, PhD¹, Alicia J. Avelar², Austin T. Akers², Skylar Y. Cooper², ¹Marshall University, Huntington, WV, USA, ²Marshall University.

Significance: To understand why the quit rate among smokers of menthol cigarettes is lower than non-menthol smokers depends on increasing our understanding of how both nicotine and menthol alter the brain mechanisms that drive reward and reinforcement. Dopamine (DA) and GABA neurons in the midbrain regulate much of the positive reinforcing effects of nicotine. **Method:** Using mouse models, we show that menthol enhances nicotine-induced changes in nicotinic acetylcholine receptors (nAChRs) expressed on midbrain DA neurons. **Results:** Menthol plus nicotine upregulates nAChR number and function on DA neurons more than nicotine alone. Menthol also enhances nicotine-induced changes in DA neuron excitability. In a nicotine reward assay (conditioned place preference), we observed that menthol plus nicotine produces greater reward-related behavior than nicotine alone. To extend our studies, we also examined two chemical flavorants of popular green apple flavors, and observed an enhancement in nicotine reward-related behavior similar to menthol. **Conclusion:** Our results connect changes in midbrain DA neurons to menthol-induced enhancements of nicotine reward-related behavior. Together, these results show that menthol and other tobacco flavorants alter nicotine's actions to increase addictive behavior. These results contribute to our understanding of why smokers of menthol cigarettes exhibit reduced cessation rates.

FUNDING: Federal

SYM13B

Influence of Menthол and Green-Apple E-Liquid Flavorants in Youth E-Cigarette Users

Asti Jackson, PhD¹, Harmanpreet Bhatti², Ralitsa Gueorguieva², Eugenia Buta², Barry G. Green¹, Stephanie S. O'Malley¹, Suchitra Krishnan-Sarin¹. ¹Yale University School of Medicine, ²Yale University School of Public Health.

Significance: E-cigarettes are available in over 15000 flavors. Our earlier evidence suggests that menthol improves the liking and taste of high dose nicotine in e-cigarette using youth. The effect of menthol may be attributed to its cooling and analgesic properties, but little is known about the influence of other flavors. We compared the effects of commercially available e-liquids that varied in flavor (menthol, green-apple, no flavor) and nicotine (6 mg/ml, 12 mg/ml) constituents. We used green apple because it was not expected to have the pharmacological properties of menthol. **Method:** Youth who were 16-20 years old, had urine cotinine levels =150ng/ml at intake, and reported using e-cigarettes at least 10 days per month, were randomized to 1 of 2 nicotine doses (6mg/ml, 12 mg/ml). Within each dose, subjects completed 3 lab sessions where they used e-cigarettes with no flavor, menthol, and green apple in a random order. During each lab session, participants were exposed to 3 puff bouts, 5 mins apart; each bout consisted of 10 puffs, each separated by 30 secs. Assessments were obtained after each puff bout and analyzed using mixed models. **Results:** Participants [n=49; 6 mg/ml(n=24); 12 mg/ml(n=25)] were 63.3% male, with an average age of 18.7 (SD=0.9) and 65.3% were non-Hispanic white. They used e-cigarettes on 26.2 (SD=3.6) days in the past month, 46.9% used cigarettes in the past month and 18.4% smoked menthol cigarettes. Participants used an average e-liquid nicotine concentration of 25.9 (SD=21.3) and preferred the following e-cigarette flavors: fruit (89.9%) and menthol (51%). Preliminary analysis of a LHS measure of taste-liking indicated a significant main effect of nicotine [$F(1,128) = 5.29$, $p<0.05$], flavor [$F(1, 128)=11.07$, $p<0.0001$]] and a nicotine*flavor*lab interaction [$F(4, 128)=2.49$, $p<0.05$]]; the taste of fruit flavor was liked more than menthol and no flavor by 33 points ($p<0.0001$) and no differences were observed between menthol and no flavor. Further evidence on interactions with nicotine doses will also be presented and discussed. **Conclusion:** Different flavors have differential influences on liking for nicotine-containing e-liquids.

FUNDING: Federal



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SYM13C

EVALUATING THE EFFECT OF SWITCHING TO NON-MENTHOL CIGARETTES AMONG CURRENT MENTHOL SMOKERS

Krysten W. Bold, PhD¹, Suchitra Krishnan-Sarin¹, Lisa M. Fucito¹, Haleh Nadim¹, Sera-Maren Wiechert², Annabel J. Burnley², Tore Eid¹, Peter Jatlow¹, Stephanie S. O'Malley¹. ¹Yale University School of Medicine, ²University of Amsterdam.

Significance: Banning characterizing menthol flavors in tobacco products may benefit public health given evidence that menthol flavor increases the appeal and addictive potential of these products. Survey reports indicate that menthol smokers think they would smoke less or try quitting if only non-menthol cigarettes were available, yet empirical studies are needed to understand the potential impact on smoking behavior. **Method:** We recruited non-treatment-seeking adults who smoked menthol cigarettes to investigate within-person changes in smoking behavior when switching to non-menthol cigarettes. Participants were provided their usual brand of menthol cigarettes to smoke in vivo for one week, and then switched to a matched-brand commercially-available non-menthol cigarette for two weeks. Repeated-measures tests were used to examine changes in average cigarettes per day (measured with the timeline follow-back interview), nicotine dependence (measured by the WISDM), and interest in quitting (measured from 1=not at all to 10=extremely) after a two-week period switching to non-menthol cigarettes. **Results:** We enrolled 29 participants (n=15 female; n=17 black, n=10 white, n=5 Hispanic) who were 34.8 years old (SD=11.6) on average. Participants smoked significantly fewer cigarettes per day at the end of the study (M=10.0, SD=5.6) compared to baseline (M=12.2, SD=5.6) $p<.001$, confirmed by significant reductions in urine cotinine levels ($p=.013$). After switching to non-menthol cigarettes, participants had significantly lower nicotine dependence scores (WISDM total baseline M=45.0, SD=10.7 vs. end of study M=36.8, SD=10.9, $p<.001$) and reported significant increases in the importance of quitting smoking (baseline M=3.3, SD=2.4 vs. end of study M=5.4, SD=2.5, $p<.001$), and confidence quitting smoking (baseline M=4.2, SD=2.9 vs. end of study M=5.5, SD=2.6, $p=.04$). **Conclusion:** Switching to a non-menthol cigarette reduced smoking heaviness and dependence among menthol cigarette smokers. These results could inform product standards and regulatory policies to restrict menthol additives in tobacco products to reduce the appeal and addictive potential of these products.

FUNDING: Federal

SYM13D

THE IMPACT OF ONTARIO'S BAN OF MENTHOL CIGARETTES ON SMOKING BEHAVIOR AFTER 1 YEAR: A COHORT STUDY

Michael Chatton, PhD¹, Robert Schwartz¹, Joanna E. Cohen², Eric K. Soule³, Bo Zhang¹, Thomas E. Eissenberg⁴. ¹University of Toronto, ²Johns Hopkins Bloomberg School of Public Health, ³Eastern Carolina University, ⁴Virginia Commonwealth University.

Significance: The province of Ontario in Canada banned the use of menthol tobacco products as of January 2017. However, the long-term impact of the menthol ban on reported smoking behaviour has not previously been evaluated. **Method:** A cohort of Ontario residents, ages 16 and over, who were current smokers at baseline (September-December 2016), provided data at follow up (n=896) (January-June 2018). Information on smoking characteristics, demographics, menthol use and reported quitting behaviour was collected. Overall crude and adjusted logistic regression models were performed. Models were also stratified by sex, age group and race. **Results:** Daily menthol users had significantly higher likelihood of reporting not smoking after the ban (adjusted odds ratio (aOR) 3.90; 95% confidence interval (CI) 2.33-6.50) when compared to non-menthol cigarette smokers. Occasional menthol users were also more likely to report to be non-smokers (aOR 1.84; 95% CI: 1.15, 2.93). Stratified analysis showed a significantly higher likelihood of reporting quitting among older adult smokers (>30 years old). **Conclusion:** The Ontario menthol ban was associated with an increased likelihood of reporting quitting for individuals who smoked menthol daily or occasionally.

FUNDING: Federal

SYM14

FACTORS THAT INFLUENCE CO-ABUSE OF ALCOHOL AND NICOTINE: A PRE-CLINICAL PERSPECTIVE ON COMORBIDITY

Anna M. Lee, PhD. University of Minnesota.

Nicotine and alcohol polysubstance abuse is highly prevalent, yet there exists no FDA-approved pharmacological therapy to treat co-addiction. Smokers who have alcohol use disorders have exacerbated health issues, more difficulty maintaining abstinence and have higher mortality. The molecular mechanisms underpinning co-use of nicotine and alcohol, and the factors that promote their co-use remain unclear. Pre-clinical research in mice is valuable as it allows for the controlled dissection of factors that influence nicotine and alcohol co-use at the behavioral, molecular and genetic level. This focused symposium brings together a diverse group of expert pre-clinical scientists to present the latest discoveries on the behavioral and genetic factors that modulate nicotine and alcohol co-use in mouse models. Dr. Helen Kamens will present new data on the impact of adolescent social stress on nicotine and alcohol consumption in adulthood in different mouse strains, and the role of differentially regulated microRNAs in the prefrontal cortex to these later drug behaviors. Dr. Imad Damaj will present new data on how voluntary alcohol consumption in early adolescence influences later life alcohol and nicotine consumption, nicotine preference and nicotine withdrawal. Dr. Darlene Brunzell will present new data on how genetic deletion of the alpha7 subunit elevates alcohol and nicotine consumption, suggesting that these receptors normally act to inhibit alcohol and nicotine consumption. Dr. Anna Lee will present new data on a model of concurrent voluntary alcohol and nicotine consumption in mice, and the role of selectively reducing the expression of alpha6 nicotinic receptor subunits in ventral tegmental area dopamine neurons on voluntary alcohol and nicotine consumption. Our discussant, Dr. Jibran Khokhar will highlight how these important pre-clinical studies can dissect and identify critical behavioral and molecular factors that influence co-morbidity, and can inform clinical research, treatment strategies and drug development efforts.

SYM14A

ADOLESCENT SOCIAL STRESS INFLUENCES LATER ETHANOL AND NICOTINE BEHAVIORS AND MICRORNA EXPRESSION

Helen M. Kamens, PhD, Michael J. Caruso, Sonia A. Cavigelli. PA State University.

Background: Epidemiological research has demonstrated an association between stress during adolescence and increased alcohol and nicotine use in adulthood. Although clinical literature has demonstrated this association, the neurobiological mediators of this relationship are unknown. The goal of the current project was to develop an animal model to examine the effect of adolescent social stress on later drug use and to elucidate possible biological mechanisms underlying this relationship. **Methods:** To examine the effect of adolescent social stress on later drug behaviors, two inbred strains of mice (BALB/cJ and C57BL/6J) were exposed to chronic variable social stress or control conditions during adolescence. In late adolescence or adulthood, separate groups of mice were examined for ethanol or nicotine behaviors. Finally, changes in prefrontal cortex microRNA gene expression were examined as a neurobiological outcome of stress exposure. **Results:** Our results demonstrate important gene by environment interactions. BALB/cJ mice exposed to adolescent stress were more sensitive to acute nicotine in late adolescence but consumed less nicotine in adulthood. In contrast, C57BL/6J mice had no long-lasting changes in these nicotine behaviors after adolescent social stress. Similar strain differences were observed for binge-like ethanol consumption. BALB/cJ mice exposed to social stress during adolescence had decreased ethanol consumption in adulthood similar to the finding with nicotine consumption. In contrast, C57BL/6J mice exposed to social stress displayed increased ethanol consumption. Small RNA sequencing uncovered differentially regulated miRNA in the prefrontal cortex depending on stress condition which may provide a biological mechanism through which adolescent stress alters later drug behaviors. **Conclusion:** These results suggest that adolescent social stress has long-term consequences on both ethanol and nicotine behaviors, but genetic background is critical. One mechanism by which stress may alter these behaviors is by altering normal brain development resulting in changes in miRNA gene expression in regions known to underlie drug use.

FUNDING: Federal; Academic Institution

SYM14B

ADOLESCENT ALCOHOL BINGE DRINKING IN MICE IMPACTS NICOTINE DEPENDENCE LATER IN LIFE

M. Imad Damaj, PhD, Rabha Younis. VA Commonwealth University.

Background: Alcohol and nicotine are two of the most commonly used drugs among adolescent populations. Given that adolescence is a unique developmental stage during which alcohol could have long-term behavioral effects; it is essential to understand how early exposure to ethanol during adolescence may affect the abuse liability of other drugs later in life. Therefore, we determined the impact of early exposure to ethanol on nicotine behavioral phenotypes in adults that may lead to dependence. **Methods:** We



investigated the impact of ethanol drinking in early adolescent C57BL/6J mice for 9 days using the Drinking in the Dark (DID) model. Mice were then evaluated for alcohol intake in adulthood. A separate group of mice were exposed to ethanol during adolescence and evaluated for nicotine reward and withdrawal symptoms in adulthood. Results. Our results showed that exposure to ethanol during adolescence enhanced ethanol intake in adulthood in the DID, and the 2-bottle choice drinking paradigm. In addition, adolescent exposure to ethanol significantly enhanced nicotine preference in the conditioned place preference (CPP) test in adult mice. Furthermore, the same treatment worsened the expression of nicotine withdrawal signs in adult mice. However, exposure to ethanol during adolescence did not affect nicotine and cotinine plasma levels in adult mice. Conclusion: The results of this study will contribute to our understanding on the long-term impact of adolescent alcohol on future nicotine-taking behavior.

FUNDING: Federal

SYM14C

DIVERSE NICOTINIC ACETYLCHOLINE RECEPTOR REGULATION OF NICOTINE USE AND ETHANOL REINFORCEMENT

Darlene H. Brunzell, PhD¹, Alexandra M. Stafford¹, Kenneth Perkins², ¹VA Commonwealth University, ²WPIC University of Pittsburgh.

Background: Preclinical studies reveal that varenicline reduces nicotine and ethanol (EtOH) self-administration, suggesting a common mechanism underlying use of these drugs. A well-known partial agonist of $\alpha 4\beta 2^*$ nicotinic acetylcholine receptors (nAChR, *denotes possible assembly with other subunits), varenicline also acts as a partial agonist to inhibit $\alpha 6\beta 2^*$ nAChR and is a full agonist of $\alpha 7$ nAChR, raising the possibility that these nAChR subtypes may contribute to nicotine and EtOH use. **Methods:** The present studies compared ethanol and nicotine self-administration of C57BL/6J mice with $\alpha 6\beta 2^*$ or $\alpha 7$ nAChR knockdown to wildtype (WT) littermates with a full complement of their nAChRs. Oral operant EtOH (15%) or water vehicle self-administration was maintained on a VR5 schedule of reinforcement during weekly overnight sessions with 24h access to food and water. Blood ethanol content (BEC), rotarod and locomotor activity were assessed in a subset of mice. Additionally, in $\alpha 7$ nAChR knockdown mice, voluntary nicotine self-administration was measured daily using a 4 bottle choice paradigm. **Results:** BEC was highly correlated with oral operant EtOH self-administration behavior. Knockdown of $\alpha 6\beta 2^*$ nAChRs significantly reduced EtOH self-administration in male and female mice ($p < 0.05$). In contrast, male $\alpha 7$ nAChR knockdown mice showed significant elevations in EtOH self-administration compared to their WT counterparts ($p < 0.05$), an effect not observed in females. Further studies exploring 24h nicotine consumption showed a similar genotype effect, with male $\alpha 7$ nAChR knockdown mice drinking more nicotine than WT littermates ($p < 0.05$). **Conclusion:** Together with previous studies, these findings demonstrate that diverse nAChR subtypes may have opposing effects on EtOH and nicotine intake. These preclinical nAChR expression studies suggest that inhibition of $\alpha 6\beta 2^*$ nAChRs may reduce EtOH reinforcement whereas inhibition of $\alpha 7$ nAChRs may increase both EtOH and nicotine self-administration. Further studies are warranted to explore the nature of these dichotomous effects and to determine if agonism of $\alpha 7$ nAChRs may conversely reduce the reinforcing effects of EtOH and nicotine.

FUNDING: Federal

SYM14D

BEHAVIORAL AND MOLECULAR INFLUENCES ON VOLUNTARY CONCURRENT NICOTINE AND ALCOHOL CONSUMPTION IN A NOVEL 3 BOTTLE CHOICE ASSAY IN MICE

Anna M. Lee, PhD, Jillienne C. Touchette, Janna K. Moen. University of Minnesota.

Background: Nicotine and alcohol addiction are frequently co-morbid, and the behavioral characteristics and molecular mechanisms that contribute to co-morbidity are still unclear. Our goal was to develop a high-throughput, cost-effective model of voluntary concurrent nicotine and alcohol consumption in mice, and to use this model to dissect the impact of drug availability and nicotinic receptor subunit expression in concurrent nicotine and alcohol consumption. **Methods:** Our chronic 3-bottle choice assay allowed mice to freely consume unsweetened nicotine, alcohol and water over a range of concentrations. Using male and female C57BL/6J mice, we assessed chronic nicotine and alcohol consumption alone and concurrently. The effect of drug concentration and forced alcohol abstinence was investigated. Finally, we assessed the impact of knocking down alpha6 nicotinic receptor subunit expression in ventral tegmental area (VTA) dopamine (DA) neurons using a novel AAV expressing a Cre-dependent short-hairpin RNA sequence targeted against the mouse alpha6 subunit. **Results:** Male and female C57BL/6J mice will readily

consume unsweetened nicotine and alcohol over a range of drug concentrations. Forced alcohol abstinence resulted in increased nicotine consumption and preference ($P < 0.01$), whereas re-introduction of alcohol availability restored pre-abstinence drinking levels. Preliminary data assessing knockdown of alpha6 nicotinic receptor subunit expression in VTA DA neurons in male mice strongly trended towards reduction of nicotine consumption ($P = 0.08$, $n = 3-4$ mice/gp) without affecting alcohol consumption ($P = 0.88$, $n = 4-6$ mice/gp). **Conclusion:** Our results demonstrate that a 3-bottle choice assay is a straightforward, inexpensive method to assess nicotine and alcohol consumption in mice. Forced alcohol abstinence results in a compensatory increase in nicotine consumption. The alpha6 nicotinic receptor subunit in ventral tegmental area dopamine neurons may play a more important role in modulating voluntary nicotine consumption compared with voluntary alcohol consumption.

FUNDING: Federal

SYM15

EFFECTS OF WATERPIPE CONSTITUENTS AND DESIGN ON TOXICITY OF WATERPIPE TOBACCO SMOKE AND SMOKING BEHAVIORS

Eva Sharma, PhD, MPH. Westat, Rockville, MD, USA

While cigarette smoking has been on a decline, waterpipe (WP) smoking has continued to grow in the past few years in the US. Perception that WP smoking is safer and less addictive than cigarette smoking is fairly common. Contrary to the popular beliefs, WP smoking may be equally if not more harmful than smoking cigarettes. The FDA has recently extended its regulatory authority under the Family Smoking Prevention and Tobacco Control Act (TCA) through a deeming rule to include WP products. According to the rule, the FDA Center for Tobacco Products (CTP) now regulates the manufacture, import, packaging, labeling, promotion, sale, and distribution of WP tobacco, charcoal, parts and accessories. As FDA executes its regulatory authority over WP, there is more need for evidence to guide the FDA and other policy bodies into effective regulations to limit the spread of WP smoking among youth in the US. In this symposium, researchers present their novel results about health warning labels, constituents, compounds, and WP design features that impact the toxicity of WP tobacco products and smoke. Specifically, Dr. Maziak will present the effects of pictorial health warning labels on the WP device on smokers' experience, puffing behavior, harm perception, and exposure to respiratory toxicants. Ms. Brinkman will discuss the effects of using different heating methods and water bowl preparation on mainstream WP toxicant yields. Dr. Bernd will report the effects of WP smoking puff profiles and pipe sizes on the physical properties, chemical composition and toxicity of the smoke generated from shisha. Finally, Dr. Hensel will describe the effect of flow conditions on total particulate matter and aldehyde emissions from WP. Finding from these studies can guide regulators and policy makers into effective ways to limit the spread of WP smoking among young people in the US and beyond.

SYM15A

HEALTH WARNING LABELS ON THE WATERPIPE DEVICE ARE EFFECTIVE IN REDUCING SMOKING SATISFACTION, PUFFING BEHAVIOR, AND EXPOSURE TO CO

Wasim Maziak, MD, PhD¹, Ziyad Ben Taleb¹, Mohammad Ebrahimi Kalan¹, Thomas Eissenberg², James Thrasher³, Alan Shihadeh⁴, Taghrid Asfar⁵. ¹Florida International University, ²Virginia Commonwealth University, ³University of South Carolina, ⁴American University of Beirut, ⁵University of Miami.

Rationale: Given the recent widespread of waterpipe (WP) smoking among US youth, and the misperception about its reduced-harm, health warning labels (H WLs) can be an optimal option for policy and regulation to curb WP use. **Objectives:** To examine the effect of pictorial H WLs on the WP device on smokers' experience, puffing behavior, harm perception, and exposure to respiratory toxicants (CO). **Methods:** Thirty WP smokers completed two, 45-minute ad libitum smoking sessions (WP without H WL vs. WP with H WL) in a crossover design study. Exhaled carbon monoxide (eCO) was measured before and after each smoking session. Puff topography was recorded throughout the smoking session, and participants completed survey questionnaires assessing subjective smoking experiences and harm perception. **Measurements and Main Results:** Significant differences were observed in eCO levels between the two study conditions, with lower levels of eCO recorded following smoking the WP fitted with H WL (17.8 ppm) compared with WP without H WL (24.5 ppm). Participants had more puffs, shorter inter-puff-intervals, and a higher total puff volume during smoking the WP without H WL relative to WP with H WL (p values < 0.05). We documented enhanced subjective smoking measures of satisfaction, taste and puff liking following smoking the WP without H WL compared with the WP with H WL. WP harm perception was significantly higher among participants



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after smoking the WP with HWL compared with WP without HWL. Conclusion: This pilot study shows that placing HWL on the WP device is effective in reducing WP smoker's positive experiences, puffing parameters, and exposure to harmful respiratory toxicants such as CO. HWLs lead also to more appreciation of WP harmful effects, making them a promising regulatory target to address the spread of WP smoking among youth in the US and globally.

FUNDING: Federal

SYM15B

EFFECT OF HEATING METHOD AND WATER BOWL PREPARATION ON MAINSTREAM WATERPIPE TOXICANT YIELDS

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Objectives: We examined mainstream total particulate matter (TPM), nicotine, menthol and CO yields from a commercial waterpipe equipped with two different methods for heating the tobacco, quick-light charcoal (Charcoal) and electric head (Electric), and two water bowl preparations: with (Ice) and without ice (Water). **Methods:** Emissions from a single brand of popular waterpipe tobacco (10 g) were generated using machine smoking according to a two-stage puffing regimen developed from human puffing topography. Tobacco and charcoal consumption were calculated for each machine smoking session as mass of material lost expressed as a fraction of pre-smoking mass. **Results:** The choice of heating method had the greatest effect on toxicant yields. Electric heating resulted in significant increases in the fraction of tobacco consumed (2.4 times more, $p < 0.0001$), and mainstream nicotine yields (1.4 times higher, $p = 0.002$), and a significant decrease in mainstream CO yield (8.2 times lower, $p < 0.0001$) as compared to Charcoal heating. Electric heating resulted in the highest nicotine yield, 0.85 ± 0.01 mg/smoking session, across the four conditions (p 's < 0.05). Adding Ice to the bowl resulted in a significant decrease in TPM (0.54 times lower, $p = 0.003$) for Charcoal heating only. Menthol yields averaged 0.16 ± 0.03 mg/smoking session, and there were no significant differences across the four conditions. **Conclusion:** Waterpipe components used to heat the tobacco and water bowl preparation can significantly affect mainstream toxicant yields.

FUNDING: Federal

SYM15C

THE EFFECT OF WATERPIPE SIZE AND SMOKING REGIMEN ON WTS PHYSICAL PROPERTIES AND TOXICITY

Karen K. Bernd, PhD, Cindy DeForest Hauser, Dylan Carmack, Ronnae Mailig, Jen-na Reed, Emilie Uffman. Davidson College.

Significance: Waterpipe (WP) tobacco smokers have developed a collector's culture in which preferences for pipe appearances and smoke output influence their habit. Our study reports the effect of puff profiles and pipe sizes on the physical properties, chemical composition and toxicity of the smoke generated from a constant brand and mass of shisha. **Methods:** Smoke was generated via protocols that used a 36cm pipe with 550mL bowl liquid and varied the length and number of puffs in a session or that used a standard Beirut puff protocol and pipes with height and bowl volumes of 22cm:220mL, 36cm:550mL, or 55cm:1150mL. Particle distributions and concentrations were evaluated using a TSI Engine Exhaust Particle Sizer (EEPS) sampling particles from 5.3 to 530 nm at rate of 10Hz. Chemical compositions of smoke profiles were evaluated by LCMS and ROS quantification. Toxicity of the profiles were compared by exposing L2 cells (type II pneumocytes) during the puff protocols and evaluating three cell viability metrics, cytoplasmic protease and esterase activity (CellTiter Fluor (Promega) and fluorescein diacetate) and lysosomal activity (neutral red dye uptake). Conditions that result in higher doses will also be investigated for differences in chemical composition that may impact toxicity. **Results:** As pipe height increased from 22 cm to 55 cm and bowl size from 220 mL to 1150 mL total particle concentration (1014 to 1013) and mass (30,000 mg/m³ to 8400 mg/m³) decreased and particle size (125 nm to 170 nm) increased. Compared with non-smoking controls, 24-hours post exposure smoke from all pipe sizes caused decreases in cell viability metrics. Smoke from both smaller pipes met the NIH definition of a cytotoxic substance ($\geq 30\%$ decrease in cell viability). Increasing puff volumes similarly demonstrate an increase in particle concentration and are expected to show a corresponding decrease in cell viability metrics. **Conclusions:**

Our data indicate a WP's configuration and smoking regimen affect the concentration and potentially toxicity of the smoke produced such that smoking the same substrate in a smaller pipe or with increased puff volume results in more toxic smoke.

FUNDING: Federal

SYM15D

FRAMEWORK TO REPORT TOTAL PARTICULATE MASS AND ALDEHYDE EMISSION CHARACTERISTICS FROM HOOKAH

Edward C. Hensel, PhD, PE, Nathan C. Eddingsaas, Sean O'Dea, A Gary DiFrancesco, Risa J. Robinson. Rochester Institute of Technology.

Significance: An emissions reporting framework is used to describe the effect of flow conditions on Total Particulate Matter (TPM) and aldehyde emissions from hookah. We propose metrics for reporting results from laboratory emissions testing of hookah. The framework quantifies the yield of compounds delivered to a hookah user as a function of user topography and consumption characteristics, providing a tool for population-level estimates of toxicant exposure from hookah use. **Methods:** Laboratory emissions testing was conducted with the PESTM-2 emissions system on an ELITETM brand hookah filled with Al FakherTM brand Two Apple flavor tobacco shisha and heated with one coal of StarlightTM brand instant light charcoal. Four repeated trials of nine flow conditions spanning three flow rates (150, 200, 250 mL/s) and three puff durations (2, 3.5, 5 s) were conducted to capture TPM and Formaldehyde, Acetaldehyde, Propionaldehyde, Butyraldehyde, Benzaldehyde, Acetone and Acrolein emissions. Emissions were collected using filter pads in series with parallel side-stream sorption tubes. Gravimetric, GC-MS and LC-MS analyses were conducted to evaluate the yield of each constituent for each condition. **Results:** Temperature, puff flow rate, gas phase sampling flow rate, and cumulative volume are presented as a function of time for data representative of 36 hookah emissions trials of nominally 50 minutes duration. TPM emissions are reported on 6 to 25 filter pads and nicotine emissions are reported up to 5 samples per trial to illustrate the dynamic behavior of hookah emissions. Cumulative gas phase emissions of constituents are reported once per trial. **Conclusions:** Aggregate results of all trials are presented to illustrate relationships between mass concentration (mg/mL) and mass ratio (mg/mg) of each constituent per volume of aerosol and unit mass of TPM respectively. TPM yield correlates well with shisha consumed ($R^2=0.79$) and jointly with cumulative volume and puff flow rate ($0.72 < R^2 < 0.88$) while relatively independent of puff duration. The concentration and mass ratio of gas phase compounds are shown to variously depend upon puff flow rate and puff duration.

FUNDING: Federal

SYM16

APPLICATION OF BIOMARKERS FOR RISK ASSESSMENT AND INTERVENTIONS IN VULNERABLE POPULATIONS

Irina Stepanov. Masonic Cancer Center, University of Minnesota.

Tobacco use is a major causative factor for cancer and a wide range of non-malignant diseases. Prevention of tobacco-associated diseases is a major public health goal globally. Some population subgroups, such as tobacco users at higher risk for cancer development and children exposed to secondhand smoke, could benefit the most from effective prevention strategies. Critical for the development of such strategies is accurate measure of tobacco exposures in users, understanding of biochemical mechanisms by which key constituents in tobacco products elicit harmful effects, and understanding which factors contribute to disease susceptibility in tobacco-exposed individuals. This knowledge can be gained through the use of established and novel biomarkers of exposure, effect, and susceptibility. The symposium will present recent and new data from studies that employed various biomarkers to investigate tobacco constituent exposure, polymorphisms in genes responsible for their metabolism, and the effects of microbiome on tobacco constituent metabolism and cancer risk. Dr. Sharon Murphy (University of Minnesota) will discuss biomarker applications in the Multiethnic Cohort Study to assess the role of tobacco constituent intake and metabolism in the observed ethnic disparities in lung cancer risk among smokers. Dr. Gideon St. Helen (University of California San Francisco) will discuss differences in exposure to toxic and carcinogenic volatile organic compounds between Black and White smokers. Dr. Samir Khariwala (University of Minnesota) will present data on application of biomarkers of exposure and effect (DNA adducts), as well as novel microbiome data, to identify tobacco users at elevated risk for head and neck cancer. Dr. Neal Benowitz (University of California San Francisco) will compare urinary and plasma biomarkers for estimating nicotine intake from smoking. Dr. Irina Stepanov (University of Minnesota) will discuss biomarker applications to characterize secondhand exposures in children and present



recent data from studies employing urinary and toenail biomarkers in U.S. and China. Dr. Mirjana Djordjevic (National Cancer Institute) will lead the discussion of the capacity of biomarkers to assess population-based and individual health risks, research gaps, and novel promising directions. Role of biomarkers in the development of preventive and policy measures will be also discussed.

SYM16A

URINARY BIOMARKERS OF TOBACCO CONSTITUENT UPTAKE AND METABOLISM AS TOOLS TO INVESTIGATE THE ETHNIC/RACIAL DIFFERENCES IN LUNG CANCER RISK AMONG SMOKERS

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The Multiethnic Cohort Study (MEC) has demonstrated that African Americans and Native Hawaiians have a higher risk for lung cancer due to cigarette smoking than Whites while Latinos and Japanese Americans have a lower risk after adjusting for smoking history. Mechanistic studies described here partially explain these differences. As determined by measurement of total nicotine equivalents in urine, which account for about 85% of the nicotine dose, African Americans take up greater amounts of nicotine than Whites per cigarette while Japanese Americans, take up less. There are corresponding differences in the uptake of tobacco smoke carcinogens, such as the tobacco-specific nitrosamine NNK, polycyclic aromatic hydrocarbons, 1,3-butadiene, and other volatiles. The lower nicotine uptake of Japanese Americans is clearly linked to the preponderance of low activity forms of the primary nicotine metabolizing enzyme CYP2A6 in this ethnic group, leading to more unchanged nicotine in the body and thus lower smoking intensity. To explore the hypothesis that inaccurate measurement of smoking intensity from self-report contributes to the observed ethnic racial differences in lung cancer risk, data from this biomarker study of 2239 current smokers (free of lung cancer at the time of urine collection) were used to predict TNE in the MEC. Adjusting for predicted TNE, Japanese Americans no longer exhibit a lower risk, and African Americans are no longer at higher risk, compared to whites. But, the striking risk differences between Native Hawaiians and Latinos persist. The results of these studies may lead to a better understanding of susceptibility factors for lung cancer in cigarette smokers and to biomarkers that can detect those individuals at highest risk so that preventive approaches can be initiated at an early stage of the lung cancer development process.

FUNDING: Federal; Academic Institution

SYM16B

DIFFERENCES IN EXPOSURE TO TOXIC AND CARCINOGENIC VOLATILE ORGANIC COMPOUNDS BETWEEN BLACK AND WHITE CIGARETTE SMOKERS

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Significance: It is unclear why Black smokers in the United States have elevated risk of some tobacco-related diseases compared to White smokers. One possible causal mechanism is differential intake of tobacco toxicants. We examined racial differences in biomarkers of toxic volatile organic compounds (VOCs) present in tobacco smoke and known to be associated with increased disease risk. **Methods:** We analyzed baseline data collected from 182 Black and 184 White adult smokers who participated in a randomized clinical trial in 2013-2014 at 10 sites across the U.S. We examined differences in urinary levels of 10 VOC metabolites in addition to total nicotine equivalents (TNE) and 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL), controlling for covariates such as cigarettes per day (CPD) and mentholated cigarette use. **Results:** Metabolites of the following VOCs were significantly higher in Blacks compared to Whites: acrolein (21% higher, $p=0.035$), acrylonitrile (20%, $p=0.048$), ethylene oxide (28%, $p=0.038$) and methylating agents (60%, $p<0.001$). No metabolite had significantly higher levels in Whites compared to Blacks. Concentrations of TNE/CPD and VOCs/CPD (except the crotonaldehyde metabolite) were significantly higher in Blacks. The ethylene oxide metabolite was significantly higher in Black non-menthol smokers compared to Black menthol smokers ($p=0.026$). All other VOC metabolites, TNE, and NNAL were

not significantly different across menthol use for either race. **Conclusion:** At a given level of cigarettes smoked per day, Black smokers are exposed to higher levels of 4 of 10 measured toxic VOCs than White smokers. Our findings support and enhance previous studies indicating Blacks take in more nicotine and carcinogens per cigarette smoked, which likely explains their elevated tobacco-related disease risk relative to other racial groups.

FUNDING: Federal; State; Academic Institution

SYM16C

TOBACCO AND ORAL CANCER: MULTI-PRONGED APPROACH TO UNDERSTANDING WHICH SMOKERS ARE AT THE HIGHEST RISK

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Tobacco use is strongly associated with the eventual development of oral cancer. While all smokers must be urged and counselled to quit, many smokers fail such that long term cessation success rates are very low. Therefore, efforts aimed at understanding which smokers are at highest risk for oral cancer have high value. This portion of the symposium will focus on data indicating profiles of risk among smokers incorporating tobacco biomarkers, DNA adduct data, genetic polymorphisms and analysis of the oral microbiome. First, we will review existing data comparing tobacco biomarkers among smokers with and without oral cancer to highlight those tobacco-related carcinogens that are most strongly associated with oral cancer. Second, we will present data examining DNA adduct formation in the oral cavity among smokers developing oral cancer. This approach represented the first report of tobacco-related DNA damage at the tissue level where oral cancer occurs. Third, we will present recently gathered data regarding the oral microbiome in smokers with and without oral cancer in which we identified different bacterial profiles in those smokers developing oral cancer. Lastly, we will report on a preliminary exploration into genetic polymorphisms governing the metabolism and detoxification of tobacco-specific nitrosamines in smokers with and without oral cancer. Taken together, this data provides a multi-pronged approach to understanding, and eventually determining, risk of oral cancer in smokers. Ultimately, these approaches create opportunities for screening smokers who cannot quit with regard to their risk of eventually developing oral cancer. In this way, disease may be caught earlier or prevented outright through individualized risk-related counselling and enhanced cessation efforts in those found to be most likely to develop oral cancer.

FUNDING: Federal

SYM16D

OPTIMAL URINE AND PLASMA METABOLITES FOR ESTIMATING DAILY INTAKE OF NICOTINE FROM CIGARETTE SMOKING

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Background: Accurate measurement of nicotine exposure from cigarette smoke is important in studying disease risk and level of dependence in smokers. Urine total nicotine equivalents, the molar sum of nicotine and six metabolites (NE7), accounts for more than 90% of a nicotine dose and is independent of individual metabolic differences. However, measuring NE7 is technically difficult and costly. We compared NE7, the gold standard of nicotine intake, with different combinations of fewer urinary nicotine metabolites as well as plasma free cotinine (COT). We also examined the impact of individual differences in nicotine metabolic rate, sex and race on strength of association with NE7. **Methods:** Urine and plasma samples from 796 daily smokers, who participated across five clinical studies, were assayed for nicotine and/or metabolites. Associations with NE7 were assessed by regression and Bland-Altman analyses. Fast and slow metabolizers were identified using the nicotine metabolite ratio.

Results: Overall, the molar sum of [COT + 3'-hydroxycotinine (3HC)] (NE2) and [nicotine + COT + 3HC] (NE3) were strongly correlated with NE7 ($r=0.97$ and 0.99, respectively). However, in slow metabolizers NE2 was less strongly predictive of NE7, while NE3 was equally robust. Urine total cotinine was more strongly correlated with NE7 than plasma free cotinine ($r=0.87$ and 0.41, respectively). **Conclusions:** Urine NE3 is a robust biomarker of daily nicotine intake, independently of individual metabolic differences, while NE2 is less accurate in slow metabolizers. Urine



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total cotinine is a better biomarker for daily nicotine intake than plasma free cotinine. Our findings inform the selection of more rigorous and cost-effective measures to assess nicotine exposure in tobacco research studies.

FUNDING: Federal

SYM16E

Biomarker Applications to Characterize Secondhand Exposures in Children

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Exposure to secondhand smoke (SHS) is associated with a spectrum of detrimental health outcomes and is responsible for approximately 600,000 annual deaths worldwide. It is classified by the International Agency for Research on Cancer (IARC) as human carcinogen, with the strongest evidence for lung cancer, and also causes a range of non-malignant diseases. Childhood SHS exposure is of particular concern because children are dependent on adults and do not have power to change their circumstances; this leads to higher SHS exposure in children than in non-smoking adults. Environmental exposure of children to e-cigarette aerosols (ECA) is an emerging issue with limited research data available. Similar to smokers, adults using e-cigarettes around children expose them to nicotine and potentially other toxic agents. This presentation will provide an overview of available biomarkers for assessing childhood exposures to SHS and ECA. Recent data from studies that applied cotinine (a biomarker of nicotine) and NNAL (a biomarker of a tobacco-specific lung carcinogen NNK) analyses to characterize SHS exposures in schoolchildren in China and ECA exposures in U.S. children will be presented. The issue of childhood SHS exposure is highly relevant to China, where 180 million children under the age of 15 are passively exposed to SHS. We conducted a cross-sectional study in 200 children whose parents are either nonsmokers or smokers with variable smoking behaviors around their children. Another study was conducted in Oklahoma and Florida, assessing exposures in 51 children whose caregivers were smokers, e-cigarette users, or non-users of any products. Relative strengths of cotinine and NNAL as biomarkers of SHS and ECA exposure will be discussed, and their analyses in urine and toenails will be compared. The results of such biomarker-based studies can provide critical insights into the links between SHS or ECA exposure and acute or long-term negative health outcomes in children. Biomarker feedback to tobacco product-using adults can also be useful for increasing their motivation to quit or change product use behaviors around children.

FUNDING: Federal; Academic Institution

SYM17

Bringing It All Back Home: Measuring the Implementation and Impact of Smoke-Free Multi-Unit Housing Rules

Brian King. CDC Office on Smoking and Health, Atlanta, GA, USA.

Secondhand smoke exposure poses a serious health risk for residents living in multi-unit housing, where it can transfer between units and involuntarily expose nonsmokers. In July 2018, US Department of Housing and Urban Development (HUD) implemented a rule requiring all public housing agencies to implement smoke-free policies, including in all living units, interior areas, and within 25 feet of buildings. The new rule prohibits combustible tobacco smoking, including cigarette, cigar, pipe, and hookah. While the rule will have long-lasting effects on the health of millions of public housing residents, assessments of the actual impact of this rule and similar rules are limited. This symposium explores how to put emerging knowledge into broader practice and provides an opportunity for researchers to harmonize efforts across the country as HUD and other smoke-free housing rules go into effect. Specifically, the symposium brings together researchers from across the country to discuss early findings on the implementation and evaluation of the HUD rule and other sub-national smoke-free multi-unit housing rules. The session is chaired by Brian King (CDC), who has been at the forefront of smoke-free multifamily housing efforts for over a decade. Lorna Thorpe (NYU School of Medicine) will present evaluation design and baseline data on findings from a NCI-funded grant evaluating the health impact of the HUD rule in the New York City Housing Authority, the largest public housing authority in the US. Andrew Plunk (EVMS) will present early pre- and post-policy indoor air quality analyses from public housing buildings in Norfolk, Virginia. Lourdes Baezconde-Garbanati (USC) will characterize perceptions of smoke-

free regulations among African-Americans in Los Angeles. Natalie Alizaga (UCSF) will present results of a study examining implementation of smoke-free policies and cessation services in permanent supportive housing in San Francisco. The panel discussants, Liz Williams (ANR) and Bob Vollinger (NCI) will reflect on implementation considerations and utility of these findings for advancing smoke-free multi-unit housing efforts nationally.

SYM17A

Evaluation of Smoke-Free Housing Policy Impacts on Tobacco Smoke Exposure and Health Outcomes

Lorna Thorpe, PhD. NYU School of Medicine.

Introduction The US Department of Housing and Urban Development passed a rule requiring all public housing agencies (PHAs) to implement smoke-free policies by July 30, 2018. No empirical studies have evaluated the impact of smoke-free housing policies on health outcomes among residents. **Methods** We are implementing a large-scale natural experiment to examine the impact of the HUD policy on reducing secondhand smoke (SHS) exposure and improving health outcomes. The New York City Housing Authority (NYCHA) is the largest housing authority in the US, with more than 400,000 residents. Using a quasi-experimental longitudinal design, we are monitoring SHS pre- and post-policy implementation compared to demographically matched high-rise buildings in housing programs not subject to smoke-free policies. Using geocoded administrative data, citywide NYCHA resident health outcomes will be compared to residents in matched low-income census blocks. We are also using qualitative interviews and focus groups to explore factors influencing implementation. For this presentation, we will present study design features and baseline results. **Results** In May-July 2018, residents in 10 high-rise NYCHA buildings completed a baseline telephone survey (n=573). Smoking prevalence was 14% among adults, 70% reported smelling smoke, and 85% saw people smoking in common areas in these buildings. Air monitors were placed in 157 homes of nonsmokers and in 45 common areas – these will be tracked longitudinally for 2.5 years. Two-thirds (65%) of apartments had PM2.5 levels >12 µg/m³. Nicotine concentration measures and results from comparison buildings are pending. For health outcomes, residents living in most of the 328 NYCHA public housing developments across NYC (n=401,093 official residents as of January 1, 2015) constitute the “exposed” population. **Conclusions** These baseline findings, in addition to future evaluation findings, will inform our understanding of health risks associated with SHS in the home, and could be used to develop guidance for implementing smoke-free policies in public and private multi-unit housing settings nationally.

FUNDING: Federal

SYM17B

An Analysis of Indoor Air Quality in Response to the Implementation of HUD-Mandated Smoke-Free Housing

Andy Plunk, PhD. Eastern Virginia Medical School.

Introduction HUD's federally-mandated smoke-free (SF) public housing rule could protect millions of low-income housing residents from second-hand smoke (SHS) exposure. However, it is unknown whether mandated SF public housing will reduce indoor SHS. We measured markers for SHS—airborne particulate matter (PM2.5) and nicotine—in five low-income public housing buildings in Norfolk, VA pre- and post-adoption of a SF rule. **Methods** SidePak AM520 aerosol monitors were installed in common indoor areas of five buildings (one monitor per building) from July, 2017–August, 2018 and set to sample for one minute each hour. Several waves of passive nicotine monitoring were performed over the same period. Two of the buildings were made smoke-free in January, 2018; the remaining three were made smoke-free in July 2018. We compared pooled PM2.5 from the month before and after adoption of the SF rule. We also compared six-month pre- and post-adoption PM2.5 for the two buildings that were made smoke-free earlier. Regression modeling was used for all analyses. **Results** Across all buildings, SF was associated with a 20.73 µg/m³ reduction in PM2.5 in the month after adoption (p=0.002), an average decrease of 25%. This reduction did not seem to persist for the two buildings that were made smoke-free in January, 2018—average PM2.5 for Summer, 2018 was slightly higher than values for Summer, 2017 (p<0.001). Airborne nicotine showed a similar pattern with significant decline immediately after SF adoption (p=0.006), followed by a subsequent increase to levels that were not significantly different from their pre-adoption values (p=0.33). **Conclusions** Adoption of a SF rule produced large reductions in indoor SHS. However, the impact of the SF rule did



not persist beyond one month post-adoption. Our results highlight the need for better implementation approaches to improve resident compliance and ensure optimal mid- to long-term impact of the SF rule.

FUNDING: Federal; Other

SYM17C

EXPOSURE AND PERCEPTIONS OF SECONDHAND SMOKE EXPOSURE AND SMOKE-FREE MULTI-UNIT HOUSING REGULATIONS AMONG AFRICAN AMERICANS IN LOS ANGELES

Lourdes Baezconde-Garbanati, PhD. University of Southern CA, Department of Preventive Medicine.

Introduction Although California has experienced decreases in cigarette smoking prevalence, low socioeconomic African Americans (AA), who compose a large portion of the multi-unit housing market in Los Angeles (LA), are disproportionately exposed to higher levels of secondhand and thirdhand smoke in multi-unit housing (MUH). African Americans also face new risks in exposure to chemicals from secondhand aerosol to e-cigarettes, and the legalization of cannabis. **Methods** Eighty-three (83) African Americans participated in door-to-door surveys with tenants living in randomly selected MUH buildings with 20 or more units in the Greater LA area. We assessed knowledge, attitudes, beliefs and behaviors, regarding smoke-free policies in MUH that include restricting the use of combustible tobacco, cannabis, and e-cigarettes. Analysis of Variance and Chi-Square tests are used to compare predictor and outcome variables in the population. **Results** Sixty-four percent (64%) of respondents reported being exposed to secondhand smoke from tobacco, e-cigarettes, and/or cannabis in multi-unit housing. Sixty-three percent (63%) reported they preferred to live in a completely non-smoking property (including outdoor common areas), and 67% reported they preferred to live in a non-smoking section of a building. Seventy-five percent of those surveyed supported a smoke-free policy, including e-cigarettes, that included a partial prohibition (e.g. designated or set aside smoking sections), and 52% stated they would be in favor of a comprehensive policy covering all smoking, e-cigarettes, and cannabis in their housing complex. **Conclusions** African Americans in LA report high exposure to secondhand smoke from tobacco and cannabis. A large portion of tenants' support smoke-free policies, including comprehensive prohibitions of the use of these products in MUH to avoid exposure to secondhand smoke and aerosol. Some exceptions were made regarding medical cannabis. Findings from this study have implications for voluntary MUH, as well as state and local tobacco control policies related to achieving policies addressing tobacco product and marijuana use in MUH in LA.

FUNDING: State

SYM17D

IMPLEMENTING TOBACCO CONTROL INTERVENTIONS IN PERMANENT SUPPORTIVE HOUSING FOR FORMERLY HOMELESS ADULTS

Natalie Alizaga, PhD. University of California at San Francisco.

Introduction Smoke-free policies are effective population-based strategies to reduce tobacco use, yet they are uncommon in permanent supportive housing (PSH) for formerly homeless individuals, who also have high rates of cigarette smoking. In this study, we partnered with six supportive housing agencies in the San Francisco Bay Area to examine the implementation of smoke-free policies and cessation services in PSH. **Methods** We administered a questionnaire and conducted in-depth, semi-structured interviews with agency directors (n=6), property management staff (n=23), and services staff (n=24) from 23 PSH sites in the Bay Area between January 2017 and July 2017 on the barriers to implementing tobacco control interventions in these sites. **Results** All properties restricted smoking in indoor shared areas, but only two had policies restricting smoking in living areas. Of the 53 staff participants, 62% were female and 26% were former cigarette smokers. While there was staff consensus that smoke-free policies were important to reduce tobacco-related harm, participants disagreed on whether smoke-free policies in indoor living areas were aligned with PSH's harm reduction framework. Residents' comorbid mental illness and substance use, and lack of appropriate tools to enforce a smoke-free policy, were barriers to implementation. With these formative findings, we present a toolkit of strategies that encompassed policy-level, organizational-level, and individually-tailored targets to increase implementation of smoke-free policies and cessation interventions in PSH. Strategies include: adoption of voluntary smoke-free homes; incorporating tobacco use screening upon entry into housing; integrating medical and social services so that prescriptions for nicotine replacement therapy and

cessation counseling are available; and integrating the treatment of substance use with tobacco use and discussing substance and tobacco use in the context of financial strain. **Conclusions** Successful implementation of indoor smoke-free policies in PSH will require concurrent cessation services and to address the mental health and substance use needs of residents.

FUNDING: Federal; State

SYM18

TRAJECTORIES OF TOBACCO PRODUCT USE AMONG ADOLESCENTS AND YOUNG ADULTS: LOOKING BEYOND INITIATION

Alexa Romberg. Truth Initiative Schroeder Institute, Washington, DC, USA.

Prevalence of use of alternative tobacco products, such as ENDS and cigars, now matches or exceeds that of cigarettes among adolescents and many tobacco users use more than one product (poly use). Understanding how young people's tobacco product use changes over time is vital to understanding the public health impact of experimentation and use in this diverse product landscape. In order to effectively design interventions and policies around tobacco use, the field must know which products tend to be used together and how use of combustible products is influenced by use of non-combustible products. This symposium includes five studies that provide insight into these questions using longitudinal samples. The first three presentations examine how ENDS use is related to cigarette use. Dr. Harrell examines trajectories of ENDS use during adolescence using growth mixture models and then uses the trajectories to predict past 30-day cigarette use. Dr. Vogel uses ANOVA to model differences in e-cigarette use in adolescence between e-cigarette-only users and dual users of e-cigarettes and combustible cigarettes. Dr. Loukas uses a Markov model to estimate transition probabilities into and out of current cigarette smoking in a sample of college students and then tests how current ENDS use influences those transitions. The fourth presentation broadens to examine longitudinal patterns of use across a range of additional products, including cigars, hookah/waterpipes and smokeless tobacco. With a nationally representative sample of 15-21-year-olds, Dr. Romberg and colleagues use a latent transition analysis to identify common categories of product co-use and describe how youth move between them. In the fifth presentation, Mr. Cole examines trajectories from experimentation to regular use within multiple products in a cohort of 9th graders. As the discussant, Dr. Niaura will describe themes that cut across all of the papers, highlight public health implications of these longitudinal studies and suggest how future research can address outstanding questions about how young people's product use changes over time.

SYM18A

STABLE TRAJECTORIES OF ENDS USE AND THEIR RELATIONSHIP WITH CIGARETTE SMOKING AMONG TEXAS ADOLESCENTS

Melissa Harrell, PhD MPH¹, Christian Jackson¹, Anna Wilkinson¹, Alexandra Loukas², Cheryl L. Perry¹. ¹UT Health School of Public Health, ²University of TX, Austin.

Introduction. Almost all longitudinal studies to date rely on a limited number of survey waves (e.g., n=2) and follow-up time (e.g., 1 year) to examine the role that electronic nicotine delivery systems (ENDS) play in the uptake, progression, and/or cessation of combustible tobacco product use. These are inadequate to describe the frequent and erratic transitions in tobacco use behaviors and between tobacco products that occur during adolescence. **Methods.** Longitudinal analyses of population-based data from the Texas Adolescent Tobacco and Marketing Surveillance System [TATAMS] (8 waves, 6 months apart each, 2014-18; n=3907, N=461,069). Growth mixture models were applied to identify stable patterns in trajectories of ENDS use, from 11 to 19 years of age. Two measures of ENDS use were used: (a) an index of susceptibility, ever use, and past 30-day use, combined; and (b) past 30-day use, alone. Once enumerated, differences in past 30-day cigarette smoking were examined by ENDS use trajectory. **Results.** Several stable trajectories of ENDS use across adolescence were identified using the index score: (a) non-susceptible, never users (43% of the population); (b) never users whose susceptibility increased across adolescence (19%); (c) ever users who never reported past 30-day use in adolescence (18%); and (d) established users whose ENDS use began in early (5%), middle (10%), and late adolescence (5%) and continued to accelerate in frequency (i.e., past 30-day use) after onset. Among adolescents who reported any past 30-day ENDS use at any wave, stable trajectories of past 30-day ENDS use included: (a) early escalators (30%); (b) mid-escalators (34%); (c) late escalators (30%); and (d) decliners (6%). By age 19, the frequency of cigarette smoking was highest for established ENDS users who started using ENDS early, by or



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before the age of 15. Conclusion. Longer-term studies with frequent observations can be used to identify stable trajectories of ENDS use across adolescence. The frequency of cigarette smoking varies in important ways across these trajectories and appears to be most problematic among those who start using ENDS products early in adolescence.

FUNDING: Federal

SYM18B

ENDS USE PREDICTS LONGITUDINAL TRANSITIONS IN CIGARETTE SMOKING ACROSS 2.5 YEARS AMONG YOUNG ADULTS

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Significance. Research indicates that use of electronic nicotine delivery systems (ENDS) predicts cigarette initiation. Little is known, however, about the role of ENDS use in transitions into and out of other smoking stages. The present study fills this void by examining the role of ENDS use in cigarette smoking transitions across a 2.5 year period among young adults. **Method.** Participants were 5,034 initially 18-29 year old students (m age=21.0, SD=2.3; 64.2% female; 36.1% non-Hispanic white, 31.0% Hispanic, and 33.0% another race/ethnicity) participating in at least two waves of a six-wave (6 months between waves) 24-college study in Texas. Markov modeling was used to examine transitions between three cigarette use states across the six waves: never use; past 30-day/current use; non-current/former use. The exposure variable was time-varying ENDS use. Models were adjusted for sex, and time-varying age and depressive symptoms. **Results.** Markov models indicated that after adjusting for the covariates, current ENDS use increased the probability of transitioning from never to current cigarette use [adjusted Hazard Ratio (aHR)=5.07; 95% CI=3.74-6.89]; decreased the probability of transitioning from current cigarette to non-current use (aHR=0.48; 95% CI=0.40-0.57); and increased the probability of transitioning from non-current cigarette to current use (aHR=2.35; 95% CI=1.85-2.97). More specifically and as an example, an 18 year old male current ENDS user reporting never use of cigarettes in any wave had an 80% probability of remaining a cigarette never-user six months later, a 16% probability of transitioning to current cigarette use, and a 4% probability of transitioning to former use. **Conclusion.** Findings extend existing research by indicating that while the probability of transitioning to cigarette use is low, ENDS use during young adulthood may contribute to cigarette initiation, discourage discontinuation, and encourage re-uptake of cigarettes. Additional research examining trajectories of dual ENDS and cigarette use is needed to determine who is at elevated risk for continued use of one or both products.

FUNDING: Federal

SYM18C

LONGITUDINAL PATTERNS OF TOBACCO PRODUCT USE IN YOUTH: A LATENT TRANSITION ANALYSIS

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Background Understanding tobacco product use trajectories is vital to assessing the public health impact of alternative tobacco products. The purpose of this study was to 1) characterize the underlying classes of tobacco product use among youth and young adults, 2) describe the probability of transitioning between classes over a 2.5 year interval, and 3) identify predictors of product use class membership. **Method** This study used the Truth Longitudinal Cohort, a probability-based nationally representative sample of 15-21-year-olds. The analytical sample consisted of 6,794 participants who reported ever use of any tobacco product. A latent transition (LTA) model was fit to data from Waves 1 (2014), 3 (2015), and 6 (2017). Indicator variables were past 30-day tobacco product use (yes/no) for: cigarettes, cigars/little cigars/cigarillos, hookah, pipe, smokeless tobacco (snus and chew) and vape (e-cigarettes/e-hookah). Transition probabilities between classes were estimated for both the Wave 1-3 and Wave 3-6 transitions. Follow-up multinomial logistic models predicted latent product use class at Wave 1. **Results** The LTA identified three latent use classes: Non-current Use (76-78% of the sample), Cigarette+ Use (cigarette users who had 25% probability of also using cigars or vape; 10-15% of the sample) , and Poly Use (those who had 42-65% probability of using 4 products; 10-12% of the sample). The probability of remaining in state was lower for Poly Use (68.9% and 48.3% for the two transitions) than for Non-current (90.3% and

93.0%) and Cigarette+ (93.5% and 94.5%) Use. Adolescents were significantly more likely than young adults to transition out of the Non-current and Cigarette+ Use classes. For both current-use classes, the probability of transitioning into Non-current Use was greater than transitioning into the other use class. Multinomial regression revealed that, relative to Cigarette+ Use, Poly Use class members were higher sensation seeking and more likely to be exposed to use of vape/cigars. **Conclusions** Among youth, poly use is associated with exposure to alternative tobacco products but is not as stable a state as cigarette use or non-current tobacco use.

FUNDING: Other

SYM18D

IDENTIFYING LATENT TRAJECTORY GROUPS DESCRIBING THE USE OF CIGARETTES, E-CIGARETTES, AND CIGARILLOS/LITTLE CIGARS

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Significance: Multiple studies have identified stages in the progression from non-susceptible never smoker to daily smoker; however, similar stages in the use of other tobacco products are lacking. This study identified the number of latent trajectory groups that described use patterns of cigarettes, e-cigarettes, and cigarillos or little cigars (CLCs). **Methods:** A three wave (2013-2016) longitudinal sample (n=4651) of 9th grade students at baseline was identified from the COMPASS study. Responses to measures of susceptibility to future cigarette smoking and past 30-day use of each product at each wave were used to identify latent trajectory groups for each product. Each student was assigned to a single trajectory group at each wave. **Results:** The same 5-group model was selected as the best fitting model for each product: non-susceptible non-users (59.5-69.0%), non-susceptible puffers (3.7-6.2%), susceptible non-users (15.9-19.1%), escalating experimenters (5.8-11.4%), and consistent current users (2.7-5.1%). Across all products and waves, the most stable group was the non-susceptible non-users. Between waves, students had a moderate probability (27.0-32.4%) of transitioning from susceptible non-users to non-susceptible non-users, a moderate probability (29.5-39.3%) of transitioning from consistent current users to escalating experimenters, and a moderate probability (21.2-27.3%) of transitioning from non-susceptible puffers to escalating experimenters. **Conclusions:** The same five latent trajectory groups were identified for the use of each product. Although many students had the highest probability of remaining in the same group over time, some transitions in group membership were evident. Consistent prevention programming is needed throughout adolescence to discourage tobacco product use.

FUNDING: Federal

SYM18E

TRAJECTORIES OF E-CIGARETTE USE AMONG SMOKING AND NON-SMOKING ADOLESCENTS

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Significance: Adolescent e-cigarette users are exposed to nicotine which increases the risk of dependence. Dual users of e-cigarettes and combustible cigarettes may be at even higher risk. This study compared e-cigarette use frequency and dependence between adolescent dual users and e-cigarette-only users over 12 months. **Methods:** Adolescent e-cigarette users (N=173, age 13-18, M age=16.6, 75.1% male, 54.9% non-Hispanic White) were recruited from the San Francisco Bay Area and surveyed about their e-cigarette use at baseline, 6, and 12 months. Participants reported their use of cigarettes in the past 30 days (yes/no), e-cigarette use frequency (days of use in a typical month, 0-30), and dependence on e-cigarettes (Penn State Electronic Cigarette Dependence Index). Two repeated-measures ANOVAs were used to examine changes in e-cigarette 1) frequency, and 2) dependence over 12 months, as a function of baseline cigarette smoking. Simple effects analysis was used to interpret a significant interaction. **Results:** Retention was 69.4% at 6 months and 61.2% at 12 months. Both frequency ($F(2,152)=7.54$, $p=.001$) and dependence ($F(2,154)=3.57$, $p=.031$) on e-cigarettes increased over time. Dual users had similar frequency of e-cigarette use ($F(1,76)=3.79$, $p=.06$) but higher dependence on e-cigarettes ($F(1,77)=13.28$, $p<.001$)



over time compared with e-cigarette only users. A time-x-smoking interaction for frequency ($F(2,152)=3.57, p=.03$) showed that dual users and e-cigarette-only users did not differ in e-cigarette use frequency at 6 months ($p=.78$), despite higher frequency of use among dual users at baseline ($p=.01$) and 12 months ($p=.02$). The time-x-smoking interaction for dependence was not significant ($F(2,154)=.12, p=.89$). **Conclusion:** In a sample of adolescent e-cigarette users and dual users with cigarettes, dual users had higher e-cigarette dependence symptoms. Results suggest a need for comprehensive intervention among adolescents who co-use cigarettes and e-cigarettes, as those who smoke may be at higher risk for heavy e-cigarette use in the future.

FUNDING: Federal; State

SYM19

SMOKELESS TOBACCO AND ARECA NUT: GLOBAL DIVERSITY OF PRODUCTS AND PARALLELS IN ASSOCIATED HEALTH RISKS

Irina Stepanov, PhD. Masonic Cancer Center, University of Minnesota.

Smokeless tobacco and areca nut – the seed of the Areca Catechu tree – share key similarities in terms of the mode of administration and the associated health risks. Both are used orally in a wide variety of formulations, with over 300 million people using smokeless tobacco and 600 million people using various areca nut-containing products globally. Similar to tobacco, areca nut contains psychoactive and carcinogenic constituents. Addiction, precancerous oral lesions, and oral cancer are among the major health consequences in areca nut users, presenting a public health concern that in many ways mirrors the issues related to smokeless tobacco use. Furthermore, while areca nut use is most common in Asia and Pacific Islands, it is also used among some immigrant communities in other parts of the world, including North America. Given the recent trends towards diversification of tobacco product marketplace, it is plausible to expect further expansion of areca nut use in Western cultures, similar to the spread of waterpipe and hookah use. This symposium will present and discuss the epidemiology of areca nut-containing product use and associated diseases, the diversity and chemical composition of areca nut-containing products, and the current state of knowledge of the mechanisms and behavioral aspects of areca nut dependence. Dr. Irina Stepanov (University of Minnesota) will discuss the diversity of areca nut-containing products. Recent and new data on toxicant and carcinogen content in various areca products, with and without tobacco, will be presented. Dr. Roger Papke (University of Florida) will present recent data on the mechanisms underlying areca addiction and their parallels with the nicotine addiction mechanisms. Dr. Samir Khariwala (University of Minnesota) will discuss the epidemiology of areca nut and associated diseases globally and in the U.S. Finally, Dr. Mirjana Djordjevic (National Cancer Institute) and Dr. Thaddeus Herzog (University of Hawaii) will moderate a discussion that will address the similarities and differences between areca nut and tobacco epidemiology, the effects of tobacco and areca co-use, identify research gaps, and consider potential policy perspectives.

SYM19A

GLOBAL DIVERSITY OF ARECA NUT-CONTAINING AND SMOKELESS TOBACCO PRODUCTS

Irina Stepanov, PhD¹, Prakash C. Gupta², Pankaj Chaturvedi³, Sok Ching Cheong⁴, Olalekan Ayo-Yusuf⁵, Samir S. Khariwala¹, Mark Parascandola⁶. ¹University of Minnesota, ²Healis-Sekhsaria Institute for Public Health, ³Tata Memorial Hospital, ⁴Cancer Research Malaysia, ⁵Sefako Makgatho Health Sciences University, ⁶National Cancer Institute.

The use of areca nut and smokeless tobacco is addictive and both substances are classified by the International Agency for Research on Cancer as human carcinogens. However, areca nut and smokeless tobacco are characterized by the presence of different toxic and carcinogenic constituents that are believed to be contributing to these effects. Thus, studies aimed at understanding the mechanisms underlying the addictiveness and carcinogenicity of areca nut have identified alkaloids guvacine, arecaidine, guvacoline, and arecoline, as the potential key chemical constituents contributing to these properties. In addition, endogenous nitrosation of these alkaloids to areca-specific nitrosamines have been suggested as a key mechanism in areca-induced carcinogenesis. In smokeless tobacco, nicotine is the major known addictive constituent, while carcinogenic effects are mainly attributed to the tobacco-specific N-nitrosamines NNN and NNK. Furthermore, in addition to being used individually, areca nut and tobacco are often used in combination, as part of formulations such as betel quid, mawa, or gutkha. Understanding the variations in key toxic and carcinogenic constituents across various areca nut and smokeless tobacco products can provide valuable insights into the role of specific product formulations and harmful constituent profiles in the development of

associated diseases. This presentation will provide the global view of the variability of areca- and tobacco-specific constituents in various products purchased in U.S., India, Malaysia, and Africa. Data on substantial variability not only across countries and product types, but also within-products and vendor-to-vendor variations will be presented, and the implications of this variability will be discussed. This presentation will emphasize the critical need for systematic surveillance of areca nut-containing and smokeless tobacco products worldwide, in order to improve understanding of exposures, addiction, and cancer risks in users of these products.

FUNDING: Federal

SYM19B

ORAL DISEASE MANIFESTATIONS OF CHRONIC ARECA NUT USE

Samir S. Khariwala, MD¹, Irina Stepanov¹, Pankaj Chaturvedi². ¹University of Minnesota, ²Tata Memorial Hospital.

Areca nut is the fruit product of the areca palm tree and an important carcinogenic agent in many parts of the world. In areas where areca nut is heavily used, the ingestion is often part of cultural traditions and results in a high rate of oral cancer. This portion of the symposium will discuss multiple features of the areca nut and its worldwide usage patterns. The presentation will include images and data documenting the oral clinical findings among areca nut users including dental caries, leukoplakia, submucous fibrosis and oral carcinoma. In addition, we will present data supporting the tissue-level mechanisms by which areca nut causes oral disease. This will include a description of areca nut influence on collagen levels and the extracellular matrix. Lastly, the presentation will describe the treatment that is required for areca nut-induced oral disease while also addressing the societal and monetary costs incurred. At the end of this session, attendees will have an understanding of the demographics of areca nut use, the oral manifestations of long-term areca nut use and the types of treatment required for areca nut users who develop a variety of resulting oral diseases.

FUNDING: Federal

SYM19C

THE TRADITIONAL USE OF BETEL NUT (ARECA) PROMOTES SMOKELESS TOBACCO ADDICTION IN SOUTH ASIA AND ASSOCIATED HEALTH RISKS, AND A HYPOTHESIS FOR A NOVEL CESSATION THERAPY

Roger L. Papke, PhD. University of Florida.

Chewing preparations of areca (betel quid) is an ancient cultural tradition in South Asia. With 600 million users, it is one of the four most commonly used addictive substances. Like tobacco use, areca use presents a serious public health burden. It is a Group 1 carcinogen and causes other oral health problems. Arecoline, a strong muscarinic agonist in areca, is also a partial agonist for the high-affinity brain nicotine receptors that cause tobacco addiction. In Myanmar and India, smokeless tobacco is commonly mixed with areca, and oral cancer has become the most common form of cancer in these countries. Nearly half of the inhabitants of Myanmar chew areca nut. We conducted surveys of 200 betel quid users in the vicinity of betel quid stands in Yangon to determine their attitudes and knowledge of betel-related health problems. A large majority of the survey subjects (84%) used tobacco with their quid. Users had a general awareness that betel chewing was "a bad habit" (85%), a small majority (55%) acknowledged that they were addicted, and 51% had tried to quit. There was a general awareness of the cancer risks (85.5 - 77%). Users had some difficulty identifying the CNS effects of betel. Only slightly more than half of the participants said they thought that betel had effects in the brain. A 58% respondents indicated that it had effects like drinking coffee, and 55.5% indicated that it had effects like drinking alcohol. An increased capacity for work was reported by 33.5%. The data suggest that betel quid addiction includes a significant component of nicotine dependence, and therefore cessation attempts may be helped by nicotine replacement therapies. However, there are other aspects of their drug-taking experience that would be better addressed with a more focused therapy. Areca compounds affect several types of brain receptors, but the muscarinic activity of arecoline stands out since a consistent effect experienced by the betel quid users is the copious production of saliva. These observations suggest that nicotine gum augmented with the safe muscarinic agent pilocarpine could help betel quid users quit.

FUNDING: Federal; Other



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SYM20

PERSPECTIVES ON TOBACCO CESSION FOR PATIENTS WITH TB, HIV AND/OR HEPATITIS C: EVIDENCE FROM FOUR COUNTRIES

Melanie Boeckmann, Dr. PH, MA. Heinrich-Heine-University Duesseldorf.

The colliding epidemics of tuberculosis (TB) and tobacco use present a significant public health problem with an estimated 10 million new TB cases worldwide in 2016, and an estimated 15% of pulmonary TB cases associated with tobacco. HIV and TB often occur as co-infections, and many persons living with HIV smoke heavily. The prevalence of smoking among persons with Hepatitis C (HCV) has been estimated to be as high as 67%, which represent three times the national average. Successful integration of tobacco cessation into care for patients with HIV, TB and/or HCV is a promising approach to reducing the burden of lung disease in these highly susceptible populations. At the same time, prioritization and funding issues, health provider workloads and lack of awareness among patients and providers are barriers to tobacco cessation integration into care globally. In this symposium, researchers present novel results about how to address these tobacco cessation barriers among HIV, TB and HCV patients in healthcare settings in Nepal, Pakistan, South Africa and the US. Dr. Boeckmann presents findings from the implementation of a tobacco cessation behavioral support intervention into TB care in Nepal, demonstrating health worker and patient perceptions of the program. Mrs. Marshall's presentation highlights data on smoking prevalence among 11,396 TB patients in Bangladesh and Pakistan collected as part of a large randomized controlled trial of cytisine vs. Placebo for tobacco cessation. Profs. Ayo-Yusuf and Louwagie discuss piloting results from their prospective, multicentre, two-arm individual randomised controlled trial "ProLife" in South Africa, which aims to determine the effectiveness and cost-effectiveness of a Motivational Interviewing (MI) strategy augmented with subsequent Short Messaging (SMS). Dr. Faseru's work describes factors associated with referral and treatment of hospitalized patients living with HIV who smoke for tobacco treatment and the differences in warm handoff vs. fax referral to the quitline for post-discharge cessation treatment. These studies show that compared to other hospitalized smokers, smokers with HIV were less likely to be referred for tobacco treatment. Dr. Pericot Valverde presents findings from an evaluation of rates of smoking and identifying factors associated with smoking in patients with HCV. Prof. Kamran Siddiqi will act as discussant.

SYM20A

PREVALENCE OF TOBACCO SMOKING AMONG TUBERCULOSIS PATIENTS IN BANGLADESH AND PAKISTAN

Anna-Marie Marshall¹, Omara Dogar, PhD¹, Ada Keding¹, Rumana Huque², Deepa Barua², Anne Readshaw¹, Kamran Siddiqi¹. ¹University of York, York, United Kingdom, ²ARK Foundation.

Introduction Smoking significantly increases the risks of contracting tuberculosis (TB) and of dying from TB. Globally, smoking at the current rate is projected to cause 18 million additional cases of TB and 40 million excess TB-related deaths by 2050. According to the Global Adult Tobacco Survey, the proportion of daily smokers in men and in women is 33.1% and 0.7% in Bangladesh and 20.6% and 2.0% in Pakistan. Both Bangladesh and Pakistan also feature in the top 5 high-TB burden countries. However, there are no estimates of smoking prevalence among TB patients in either country. **Methods** We conducted a large randomised controlled trial of cytisine vs. placebo for tobacco cessation in Bangladesh and Pakistan. From preliminary data, 11,396 TB patients (7,003 men and 4,393 women) were screened and 2,472 of them were recruited for the trial, from 30 TB clinics. All TB patients attending these clinics between June 2017 and April 2018 were screened for any form of (daily) tobacco smoking. We used their screening data to estimate smoking prevalence in TB patients. **Results** Overall, 2,904/11,396 (25.5%) TB patients reported smoking some form of tobacco daily: 1,799/7,355 (24.5%) in Bangladesh and 1,105/4,041 (27.3%) in Pakistan. The proportion of smokers was 2,867/7,003 (40.9%) in men and 37/4,393 (0.84%) in women (41.2% and 0.3% in Bangladesh and 40.6% and 2.0% in Pakistan). Smoking was reported by 2,689/9,161 (29.4%) patients with pulmonary TB and by 215/2,235 (9.6%) patients with extra-pulmonary TB. Among those with pulmonary TB, 29.7% of 'new' TB patients smoked, and 24.5% of 'treatment' category smoked. **Conclusions** The prevalence of daily smoking in TB patients was similar in both Bangladesh and Pakistan. When compared with the general smoking populations of the two countries, the proportion of daily smokers among male TB patients was higher in both countries. Smoking prevalence was also higher in those affected by pulmonary TB, rather than extra-pulmonary TB. In the absence of national smoking cessation services in these countries, TB clinic services provide a unique opportunity to support people in quitting tobacco use, and hence improving their TB outcomes.

FUNDING: Other

SYM20B

IMPLEMENTATION AGAINST THE ODDS: TOBACCO CESSION FOR TUBERCULOSIS PATIENTS IN NEPAL

Melanie Boeckmann, Dr. PH, MA¹, Prabin Shrestha², Sudeepa Khanal², Sushil C. Baral², Daniel Kotz¹. ¹Heinrich-Heine-University Duesseldorf, ²HERD International.

Significance: Tobacco use is associated with higher risks of tuberculosis (TB) infection and worse TB outcomes. TB patients can profit from tobacco cessation support, yet integration into routine care is challenging. As part of the EU-funded TB & Tobacco effectiveness and implementation hybrid trial (ISRCTN43811467), we conducted a case study in Nepal to examine the feasibility of low-resource implementation of a behavior support (BS) intervention on tobacco cessation into routine TB care. Findings shed light on the barriers and facilitators to implementation when only limited resources are available. **Methods:** Health workers at two case study sites in the Kathmandu area were trained to deliver the BS intervention consisting of a flip book, leaflet and posters. All materials were developed in consultation with health workers and patients, and contained messages on TB and tobacco cessation based on behavior change techniques. Semi-structured qualitative interviews with 10 patients and 2 health workers were conducted by trained native speaker researchers, transcribed directly into English and analyzed using a combined deductive – inductive coding approach guided by the Consolidated Framework for Implementation Research (CFIR) and Theoretical Domains Framework (TDF). **Results:** All patients reported quit attempts after receiving TB diagnosis and counseling. Stigma of tobacco use was not perceived as a hindrance to admitting use, even among women and those accompanied by family. The TDF domains behavioral regulation, emotions, and beliefs in consequences were prominent among patients, with provided information on effects of tobacco on TB progression reported as important for quit attempts. Health workers integrated the BS materials into their routines. Most of the sessions were completed within the intended 15–20 minutes, however, a few sessions were up to an hour long. **Conclusions:** At case study sites, the intervention could be successfully implemented even with limited monitoring. Scale-up in the country could profit from additional technical support from TB control programs in light of the work load and additional time requirements of counseling.

FUNDING: Other

SYM20C

IMPROVING TB OUTCOMES BY MODIFYING LIFESTYLE BEHAVIORS THROUGH A BRIEF MOTIVATIONAL INTERVENTION FOLLOWED BY SHORT TEXT MESSAGES (PROLIFE): PILOTING STUDY

Goedele M. Louwagie, PhD¹, Kamran Siddiqi², Neo Morojele³, Mona Kanaan², Norreen D. Mdege², John Tumbo⁴, Max O. Bachmann⁵, Olalekan A. Ayo-Yusuf⁴. ¹University of Pretoria, ²University of York, ³Alcohol, Tobacco and Other Drug Research Unit, Medical Research Council SA, ⁴Sefako Makgatho Health Sciences University, ⁵University of East Anglia.

Background: South Africa has one of the highest burdens of tuberculosis (TB) globally. Harmful lifestyle behaviours can affect clinical outcomes, as can poor adherence to treatment. The ProLife study aims to determine the effectiveness and cost-effectiveness of Motivational Interviewing (MI) delivered by lay health workers, augmented with Short Messaging (SMS) on improving TB treatment outcomes, tobacco smoking and problem drinking. We report the piloting findings for this multi-centre, two-arm individual randomised controlled trial. The aim was to identify potential problems with data collection and SMS-delivery and to determine recruitment and MI uptake rates. **Methods:** We recruited adults with drug-sensitive pulmonary TB who were current smokers and/or reported harmful or hazardous alcohol use. Patients were consecutively enrolled at 30 clinics in three health districts in South Africa. Participants were randomised to receive either usual care or three MI counselling sessions one month apart. Each MI session was followed by twice-weekly SMS messages targeting treatment adherence, alcohol use and tobacco smoking. **Results:** Of 629 patients screened, 226 were eligible and 191 consented and completed the baseline questionnaire, of whom 93 were randomized to intervention and 98 to control. Of randomized participants, 22.0% (n=42) only smoked, 23.0% (n=44) were only problem drinkers and 55.0% (n=105) both drank hazardously and smoked. Most (82.2%) were male, mean age was 39.4 (SD 11.7). Smokers smoked on average 7.8 cigarettes daily and 45.6% had previously attempted to quit. One third of participants (34.6%) were depressed (CES-D10 score = 10). Of the intervention participants, only 57% received their first MI. Of the total of 1418 SMS-messages sent, 19.8% were not delivered due to technical errors. **Discussion:** Most trial participants smoked and concurrently engaged in problem drinking. There was a relatively low uptake of



the intervention. Piloting results helped to modify the trial to improve data quality and intervention uptake. Three clinics were excluded due to low enrolment rates and local safety concerns. Enrolment for the actual trial is ongoing.

FUNDING: Nonprofit grant funding entity

SYM20D

REFERRAL AND TREATMENT OF HOSPITALIZED SMOKERS LIVING WITH HIV IN AN ACADEMIC MEDICAL CENTER

Babalola Faseru, MD, MPH, Sharon A. Fitzgerald, Laura Mussulman, Kimber P. Richter. University of Kansas Medical Center.

Introduction: People living with HIV (PLWH) use tobacco more than the general population. The life expectancy of PLWH has increased within the last two decades due to medical advances in HIV care. However, PLWH who use tobacco continue to experience greater morbidity, mortality and decreased quality of life compared to PLWH who do not use tobacco. We will discuss two studies that examined 1) differences in referral and treatment of PLWH compared to the general population of hospitalized smokers for tobacco treatment and 2) differences in uptake of quitline services and cessation outcomes between PLWH randomized into warm handoff vs. fax referral in a clinical trial.

Methods: In the first study, we analyzed smoking cessation service data to determine factors associated with the referral and treatment of hospitalized PLWH who smoked compared to hospitalized smokers without HIV diagnosis. In the second study, we analyzed data of PLWH enrolled into a randomized clinical trial to test the efficacy of warm handoff vs. fax referral for post-discharge tobacco treatment.

Results: Over 50% of hospitalized PLWH smoked and were less likely to be referred for tobacco treatment compared to other hospitalized patients who smoked. Tobacco-related diagnosis and concurrent substance use were factors associated with referral to treatment. One in three of those treated were fax-referred to the quitline for post-discharge treatment but none reported using the quitline. In the second study, warm handoff to the quitline out-performed fax referral and cessation rate was higher among patients referred to the quitline through warm handoff compared to fax referral. Verified abstinence rate at 6 months was 45.5% in patients connected to the quitline via warm handoff compared to 14.3% in those connected through fax referral.

Conclusion: Hospitalization creates a great opportunity for tobacco cessation for PLWH who smoke. Concerted efforts geared towards improving referral of PLWH for tobacco cessation treatment is needed. Continuity of care through the quitline is important for successful tobacco cessation.

FUNDING: Federal

SYM20E

PATTERNS AND CORRELATES OF CIGARETTE SMOKING AMONG PATIENTS RECEIVING TREATMENT FOR HEPATITIS C

Irene Pericot-Valverde, Alain H. Litwin. Clemson University, Greenville, SC, USA.

Introduction Smoking and hepatitis C (HCV) are prevalent conditions that co-occur at high rates in the US. The prevalence of smoking among persons with HCV has been estimated to be as high as 67%, which represent three times the national average. Despite available antiviral treatments for HCV, many persons with HCV die from cardiovascular/respiratory diseases related to smoking. Thus, it is critical to identify correlates of smoking in this population in order to develop effective cessation treatments. This study aimed at evaluating rates of smoking and identifying factors associated with smoking in patients with HCV. Methods Participants were (N=150) HCV-infected individuals enrolled in a clinical trial aimed at testing three intensive models for HCV. Assessments included sociodemographics (e.g., gender, income), a structured diagnostic interview (MINI), a tobacco use questionnaire, a semi-structured interview for substance use assessment (ASI), questionnaires assessing quality of life (HCV QoL and EQ-5D-3L), and a medical record review. Results Of the 150 participants who initiated treatment, 128 (85.3%) were current cigarette smokers, 14 (9.3%) were former smokers, and 8 (5.4%) had never smoked. Cigarette smoking was associated with an increased self-perception of good health ($p=.02$), higher drinking intensity ($p<.000$), and higher levels of alcohol-related problems ($p<.001$). Follow-up assessments were conducted with 92% of the initial sample. All the drop-outs were cigarette smokers at initial assessment. With respect to those 138 who completed the follow-up, 7 quit smoking between assessments and 3 started cigarette smoking. Discussion Our results evidence that smoking appears to be associated with higher perceptions of health and problematic drinking. The co-occurrence of drinking and smoking among individuals with HCV is especially dangerous

as the combination dramatically increases the risk of liver-related diseases. To reduce the burden of smoking among individuals with HCV, interventions need to address the distinctive needs of this population.

FUNDING: Federal

SYM21

NEW PERSPECTIVES ON MULTIPLE TOBACCO PRODUCT USE AND IMPLICATIONS FOR TOBACCO REGULATION

Joe McClelland, PhD. Duke University Medical Center, Durham.

Twenty-three percent of the tobacco using population are dual users of combusted cigarettes (CC) and e-cigarettes making CC/EC use the most common form of multiple tobacco product (MTP) use. Despite the prevalence of dual CC/EC use, a disproportionately small amount of tobacco research has focused specifically on how person, product and situational factors influence the uptake, use, and discontinuation of dual CC/EC use. This lack of data on CC/EC use and on dual users has significant implications for designing next generation policy interventions. We lack, for instance, data on how a new product standard targeting EC might alter the initiation and use of CC; and vice versa. In this symposium, speakers will present new data and insights into dual CC/EC use across different populations and using a variety of research methods. Dr. Barrington-Trimis will present recent analyses examining longitudinal transitions between single and dual CC/EC use among youth and whether these transition patterns differ by ethnicity. Dr. Pacek will present data from surveys of dual CC/EC users regarding their anticipated responses to tobacco product standards that target the nicotine content and flavoring of CC and EC. Dr. Mermelstein will present recent data from an ecological momentary assessment study of dual CC/EC users examining the differential situations in which each product is used. Last, Dr. Hatsukami will present data from a pilot study of an experimental marketplace in which smokers can exchange vouchers for CC and non-combusted tobacco products. The marketplace will serve as a platform for investigating the effects of nicotine reduction in CC on the adoption and use of non-combusted tobacco products. Finally, our discussant, Dr. McClelland, will summarize findings from the four presentations and interpret them within the context of a recently published framework for understanding MTP use and implications for tobacco product regulation. The framework articulates factors (e.g. product, person, situation) that influence the degree of substitutability between products and how different regulatory actions (e.g. product standards) alter that substitution.

SYM21A

ETHNIC DIFFERENCES IN PATTERNS OF TRANSITION BETWEEN CIGARETTE AND E-CIGARETTE USE: RESULTS FROM A POOLED ANALYSIS OF DATA FROM THREE PROSPECTIVE COHORT STUDIES

Jessica L. Barrington-Trimis, Ph.D.¹, Mariel S. Bello², Fefei Liu¹, Adam Leventhal¹, Grace Kong³, Margaret Mayer⁴, Tess Boley Cruz¹, Suchitra Krishnan-Sarin³, Rob McConnell¹. ¹University of Southern CA, ²University of Southern California, ³Yale University School of Medicine, ⁴Yale School of Public Health.

Background: Little is known about whether adolescent patterns of transition between cigarette and e-cigarette use – and the role of dual product use – differ by ethnicity. This data is critically needed to inform targeted efforts to minimize the adverse public health impact of e-cigarettes among adolescents. **Methods:** Data were pooled from three prospective cohort studies of adolescents in California and Connecticut (baseline: 2013-2014; follow-up: 2014-2015; N=6258). Adjusted polytomous regression models were used to evaluate the association of baseline use (exclusive ever use e-cigarette, exclusive ever cigarette, dual ever use, or use of neither product) with past 30-day use at follow-up (exclusive e-cigarette, exclusive cigarette, dual, or use of neither product). Interaction analyses evaluated whether effect estimates for transition patterns differed by race/ethnicity (Hispanic White [HW], non-Hispanic White [NHW], Other). **Results:** Baseline ever use of any product was higher for HW than for NHW participants ($p<0.001$), while past 30-day use of any product at follow-up was higher for NHW than for HW participants ($p=0.001$). A significant interaction was observed by ethnicity ($p=0.009$); among NHW participants, those who had ever used e-cigarettes or cigarettes (exclusively or together) at baseline had significantly higher odds of using either product (or both) in the past 30-days at follow up, while HW exclusive e-cigarette users at baseline had no increased risk of exclusive cigarette use at follow-up, and HW exclusive cigarette users at baseline had no increased risk of exclusive e-cigarette use at follow-up. **Conclusions:** NHW participants exhibited increased odds of all patterns of tobacco use transition while HW participants showed greater odds of stabilizing tobacco use patterns (i.e., using the same product). These findings raise concern about differential



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impacts of e-cigarettes by ethnicity in increasing subsequent transition to or cessation from cigarette smoking. Culturally relevant education programs may be warranted to discourage non-smoking youth from initiating cigarette use, and to encourage youth smokers to quit smoking cigarettes.

FUNDING: Federal; Nonprofit grant funding entity

SYM21B

HYPOTHETICAL REGULATIONS REGARDING E-CIGARETTE FLAVOR AVAILABILITY AFFECTS ANTICIPATED E-CIGARETTE AND COMBUSTED CIGARETTE USE AMONG DUAL USERS

Lauren R. Pacek, Ph.D.¹, Jason Oliver¹, Joe McClernon². ¹Duke University School of Medicine, ²Duke University Medical Center.

Background: To date, most regulatory science research has investigated the impact of regulations targeted at a single tobacco product (i.e. nicotine reduction in cigarettes) on the use of that single product (i.e. cigarettes). In order to anticipate the potential impact of tobacco regulations, investigation regarding the effects of regulations on other tobacco products and the impact of simultaneous regulations on tobacco product use, are warranted. **Methods:** We conducted two surveys (June 2017/July 2018) among dual EC/CC users aged 18-29 (n=244) and ?18 (n=506) on Amazon Mechanical Turk. Participants reported whether they would quit, reduce, maintain, or increase their EC and CC use in response to hypothetical regulations regarding the availability of EC flavors alone and in combination with regulation that would ban menthol in CC. **Results:** Restrictions that limited e-liquid flavors to 'tobacco/menthol only', 'tobacco only', and 'unflavored' resulted in 15%, 17%, and 28% of dual users, respectively, indicating that they would increase CC use. These restrictions also resulted in anticipated reductions in EC use. Among menthol smokers, simultaneous bans on menthol CC and limiting EC flavors to 'tobacco/menthol only' led to significantly greater numbers of dual users anticipating that they would quit ($p<0.001$) or reduce ($p<0.001$) their CC use and increase ($p<0.001$) EC use. Among menthol smokers, a simultaneous menthol CC ban and restricting EC to unflavored e-liquid resulted in dual users anticipating quitting EC use ($p=0.005$) and maintaining ($p=0.047$) or increasing ($p=0.024$) CC use. **Discussion:** In the absence of a menthol CC ban, regulations that restrict EC flavors may have unintended consequences in the form of dual users intending to increase CC use. Hypothetically regulating EC flavor availability in combination with menthol CC may change patterns of anticipated use dependent upon the stringency with which EC flavors are regulated. Potential product standards aimed at one product need to be considered in light of the impact they may have on the use of other tobacco products as well as the impact that other tobacco regulations may have.

FUNDING: Federal

SYM21C

PREDICTORS OF "IN THE MOMENT" PRODUCT CHOICE IN ADULT DUAL CIGARETTE AND ENDS USERS

Robin Mermelstein, Ph.D., Donald Hedeker, Oksana Pugach. University of Illinois at Chicago.

Background: Electronic nicotine delivery systems (ENDS) may provide an opportunity for smokers to reduce their cigarette use. Yet little is known about smoker's transition to ENDS or whether dual use of both products is a potential pathway to reduce or to maintain use. This study examined factors that may influence dual users' "in the moment" use of either a cigarette or ENDS. **Method:** Adult smokers who also used ENDS were enrolled in a longitudinal observational study. Data come from the baseline assessment and included both questionnaire and 7-days of ecological momentary assessments (EMA). Participants provided both cigarette and ENDS use EMA data (N = 256; 39.1% female; 47.3% white; mean age of 35.2). We used conditional random forest analyses to identify the strongest predictors of product choice (cigarette or ENDS). We considered person level factors (demographics; nicotine dependence; smoking and ENDS use rate; reasons for ENDS use); EMA situational variables (smoking restrictions in the location; presence of other smokers; urge for a cigarette; mood effects); and product characteristics (flavor). **Results:** Participants provided 7268 cigarette and ENDS events over the 7 days (mean of 22.8 cigarette and 10.6 ENDS events). Compared to cigarettes, ENDS use times were associated with lower urges prior to use (means = 5.6 vs 7.1, 1-10 scale); being in places with restrictions on smoking (68.3% vs. 48.5%); others using cigarettes (26% vs 35%); flavor preference (preferring ENDS with sweet flavors more likely associated with ENDS use than preferring tobacco or menthol flavored ENDS); and lower nicotine dependence. Mood in the moment or subjective evaluation of the product did not predict

choice, and neither did motives or reason for using ENDS (e.g. substitute for cigarette, cutting down, etc). **Conclusion:** Situational factors were the strongest predictors of the moment choice of ENDS or cigarettes among adult dual users. Product characteristics (flavor) were also important, but may have been driven by linkages with dependence. Understanding the combined effects of individual, product, and situational factors is critical to interventions targeted to dual users.

FUNDING: Federal

SYM21D

AN EXPERIMENTAL TOBACCO AND NICOTINE PRODUCT MARKETPLACE: A PLATFORM FOR TESTING POLICIES AND REGULATIONS

Dana Mowls Carroll, Ph.D.¹, Lori Strayer¹, Warren Bickel², Dorothy Hatsukami³. ¹University of MN, ²VA Tech Carilion Research Institute, ³University of MN, Minneapolis, MN, USA.

The objective was to develop and test the feasibility of an experimental tobacco and nicotine product marketplace (EPM) which provides a platform for product preferences to be evaluated in a systematic way and with a high degree of generalizability. The EPM can be used to determine factors that influence tobacco product choice and subsequent patterns of product use. The EPM resembles an on-line store with cigarettes and alternative nicotine delivery systems (ANDS). Surveillance activities at retail locations at study sites were used to populate the marketplace with the most popular brands of four ANDS categories (i.e. e-cigarettes, smokeless tobacco, snus, and NRT) and determine their value. When applicable, flavor and nicotine strength options were made available. Standardized information and a video demonstrating how to use each ANDS were provided. To test the feasibility of the EPM, 30 adult daily cigarette smokers underwent two weeks monitoring of usual brand cigarette smoking and other tobacco product use followed by two weeks access to the EPM that included their usual brand cigarettes and ANDS. During the EPM phase, participants were provided points to exchange for products. Points were calculated to allow the participant to cover their baseline tobacco use behavior and to allow for experimentation with ANDS. Participants were advised to exchange points for enough products to last until their next visit and to refrain from using products outside of the EPM. Participants completed questionnaires on their product use and marketplace experience. All participants selected their usual brand cigarettes at each marketplace visit. E-cigarettes were the most popular ANDS selection followed by NRT; although NRT was associated with more frequent use. The majority of participants stated they were comfortable with navigating the marketplace (79.4%), it was easy to determine the characteristics and the points needed for each product (82.7%), and were satisfied with the products included in the marketplace (72.4%). The EPM can be readily adapted to test tobacco and nicotine policy and regulatory science research questions.

FUNDING: Federal

SYM22

EXPLORING COMBUSTIBLE CIGARETTE INNOVATIONS IN A SMOKEFREE WORLD

Janet Hoek, PhD. University of Otago.

Described as a highly engineered nicotine dosing system, combusted cigarettes have addicted billions of smokers and caused most to die prematurely. Analyses of industry documents demonstrate how tobacco companies created and aggressively marketed an exquisitely addictive product while simultaneously denying nicotine's effects. Yet recent years have seen an apparent transformation as tobacco companies declare their vision of a smokefree world, intention to resile from selling combustible tobacco, and commitment to 'reduced harm' alternatives. To assess these assurances, we need a deeper understanding of how tobacco companies' recent product innovations and overall product portfolios align with smokefree goals. In this symposium, we examine the extraordinary growth of flavour capsule variants (FCVs); FCVs contain flavour beads embedded in the filter that, when squeezed, break, release the flavour, and create a customised and potentially more palatable smoking experience. Specifically, we will discuss recent findings from the US, the UK, and New Zealand, and offer international perspectives on how this innovation may affect combusted tobacco use and its alignment with tobacco companies' newly articulated vision of a smokefree world. Dr Hoek will locate product innovations such as FCVs within a progressive policy context and explain how product development is replacing other elements of the marketing mix. She will also will outline findings from experimental studies estimating smokers' and susceptible non-smokers' responses to FCVs that suggest FCVs may function as a gateway product. Dr Thrasher



will discuss data from the first three waves of the PATH study and highlight differences in flavour capsule use across subgroups of adolescent and young adult smokers, as well as how FCV users perceptions of their brand differs from those who smoke other brand varieties. Dr Moodie will explain determinants of FCV use among UK smokers. Dr Dewhirst will summarise the presentations, discuss their implications for future research and smokefree policy, and consider how the emergence and growth of FCVs fit with tobacco companies' stated goal of supporting a smokefree world.

SYM22A

SMOKERS' AND SUSCEPTIBLE NON-SMOKERS' RESPONSES TO FLAVOUR CAPSULE VARIANT CIGARETTES: AN ONLINE SURVEY

Janet Hoek, PhD¹, Philip Gendall², Christine Eckert³, Jordan Louviere⁴, Mei-Ling Blank², James F. Thrasher⁵. ¹University of Otago, ²Department of Marketing, University of Otago, New Zealand, ³Department of Marketing, University of Technology Sydney, Australia, ⁴Department of Marketing, University of South Australia, ⁵Arnold School of Public Health, University of South Carolina.

SIGNIFICANCE: Flavour capsule cigarette variants (FCVs) position smoking as fun, pleasurable and creative, and have captured an increasing share of many markets. To examine how FCVs affect primary and secondary demand, we estimated smokers' and susceptible non-smokers' responses to this innovation. **METHODS:** Using an online panel from New Zealand, we surveyed 425 smokers, 224 susceptible non-smokers, and 166 smokers aged between 18-25 during November and December 2017. The survey included a choice experiment comparing FCV options to an unflavoured option, a behavioural probability measure estimating the likelihood respondents would smoke FCVs and regular cigarettes if offered to them, and a perception task where respondents evaluated FCV attributes. **RESULTS:** Non-smokers were significantly more likely to select all the FCV flavours tested (ORs ranged from 1.49 to 3.44, $p<.001$), particularly fruit flavours, to the unflavoured option. By contrast, smokers were significantly more likely to select the unflavoured cigarette option for all flavours except fruit burst (ORs for flavoured options ranged from 0.79 to 0.99, $p<.001$ for all but one flavour). Susceptible non-smokers and former smokers were more likely to smoke a fruit flavoured FCV offered to them relative to an unflavoured stick while daily smokers were more likely to smoke an unflavoured than a flavoured cigarette. Compared to daily smokers, susceptible non-smokers perceived FCVs more positively relative to unflavoured sticks on several dimensions. **CONCLUSIONS:** FCVs appeal more to non-smokers than to smokers, and more to non-daily smokers than to daily smokers. These response patterns suggest FCVs are likely to recruit non-smokers, thus potentially increasing overall smoking prevalence. Regulators could consider banning FCVs in standardised packaging legislation, or introducing bespoke regulation that regulates the appearance and design of tobacco products, thus precluding the sale of FCVs.

FUNDING: Academic Institution

SYM22B

PREVALENCE AND CORRELATES OF FLAVOR CAPSULE USE IN THE UNITED STATES: RESULTS FROM NATIONAL SURVEYS OF ADOLESCENTS AND YOUNG ADULTS, 2013-2016

James F. Thrasher, PhD¹, Paula Lozano², Huizhong Yang³, Yoojin Cho², Crawford Moodie⁴. ¹University of South Carolina, ²Arnold School of Public Health, University of South Carolina, ³Department of Tobacco Research, National Institute of Public Health, Mexico, ⁴University of Stirling.

SIGNIFICANCE: The popularity of flavor capsule cigarette varieties (FCVs), which allow smokers to crush a capsule in the filter thus flavoring the smoke, has grown rapidly. Few studies have explored this product innovation, however. We describe the prevalence and correlates of FCV use in the US. **METHODS:** We analyzed data from current smokers in nationally-representative surveys of adolescents (12 – 17; n=634) and young adults (18 – 34, n=4994) from the first three waves (2013-2016) of the Population Assessment of Tobacco and Health. Brand preferences were classified as regular, menthol, or FCV. The prevalence of preference for capsules was assessed by race/ethnicity, age, and survey wave. Adjusted Generalized Estimating Equation (GEE) models regressed brand preference on sociodemographic variables, smoking intensity (daily vs. nondaily), and survey wave. GEE models also regressed reasons for selecting one's brand (i.e., pack design, taste, price) on brand variety (regular, menthol, FCV), adjusting for the same covariates. **RESULTS:** Among young adults, preference for flavor capsules was highest amongst Mexican Americans (14%), followed by other Latinos (7%), Whites (6%) and Blacks (2%), with significantly higher prevalence among Mexican Americans than other groups in adjusted models. A similar but weaker trend was found among

adolescents (all Latinos=6%, Whites=4%, Blacks=5%), but no difference between groups was statistically significant. Preference for FCVs did not change over time for either age group. In models of reasons for brand selection among young adults, FCV users were more likely than regular cigarette users to smoke their brand because of pack design (AOR=1.78, 95%CI=1.17-2.71), taste (AOR=3.30, 95%CI=2.02-5.38), and price (AOR=1.33, 95%CI=1.00-1.76). Results from adolescent smoker models were similar, but contrasts between preference groups were not statistically significant. **CONCLUSIONS:** A significant percentage of adolescent and young adult smokers, particularly Mexican Americans, prefer FCVs. To reduce the appeal of cigarettes for youth, regulators should consider banning this product innovation, as other countries have begun to do.

FUNDING: Federal

SYM22C

USE OF CIGARETTES WITH FLAVOUR-CHANGING CAPSULES AMONG SMOKERS IN THE UNITED KINGDOM: AN ONLINE SURVEY

Crawford Moodie, PhD¹, Anne Marie MacKintosh¹, James F. Thrasher², Ann McNeill³, Sara Hitchman³. ¹University of Stirling, Scotland, ²Arnold School of Public Health, University of South Carolina, ³Kings College London, United Kingdom.

SIGNIFICANCE: Cigarettes with flavour-changing capsules in the filter have experienced phenomenal global growth in the last decade. We explore socio-demographic and smoking-related factors associated with using capsule cigarettes, how frequently users burst the capsule, and reasons for using them. **METHODS:** An online survey was conducted in the United Kingdom between April-May 2016 with 6234 factory-made and/or hand-rolled cigarette smokers. This analysis focuses on 3620 factory-made cigarette smokers, aged 18 years and over, who had smoked in the past month. **RESULTS:** Thirteen percent smoked capsule cigarettes, with younger smokers more likely than older smokers to do so. Capsule use was significantly more common among white non-British than white British, and among those planning to quit in the next six months than those not planning to quit. Most capsule users who crushed the capsule did so always (51%) or most of the time (18%), with more frequent crushing of capsules more common among females, younger and middle-aged participants, white-British and those with a lower score on the Heaviness of Smoking Index. The most common reasons for using capsule cigarettes were that they taste better (52%), are smoother (41%), provide a choice of flavours (32%) and the enjoyment of clicking the capsule (25%). Capsule and non-capsule smokers did not differ significantly in their perceptions of the harmfulness of their brand relative to other brands. **CONCLUSIONS:** Our study provides an insight into how and why smokers of capsule cigarettes use these products, with the key drivers of use being taste, flavour choice and interactivity.

FUNDING: Nonprofit grant funding entity

SYM22D

DISCUSSANT

Timothy Dewhirst, PhD. University of Guelph.

Dr Dewhirst will summarise the presentations, discuss their implications for future research and smokefree policy, and consider how the emergence and growth of FCVs fit with tobacco companies' stated goal of supporting a smokefree world.

FUNDING: Unfunded

SYM23

NEW STRATEGIES TO INCREASE THE DELIVERY OF EFFECTIVE TOBACCO CESSATION TREATMENT IN PRIMARY CARE

Melanie Boeckmann, Dr. PH, MA. Heinrich-Heine-University Duesseldorf.

Healthcare systems do not yet consistently deliver highly effective smoking cessation treatment. The 2017 Cochrane Review of System Change Interventions for Smoking Cessation identified a need for research to explore the impact of system change interventions on cessation and system-level outcomes. This symposium will describe outcomes of novel interventions to systematically engage each smoking patient in a primary health care system in smoking treatment. The first presentation will focus on proactive outreach to offer tobacco treatment to primary care patients independent of



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office visits (a population health strategy), while the other five presentations will focus on clinical encounter-based strategies (capitalizing on the health care visit as an opportunity to intervene). Dr. Rigotti will present a population-based strategy using the EHR to proactively offer tobacco treatment to primary care patients and compare alternate strategies to engage smokers who respond into effective treatment. Dr. Carpenter will report effects of providing NRT starter kits to smokers in primary care regardless of motivation to quit. Dr. Flocke will detail improvements after implementing an EHR supported staff role change that increased cessation care in safety-net clinics. Ms. Oguss will examine the impact of modifying the EHR in primary care clinics to facilitate clinic staff referring patients to smoking treatment via a 1-click referral system. She will also examine how clinic staffs' attitudes influence implementation of the referral system. Dr. Schlam will present data from a large RCT evaluating whether primary care patients who smoke will continue in chronic care smoking treatment once they relapse following an initial quit attempt. She will report the percent of patients who relapse who are willing to engage in a relapse recovery chronic care treatment and predictors of engagement. Dr. Kastaun will describe efforts to recruit and train general practitioners (GPs) to deliver brief stop-smoking advice in Germany, outlining the training development and piloting, and present qualitative data from the process evaluation of the pilot. Dr. Anne Joseph will lead the discussion.

SYM23A

OFFERING TOBACCO TREATMENT OUTSIDE OF OFFICE VISITS TO A POPULATION OF SMOKERS IN A PRIMARY CARE NETWORK

Nancy Rigotti, MD, Sara Kalkhoran. Harvard Medical School, Boston, MA.

SIGNIFICANCE: Offering tobacco cessation treatment proactively outside of clinical encounters is a population-based strategy that could increase the delivery of treatment to smokers in primary care practices. The most effective way to engage smokers in treatment is uncertain. **METHODS:** A 3-arm pragmatic RCT compared the effectiveness of 2 strategies to provide tobacco treatment outside of clinical encounters vs. usual care. Current smokers >18 yo with a primary care provider (PCP) at 5 community health centers were identified via the electronic health record (n=5225), recruited using automated phone calls and randomly assigned to: (1) Internal Care Coordination (health system based coach offers brief advice, facilitates medication prescriptions, connects to counseling support); (2) External Community Referral (warm transfer to Quitline); (3) Usual care (advice to visit PCP). Primary outcome was the proportion of smokers with documentation of cessation treatment 6 months post-enrollment. **RESULTS:** Of 640 patients (12%) who responded to the outreach, 234 (4.5%) consented and were randomized. At 6-mo follow-up, the pooled intervention group, vs. usual care, had more documented cessation treatment (63% vs. 34%, $p<0.001$), medication prescription (53% vs. 30%, $p=0.001$), and counseling (47% vs. 9%, $p<0.001$). Internal Care Coordination was more effective than External Community Referral at connecting smokers to any cessation treatment (76% vs 51%, $p=0.001$) and providing medication (66% vs 39%, $p<0.001$) but comparable at linking smokers to counseling resources. Self-reported cessation at 6 months occurred in 7.6% of each intervention group vs. 5.1% in controls ($p=NS$). **CONCLUSIONS:** Smokers responding to a population-based, proactive outreach strategy had better provision of tobacco cessation treatment when referred to either a health system-based or community-based program compared to usual care. The health system-based strategy outperformed the quitline-based one in several measures. Future work should aim to improve population reach and test the effect on smoking cessation rates.

FUNDING: Pharmaceutical Industry

SYM23C

MEDICATION SAMPLING FOR SMOKERS INITIAL RESULTS FROM A CLUSTER RANDOMIZED CLINICAL TRIAL IN PRIMARY CARE

Matthew Carpenter, PhD¹, Amy Wahlquist¹, Robert Davis², Jennifer Dahne¹, Michael Cummings¹, Kevin M. GrayMD³, Brent Egan². ¹Medical University of SC, Charleston, SC, USA, ²Care Coordination Institute, Greenville, SC, USA, ³Medical University of South Carolina, Charleston, SC, USA.

Prior evidence suggests that treatment engagement and quitting behavior can be induced through medication sampling, i.e., provision of starter kits to smokers regardless of motivation to quit. The effectiveness of nicotine replacement therapy (NRT) sampling was tested within a cluster randomized trial of 22 primary care practice sites in South Carolina. Sites were randomized to one of two conditions: 1) NRT sampling, in which smokers were offered a one time, two-week supply of both nicotine patch and lozenge; or 2) a no sampling control condition. A total of 1245 smokers were recruited

and followed over six months. Screening, consenting, baseline assessment and delivery of intervention were managed entirely by clinic staff during a routine clinic visit, while follow-up assessment was managed centrally by study staff. At study entry, participants averaged 50.7 yrs of age, smoked 15.2 cigarettes per day, and were 61% female and 38% non-white. Within one month following the clinic visits, marginally more smokers in the sampling condition made a quit attempt (24% vs. 18%; OR=1.5; 95% CI: 0.95 - 2.3), though over the entire six months, there were no differences in the incidence of quit attempts (48% vs. 45%). Use of any cessation medication (NRT or other) was higher in the sampling group in the 30 days following intervention (55% vs. 10%; OR=11.9; 95% CI: 8.2 - 17.3), and remained so at 6-month follow-up (25% vs. 14%; OR=2.0; 95% CI: 1.5 - 2.7). Adjusting for practice site, self-reported abstinence (7-day point prevalence) was higher among participants in the sampling condition, at 1-month (5% vs. 2%; OR=3.6; 95% CI: 1.4 - 8.7), 3-month (10% vs. 5%; OR=2.2; 95% CI: 1.4 - 3.5), and 6-month follow-up (12% vs. 8%; OR=1.5; 95% CI: 1.0 - 2.4). Sensitivity analyses, split among smokers who are and are not motivated to quit, will be presented during conference presentation. Medication sampling, pragmatically delivered in a real-world context, offers a brief, easily implemented strategy for providers in a busy clinical practice. Though abstinence rates are low, sampling represents a low-cost and immediately actionable method to engage large numbers of smokers in quitting.

FUNDING: Federal

SYM23E

12 MONTH EVALUATION OF AN EMR SUPPORTED STAFF ROLE CHANGE FOR PROVISION OF TOBACCO CESSATION CARE IN 8 PRIMARY CARE SAFETY-NET CLINICS

Susan Flocke, PhD¹, Eileen Seeholzer, MD, MS², Steven Lewis, MS, MPH², Elizabeth Antognoli³, India Gill, MPH³, Jeanmarie Rose, MPA³, Elvira Ordillas, RN². ¹Oregon Health & Science University, Portland, OR, USA, ²MetroHealth Health System, Cleveland, OH, USA, ³Case Western Reserve University, Cleveland, OH, USA.

Significance: Rates of tobacco use among economically disadvantaged populations are substantially higher than other groups. Guidelines urge primary care practices to routinely provide tobacco cessation care (i.e. assess tobacco use, provide brief cessation advice and refer to cessation support). This study evaluates an approach to design and implement a systems-based strategy to provide tobacco cessation care in primary care clinics serving low income patients. **Methods:** A stepped wedge study design was used to implement the intervention with eight community primary care clinics. The intervention consisted of changes to the EMR referral functionality and an expansion of staff roles to document tobacco use, provide brief advice to quit, offer connection to a quitline (QL) counselor and sign the QL referral. The intervention approach involved training nurses and medical assistants on new EMR tobacco assistance sections, providing technical support, and providing informal and formal feedback to clinics. Documentation of assessing tobacco status, providing advice, assessing readiness to quit, and offering and accepting referrals was assessed from the EMR. Graphic representations of performance over time for each site are generated and odds ratios comparing pre-implementation vs. post-implementation for each indicator for 6 and 12 months of follow-up test intervention effect. **Results:** Of the 200,000 visits, 25,935 were by identified smokers. All indicators increased post implementation. In comparison to the pre-intervention period, assessing smoking status (OR=2.9; OR=3.6), providing advice (OR=4.3; OR=5.9), assessing readiness to quit (OR=11.2; OR=7.2) and offering a referral to the QL (OR=50.9; OR=32.6) all $p<.001$ at 6 and 12 months post intervention respectively. There were 1,844 referrals to the QL. **Conclusions:** This system change intervention that includes an EMR supported role expansion substantially increased the provision of tobacco cessation care and improvements were sustained beyond 1 year. This intervention and implementation strategy has the potential to greatly increase the number of individuals that receive tobacco cessation care.

FUNDING: Federal

SYM23F

ELECTRONIC HEALTH RECORD BASED SMOKING TREATMENT REFERRAL: CLINIC STAFF ATTITUDES AND REFERRAL SUCCESS

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SIGNIFICANCE: EHR-based referral of primary care clinic patients who smoke has been identified as a powerful means of connecting many patients to evidence-based smoking treatment. The reach and impact of EHR-based referral depend on implementation success. Qualitative research on user workflow, perceptions and attitudes may enhance implementation success. **METHODS:** Clinics in 2 Wisconsin healthcare systems were randomized to 1 of 2 methods of inviting and referring patients to smoking treatment: 1) an EHR-enabled system prompting staff to invite patients to learn about treatment studies and click a button to refer, or 2) a paper-fax quitline referral system (Fax to Quit; FTQ). We examined referral rates for both systems. We also conducted focus groups 8 months post-implementation with EHR-enabled clinics' rooming staff (MAs, LPNs, RNs). The focus groups assessed constructs potentially related to the EHR-referral implementation success: smoking treatment importance, work and time burden, training, staff experience with patient resistance to or acceptance of the invitation, and the efficiency of EHR-guided technology. Key themes were identified via qualitative analysis. **RESULTS:** Analyses compared referral rates in 16 EHR-enabled clinics (N=21,798 smokers) with 8 FTQ clinics (N=4,893 smokers). Referral rates were much higher in EHR clinics (31.7%) than in FTQ clinics (2.1%; Chi-square=1218.3, p<0.0001). We conducted 16 focus groups (N=95, 63.8% of those invited) across 15 clinics (1 clinic declined). Focus group participants indicated that the EHR processes of invitation and referral were easy and efficient. They also reported that positive feedback on referral outcomes motivated referrals, they took pride in connecting their patients to smoking treatment, and they welcomed a central role in smoking treatment. **CONCLUSIONS:** Staff in EHR-enabled clinics referred a much higher proportion of smokers to smoking treatment resources than did FTQ clinic staff. Qualitative data suggest that EHR referral systems can be implemented effectively with little disruption to workflow, with good buy-in by clinic staff, and that feedback on referral outcomes can motivate clinic staff.

FUNDING: Federal

SYM23G

WILL SMOKERS CONTINUE IN CHRONIC CARE ONCE THEY RELAPSE?

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SIGNIFICANCE: Tobacco dependence is a chronic, relapsing condition, but no validated treatments exist for recently relapsed smokers, and it is unclear if smokers will transition to relapse recovery (RR) chronic care treatment after they relapse. **METHODS:** Participants (N=1154; 54% female; 83% White) were patients from primary care clinics in two Wisconsin health systems who expressed interest in quitting smoking at a regular office visit. In their initial cessation treatment, participants received 8 weeks of nicotine patch, 3 brief counseling contacts, and encouragement to engage in RR treatment should they relapse. At every contact through 6 month follow-up, staff asked if participants had relapsed (smoked for the last 7 days). Unless participants opted out, those reporting a relapse were randomized to one of three types of RR treatment: recycling (quitting again as soon as they felt ready), smoking reduction, or quitline referral. **RESULTS:** Of 1154 participants in initial cessation treatment, 63% reported a relapse by 6 months, and 80% of these known relapsers agreed to shift to RR treatment. Of those who agreed, 72% agreed to shift to RR treatment as soon as it was offered while 28% agreed after multiple offers. The 20% of relapsers who refused to shift offered reasons which included: stress, not wanting to give up on this quit attempt, feeling pleased with how the quit attempt was going, and feeling happy they had cut down so much. 73% of known relapsers attended at least one session of RR treatment or immediately started a new aided quit attempt. Among relapsers, engaging in this new phase of treatment was positively related to being older, feeling overwhelmed by their problems, and reporting greater baseline dependence on the Brief Wisconsin Inventory of Smoking Dependence Motives (WISDM; p's<.05). **CONCLUSIONS:** The majority of smokers who relapsed engaged in relapse recovery treatment, thereby staying engaged in chronic care treatment. Moreover, almost one-quarter of relapsers initially refused an offer of on-going treatment but agreed to a later offer. Refusal to re-engage was often related to participants viewing their failed quit attempt as successful.

FUNDING: Federal

SYM23H

TRAINING GENERAL PRACTITIONERS IN GERMANY TO PROVIDE BRIEF STOP-SMOKING ADVICE: PROCESS EVALUATION OF A PILOT STUDY

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SIGNIFICANCE: Strategies are needed to overcome barriers preventing GPs in Germany from routinely providing brief stop-smoking advice that follows the German clinical guideline on treating tobacco. We developed two 3-hour-trainings for GPs in delivering such advice: one based on the 5As and one based on the ABC approach. Trainings included peer coaching and role plays with professional standardized patients (SPs). We conducted a pilot study with process evaluation to optimize the trainings according to the needs of GPs. **METHODS:** In 2017, 14 GPs from the province North Rhine-Westphalia received training in either the 5A or ABC approach. Six of the GPs (4 women and 2 men, age range 41 to 61) participated in problem-centered interviews about their experiences with the training and barriers/facilitators to implementing the training content in their clinical practice. Interviews were transcribed verbatim and analyzed using content analysis. Core themes were identified by a multi-professional team. **RESULTS:** GPs reported that the balance of theoretical, reflective and practice elements, standardization of role plays, peer coaching, and formal aspects of the training met their needs for medical education. Motivation to assist patients with quitting was high following the training, but effects on the rate of successful quitters were expected to be small, reflecting the GPs' uncertainty about their role in smoking cessation. Peer feedback during role plays was highly appreciated, but SPs' feedback was perceived as not reflecting real patient-doctor-relationships. GPs reported a need for informational material to pass on to patients. **CONCLUSIONS:** Based on these results, the materials and content of both trainings were finalized: e.g., educational objectives were adopted to strengthen GPs' self-perception as supporter and trigger of quit attempts rather than being responsible for the quit attempt's success, and duration was extended to 3.5 hours to enable more intensive role-plays with peer-feedback. Trainings will be evaluated regarding their effectiveness in increasing the rates of brief stop-smoking advice delivered by GPs in the context of a large cluster-RCT.

FUNDING: Federal

SYM24

THE GROWING PUBLIC HEALTH RISKS FROM ASPIRING TRANSNATIONAL TOBACCO COMPANIES

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Global efforts to prevent 1 billion deaths from tobacco use this century are giving important attention to the tobacco industry. As WHO reports, "All epidemics have a means of contagion, a vector that spreads disease and death. For the tobacco epidemic, the vector is not a virus, bacterium or other microorganism – it is an industry and its business strategy." Public health research on the tobacco industry to date has focused on leading transnational tobacco companies (TTCs), six of whom control 80% of the world cigarette market outside China (2016). However, the industry has undergone rapid change since the mid-2000s with the growth of non-TTCs, restructuring of production, and growth of new nicotine products. The papers in this symposium present new research about the changing global tobacco industry by focusing on non-TTCs. Some of these companies can be described as "aspiring TTCs" because their products, restructured operations and expanding markets move them, from domestically-focused, to competitors with leading TTCs. The extent they are successful will have direct impacts on tobacco control. Smith and Fang will present new findings from East Africa where Chinese business interests are expanding leaf production. This is coinciding with growing contract farming by the China National Tobacco Corporation (CNTC) in such countries as Brazil, Zimbabwe and USA ahead of cigarette export plans. Bianco will present new evidence of Asian cigarette manufacturing in Latin America to supply the illicit market. His findings complement new analysis by Lee et al. of the growth of Tabesa, Paraguay's leading cigarette manufacturer. The final paper on the growth of Grand River Enterprises (GRE), presented by Cunningham, adds a further layer of economic and political complexity. GRE is now the fourth largest cigarette producer in Canada spurred by exports. It also faces legal action in the US for illicit sales. The 3 papers point to the need to understand leading and aspiring TTCs when implementing the FCTC Illicit Trade Protocol. Overall, the symposium will present new evidence on aspiring TTCs changing the global tobacco industry, and the implications for public health.



SRNT 2019 SYMPOSIA

SYM24A

CHINESE TOBACCO INTERESTS IN EAST AFRICA: IMPLICATIONS FOR TOBACCO CONTROL REGIONALLY AND GLOBALLY

Julia Smith, MA, PhD, Jennifer Fang. Simon Fraser University.

Significance: Tobacco leaf exports from East Africa to China are rapidly growing. China provides loans, inputs and training to farmers, purchases farmland, and invests in manufacturing facilities. In 2008, China and Malawi signed a Memorandum of Understanding which includes partnership agreements on tobacco. China's share of Malawi's leaf exports rose from 1% in 2005 to 9.5% in 2013. Investments by the Chinese National Tobacco Corporation (CNTC) in East Africa are substantial, yet remain little understood.

Methods: To map and document trends in CNTC activity in the region, financial and investment data were gathered from primary (e.g. company reports, trade data) and secondary (e.g. industry publications, business and financial reports) sources. Media analysis, with articles gathered through systematic searches of AllAfrica.com and Factivia, was conducted to document CNTC engagement in policy and development processes. Malawi was selected as a case study (most tobacco dependent country in the world) to further explore and triangulate findings from document analysis. 12 key informant interviews were conducted with tobacco industry actors and analyzed thematically. Research results were analyzed using global value chain analysis to situate CNTC engagement in East Africa within the broader context of global tobacco control.

Results: CNTC is expanding its leaf buying, tobacco land ownership and manufacturing capabilities in East Africa. It engages with policy-makers through corporate social responsibility initiatives and development projects. It is also contributing to the shift to contract farming.

Implications: The shift to contract farming, promoted by CNTC, increases the livelihood risks faced by farmers and increases the dependence of exporting states on externally-based companies. This inhibits the adoption of tobacco control policies and crop diversification efforts at the national level, weakening efforts to implement the Framework Convention for Tobacco Control in the region. Globally, this has direct public health implications associated with CNTC's access to new markets and growing ability to influence policy-making processes.

FUNDING: Federal

SYM24B

GOING GLOBAL: THE ILLICIT TOBACCO TRADE FROM ASIA TO LATIN AMERICA AND THE CARIBBEAN

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Significance: The illicit tobacco trade is evolving worldwide into new, and increasingly complex global, patterns of actors, activities and consequent public health outcomes. Previous analysis has found evidence of widespread complicity by leading transnational tobacco companies (TTCs) in the illicit tobacco trade within specific countries and regions. There is limited analysis to date of the role of non-TTCs, and their use of the illicit trade to access new markets and grow market share worldwide. This paper analyses the growing presence of Asian tobacco companies in the illicit trade in Latin America and the Caribbean region.

Methods: We begin by compiling data from the United Nations Commodity Trade Statistics Database (UN Comtrade) and International Trade Centre (ITC) on reported trade value of "Cigarettes containing tobacco" between 12 East and Southeast Asian countries and 22 Latin American and Caribbean countries between 2010-2017. We compare reported exports and imports to identify any major discrepancies which suggest potential illicit trade. We then collect additional data from 1990-2010 on countries accounting for the bulk of interregional cigarette trade (e.g. China and Panama), and countries with the most significant discrepancies between reported exports and imports.

Findings: There is new evidence of a growing market for illicit tobacco products from Asian tobacco manufacturers to the LAC region. Geographical patterns of trade suggest that special economic zones in both regions play an important role in this trade.

Implications: We conclude that there is a need to better understand the target markets for this substantial inflow of illicit tobacco products, both within the region and beyond. The findings have important implications for public health and law enforcement including implementation of the FCTC Protocol beginning in 2018.

FUNDING: Federal

SYM24C

"WE THINK GLOBALLY": THE RISE OF PARAGUAY'S TABACALERA DEL ESTE AS A THREAT TO GLOBAL TOBACCO CONTROL

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Significance: We previously documented how Paraguay was used as a key transit route for illicit cigarettes produced by BAT and PMI, into Brazil and Argentina. TTCs thus seeded the conditions for Paraguayan manufacturers to enter the illicit market. Today, Tabacalera del Este (known as Tabesa) is Paraguay's largest tobacco company and part of the country's largest conglomerates, owned by the family of former President Horatio Cartes. Beyond media reports, there has been no scholarly analysis of the rapid growth of Tabesa from the late 1990s and its future business strategies.

Methods: We begin by searching Truth Tobacco Industry Documents (TTID), and company websites, to understand the business strategies of leading TTCs in Paraguay and the region. We then compile data from the United Nations Commodity Trade Statistics Database (UN Comtrade) on reported trade value of "Cigarettes containing tobacco" between Paraguay and countries identified by Tabesa executives in media interviews as export markets. We contextualize and triangulate our findings with 42 key informant interviews (mainly off the record).

Results: Tabesa became one of Paraguay's largest companies largely by supplying the illicit market. This strategy was enabled by market conditions created by BAT and PMI and a permissive domestic regulatory environment. By the late 2000s, Tabesa had grown to be a major supplier of illicit tobacco products in Latin America and increasingly beyond. Although Brazil continues to account for the bulk of Tabesa's revenues, findings suggest the company aspires to become a TTC through both legal and illegal markets.

Implications: We conclude that the rise of Tabesa is part of the changing nature of the illicit trade in tobacco products which must be taken into account in implementing the FCTC Protocol to Eliminate Illicit Trade in Tobacco Products. The ownership of Tabesa also illustrates the importance of FCTC Article 5.3 on industry interference.

FUNDING: Federal

SYM24D

GRAND RIVER ENTERPRISES: THE RISE OF INDIGENOUS COMMERCIAL TOBACCO ECONOMIES

Rob Cunningham, LLB. Canadian Cancer Society.

Significance: During the 1990s an Indigenous reserve straddling the Canada-USA border was used by leading TTCs to transit their brands without paying taxes. Today, Indigenous reserves in Ontario and Quebec have licensed and unlicensed manufacturers. The largest is Grand River Enterprises (GRE), incorporated in 1996, located on the Six Nations of the Grand River reserve in Ontario. GRE is licensed by the Canadian and Ontario governments. Today, GRE exports to many countries and has had a long-term private contract with the German Army. GRE cigarettes have been found in illicit markets. Several US states have brought legal proceedings against GRE for illegal sales. In 2013, NY State initiated legal action against GRE for selling untaxed cigarettes to retailers. To date there has been limited analysis of the GRE and the implications for public health in Canada, USA, and globally.

Methods: We review scholarly and grey literature, and internal industry documents, to understand the development of the tobacco industry on Indigenous reserves since the 1990s. We explain the growth of manufacturers on Indigenous territories, and GRE specifically, since the mid-2000s. We review the alleged involvement of GRE in the illicit trade based on government, industry and media policies and reports, and US court cases.

Findings: GRE is now the 4th largest cigarette manufacturer in Canada and competes with TTCs using advantages gained from illicit trade. GRE states it is not required to comply with Ontario tobacco tax legislation despite court decisions confirming government authority to enforce legislation. Due to political sensitivities, Ontario and Quebec governments have been unwilling to do so. This context can create challenges for federal and provincial/state governments to act to protect public health.

Implications: The growth of GRE within the global tobacco industry must be better understood. Any effort to reduce tobacco use, within Indigenous and non-Indigenous populations, as well as control illicit sales in Canada, the USA and further afield must take account of the political and economic context within which GRE operates.

FUNDING: Unfunded



SYM25

INNOVATIVE METHODS FOR RESEARCH ON E-CIGARETTES

Jessica L. Braymiller, MS. Penn State University.

Rates of experimentation with and current use of electronic nicotine delivery systems (ENDS) are on the rise, yet, the impact of ENDS use on nicotine dependence (ND), the uptake of cigarette smoking, and overall population health remains unclear. The emerging popularity of ENDS has radically impacted tobacco research and innovative methods are needed to shed light on this rapidly changing landscape. This symposium will illustrate five empirical studies on ENDS use and attitudes using innovative methods. Psychometric techniques are used to evaluate and compare measures of ND and ENDS expectancies, propensity score methods draw causal inferences about ENDS use, and time-varying effect models (TVEM) explore age-varying differences in the associations between ENDS and other substance use behaviors. First, Ms. Rest will present a measurement model that explores the product-specific and common factors underlying ND among dual users of cigarettes and ENDS. Dr. Piper will then discuss the reliability and validity of three ENDS-specific ND measures and their associations with self-reported smoking and vaping, as well as biomarkers of exposure. Next, Dr. Harrell will discuss the unique measurement of ENDS expectancies among young adults using factor analysis and item response theory. Dr. Selya will further explore risk factors for ENDS use, building on the connection between ENDS use and conventional cigarette smoking using propensity score methods to estimate the causal effect of e-cigarette use on cigarette smoking. Finally, Ms. Braymiller will discuss the age-varying prevalence of current ENDS, hookah, and marijuana use and associations between these behaviors using TVEM. Findings demonstrate how TVEM provides added insight into nuanced age-trends in ENDS and other substance use behaviors that may be masked using traditional analytic techniques. The symposium will conclude with a discussion on the promise of applying innovative methods to examine ENDS use and dependence.

SYM25A

ASSESSMENTS OF E-CIGARETTE DEPENDENCE IN ADULT DUAL USERS: PSYCHOMETRICS AND VALIDITY OF THREE MEASURES

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Background: Electronic cigarettes (ECs) have drastically changed the nicotine and tobacco product landscape. However, their potential public health impact is still unclear. A reliable and valid measure of EC dependence would likely advance assessment and prognostication of the public health impact of ECs. The aim of this research is to examine the internal consistency, concurrent validity, construct validity, and predictive validity of 3 EC dependence scales. **Methods:** Adult dual users (smokers who also vape) were enrolled in two observational cohorts (University of Wisconsin [UW], N=256, 45.1% women, mean cigs per day=12.5; University of Illinois, Chicago [UIC], N=382, 39.3% women, mean cigs per day=8.2). At baseline, all participants completed the EC Fagerstrom Test of Nicotine Dependence (e-FTND) and the EC Wisconsin Inventory of Smoking Dependence Motives (e-WISDM); the UIC sample completed a short form with 2 questions per subscale), adapted from the respective combustible cigarette versions. The UW cohort also completed the Penn State Electronic Cigarette Dependence Index (PS-ECDI), provided a urine sample for cotinine analysis, and reported EC use at 1 year. **Results:** In the UW cohort, the e-WISDM subscales had the highest internal consistency ($\alpha=.89-.96$), then the PS-ECDI ($\alpha=.77$) and e-FTND ($\alpha=.51$). Internal consistency for the e-FTND was higher in the UIC cohort ($\alpha=.66$), but lower for the e-WISDM ($\alpha=.70-.85$), possibly due to the short form. The EC dependence scales demonstrated strong convergent validity and, in the UW cohort, were highly correlated with self-reported addiction and time to first vape, but not with e-liquid nicotine concentration or cotinine. In the UW cohort, various e-WISDM subscales, the total e-WISDM, e-FTND, and the PS-ECDI predicted EC use at 1 year. **Conclusions:** The e-WISDM and PS-ECDI had stronger internal consistency than did the e-FTND but all 3 measures had strong concurrent, construct, and predictive validity. The EC dependence measures were related to biochemical measures of smoke, but not nicotine exposure. Thus, dual users who are more dependent on ECs may smoke fewer cigarettes but compensate with nicotine from ECs.

FUNDING: Federal

SYM25B

ESTIMATING THE CAUSAL EFFECT OF ELECTRONIC CIGARETTE USE ON CONVENTIONAL CIGARETTE SMOKING: ACCOUNTING FOR SHARED RISK USING PROPENSITY SCORE METHODS

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Background: The growing popularity of electronic cigarettes (e-cigarettes) among youth raises public health concerns about possible "gateway" effects on smoking conventional cigarettes; however, past research remains inconclusive due to the difficulty of accounting for shared risk in observational data. Fortunately, propensity score methods for causal inference have the potential to overcome this limitation. The current study is among the first to estimate the causal effect of e-cigarette on conventional smoking using inverse propensity weighting. **Methods:** Cross-sectional data were extracted from the 2015-2016 waves of the Monitoring the Future study (N=12,421). Fourteen variables were identified as possible confounders and were used to calculate each participant's propensity for e-cigarette use. The effects of (1) lifetime and (2) current e-cigarette use on (A) lifetime and (B) current conventional cigarette smoking were examined using logistic regression analyses that combined both inverse propensity weighting and survey weights. **Results:** Inverse propensity weighting successfully achieved balance on all 14 tobacco use risk factors between e-cigarette users and non-users. The unadjusted associations between e-cigarette use and conventional cigarette smoking were significant and very strong (OR's ranging from 16-36). After accounting for this shared risk, both lifetime and current e-cigarette use remained associated with ever smoking a conventional cigarette, though much more weakly (OR = 2.49 and 2.32, respectively; both $p<.0001$). However, neither lifetime nor current e-cigarette remained significantly associated with current conventional cigarette smoking (OR = 2.17 and 0.95 and $p = .228$ and .849, respectively). **Conclusion:** E-cigarette use may to some degree promote conventional cigarette initiation, but does not appear to be causally related to current, continued smoking. However, further research is needed to more robustly measure shared risk factors for tobacco use. Instead, the apparent relationship between current e-cigarette use and regular conventional smoking seems to be fully accounted for by shared risk factors.

FUNDING: Academic Institution

SYM25C

AGE-VARYING ASSOCIATIONS BETWEEN E-CIGARETTE, HOOKAH, AND MARIJUANA USE AMONG YOUNG PEOPLE: FINDINGS FROM THE PATH STUDY

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Background: E-cigarette and hookah use are increasing rapidly among young people in the United States and evidence suggests that their use may be associated with concurrent marijuana use. Nicotine and marijuana use behaviors have previously been examined by developmental period (e.g., middle school, high school, and college-aged individuals). However, these behaviors likely vary across continuous age. The purpose of this study is to model rates of recent e-cigarette, hookah, and marijuana use and the associations among these behaviors across continuous age using time-varying effect modeling (TVEM). **Methods:** Participants were adolescents and young adults from wave 2 of the Population Assessment of Tobacco and Health Study, a nationally representative longitudinal cohort study of individuals ages 12 and older. Wave 2 data were collected in 2014/15. The analytic sample was restricted to ages 12-24 (N = 20,351; 65% White, 16% Black, 14% Multi-racial/other; 49% Female). Weighted TVEM, an innovative method that flexibly estimates regression coefficients as a function of continuous age, was used to examine 1) age-varying prevalence rates of past month e-cigarette, hookah, and marijuana use, and 2) age-varying, bivariate associations between past month use of these products. **Results:** Prevalence of past month e-cigarette use was minimal at age 12, increasing steadily through age 18 (18%) and declining slightly during young adulthood. Hookah use increased from ages 15 to 20, peaking at 21% and declining slightly through age 24. Marijuana use increased rapidly from ages 12 to 20, peaking at 30% and declining slightly through age 24. Recent e-cigarette and hookah were associated with increased odds of marijuana use during adolescence only; associations were strongest prior to age 15. The association between hookah and e-cigarette use was significant across all ages. This association was also strongest during early adolescence. **Conclusion:** Prevalence rates and associations between recent e-cigarette, hookah, and marijuana use vary significantly by continuous age. Individuals using e-cigarettes or hookah prior to age 15 are significantly more likely to also use marijuana.

FUNDING: Federal



SYM25D

MEASUREMENT OF ELECTRONIC NICOTINE EXPECTANCIES AMONG YOUNG ADULTS: FACTOR ANALYSIS, ITEM RESPONSE CHARACTERISTICS, AND PRELIMINARY CONCURRENT VALIDITY

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Significance: Emerging research suggests that young adulthood is now the most common period for nicotine initiation. The nicotine product first used is often an electronic nicotine delivery system (ENDS). Although ENDS use is potentially harm-reducing for cigarette smokers, use is also associated with increased risk of combustible initiation among never-smokers. Measures of beliefs about outcomes of use (i.e., expectancies) can be helpful in predicting use, as well as informing and evaluating interventions to impact use. **Methods:** We surveyed young adult (18-24) students (N=2296, $M_{age}=20.0$, $SD=1.8$, 64% female, 46% White) from a community college, a historically black university, and a state university. Students answered ENDS expectancy items derived from focus groups and expert panel refinement. Factor Analysis and Item Response Theory (IRT) methods were used to understand relevant factors and identify useful items. One-way ANOVAs compared students across three groups (never-user, ever-user of ENDS, established ENDS user), followed by post-hoc pairwise t-tests using Bonferroni corrections.

Results: A 5-correlated-factor solution [Positive Reinforcement ("PR", consists of Stimulation, Sensorimotor, and Taste subscales, $\alpha=.93$), Negative Consequences ("NC", consists of Health Risks and Stigma subscales, $\alpha=.94$), Negative Affect Reduction ("NAR", $\alpha=.96$), Weight Control ("WC", $\alpha=.93$), and Addiction ("ADD", $\alpha=.87$)] fit the data well (CFI=0.974; TLI=0.973; RMSEA=0.053). IRT analyses indicated that individual items tended to be related to their underlying constructs (a parameters ranged from 1.20-3.18) and covered a relatively wide range of the expectancies continuum (b parameters ranged from -0.72 to 2.47). All subscales successfully differentiated ENDS user groups (all $p<.005$, η^2 range from .01 for WC to .20 for PR). Post-hoc analyses were significant for all 3 groups for PR, NC, and ADD, and for 2 groups (established versus never-users) for NAR and WC.

Conclusions: A novel ENDS expectancy measure appears to be a reliable and valid measure for young adults, successfully differentiating between ENDS users groups. This tool may be helpful in predicting use and informing interventions.

FUNDING: Federal; Academic Institution

SYM25E

ASSESSING NICOTINE DEPENDENCE IN DUAL-USERS OF CIGARETTES AND ENDS: UNIQUE AND COMMON ELEMENTS OF DEPENDENCE

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Background: Assessing nicotine dependence (ND) in dual users of cigarettes and electronic nicotine delivery systems (ENDS) is challenging. It is unclear, for example, whether underlying dimensions of ND are shared between cigarettes and ENDS, or whether ND is better assessed separately for each product. This study examined whether ND in dual users is represented by common factors across products, or whether there are product-specific factors of ND. **Methods:** Adult smokers who also used ENDS were enrolled in a longitudinal observational study. Data come from the baseline assessment which included the Nicotine Dependence Syndrome Scale (Shiffman et al., 2004) and a version adapted for ENDS. Participants (N=392) were 39% female, aged 18-70, 39% White, 32% Black, 12% Hispanic, and 12% Asian. We applied a bifactor measurement model to test the hypothesis that there would be a common ND factor across both products (scales) as well as distinct factors for each product. We used traditional factor analysis of both scales combined to compare results. Common factors of ND were extracted (eigenvalue > 1) using a maximum likelihood method and a Varimax rotation with Kaiser normalization. **Results:** Across both the bifactor and traditional factor analyses, one common factor of ND emerged across products: a factor reflecting environmental/location restrictions on product use. Beyond that one factor, items loaded separately by product: 5 factors for cigarettes, explaining 51.1% of the variance (chi-square=209.99), and 4 factors for ENDS, explaining 54.1% of the variance (chi-square=381.67). The factors extracted for ENDS mimicked those for cigarettes, reflecting the original NDSS dimensions of drive, tolerance, priority, but less so for continuity and stereotypy. **Conclusions:** Even though the NDSS items posed for cigarettes and ENDS were the same,

only one common factor emerged, which was limited to environmental restrictions. The subfactors extracted for cigarettes and ENDS were stronger than one common factor, suggesting the importance of assessing ND separately for each product among dual users. The dimensional structure of ND, however, was relatively similar for both products.

FUNDING: Federal

SYM26

ADVANCES IN THIRDHAND TOBACCO SMOKE RESEARCH

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Thirdhand cigarette smoke (THS) is an indoor environmental contaminant that can cause distinct exposure and health effects. Over the past decade, researchers made significant progress in understanding the underlying chemical processes leading to the accumulation of harmful compounds arising from the use of tobacco products, on indoor surfaces and dust. Some components of THS partition to indoor air, others remain on surfaces and this generates long-term, low-level chemical exposures via multiple pathways. An initial focus on the significant role played by indoor surfaces has recently been expanded to include human dermal uptake of THS pollution. A better understanding of the chemical composition of THS and the presence of unique or differentiating features with respect to secondhand smoke (SHS), is leading to significant advances in the development of biomarkers of exposure that can distinguish between SHS and THS. In vitro and in vivo models have been used to assess the biological effects and potential health impacts of THS. This information is used to develop improved exposure models, risk assessment tools and remediation approaches that are effective in cleaning up THS residues. This research has also inspired regulatory measures such as restricting smoking 24/7 in child care facilities, smoke free policies in multiunit housing complexes, and provided the basis for improving educational materials for people interested in effectively implementing smoke free environments. Acknowledgement: Supported by the University of California's Tobacco-Related Disease Research Program (UC-TRDRP), Grant 23PT-0013.

SYM26A

NICOTINE AND NNK IN THIRDHAND CIGARETTE SMOKE

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When people smoke indoors, 60-90% of the nicotine and tobacco-specific nitrosamines in the smoke sorb to surfaces in the room before they can be removed by ventilation. NNK (4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone) is the tobacco-specific nitrosamine found in highest concentrations on surfaces and materials exposed to tobacco smoke. Research from the tobacco industry shows that loading of materials from a room with repeated exposures to high concentrations of cigarette smoke can reach hundreds of milligrams of nicotine and tens of micrograms of NNK, per square meter. Because the nicotine on surfaces can react with oxidant chemicals to form more nitrosamines, under normal indoor conditions, the total amount of NNK on surfaces can be much higher than the amount that was emitted directly from the cigarettes. NNK is a class A human carcinogen that binds to DNA and causes mutations. Because of low volatility, the NNK that sorbs to and forms on surfaces tends to remain in place. Thus, inhalational exposure to NNK from thirdhand smoke is low. However, research has shown that nicotine is absorbed readily through human skin and research animals living in cages containing THS have elevated urinary levels of both cotinine, the metabolite of nicotine and NNAL (4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol), the metabolite of NNK. To test dermal uptake of nicotine and NNK in human subjects, we had adult nonsmokers wear cotton clothing that had been exposed to the equivalent of one month of smoke in the home of a pack-a-day smoker (3-4 grams total smoke particulates). We found that wearing the smoke-exposed clothing increased the urinary concentrations of both cotinine and NNAL. Our findings suggest that 1) nicotine and NNK are important toxicants in thirdhand smoke, 2) indoor concentrations of NNK can increase over time and 3) dermal absorption is an important exposure route for thirdhand smoke. Acknowledgement: Funded by Tobacco-Related Disease Research Program grant #24RT-0039

FUNDING: State; Academic Institution



SYM26B

BIOMARKERS FOR THS, AND THE SEARCH FOR BIOMARKERS TO DISTINGUISH THS EXPOSURE FROM SHS EXPOSURE

Peyton Jacob, III, Ph.D., Christopher Havel, Neal Benowitz. University of California San Francisco.

Biomarkers of exposure are widely used in studies of tobacco use and toxicology to assess the relative risks of different tobacco products, to validate cessation in treatment programs, and to assess exposure to secondhand smoke (SHS) or thirdhand smoke (THS). The most frequently used and most generally applicable biomarkers are nicotine and its metabolites, and the tobacco-specific carcinogen metabolite NNAL (4-(methyl-nitrosamino)-1-(3-pyridyl)-1-butanol). They are useful for estimating the intake of toxic substances from active smoking, SHS exposure, and THS exposure because of their specificity for tobacco. However, they cannot distinguish SHS from THS exposure. Non-smokers exposed to SHS will be generally exposed to THS as well, especially if they live with a smoker. To investigate the relative health risks of SHS and THS, a specific biomarker for THS is highly desirable, but a major challenge to identify and develop. In this presentation, applications of nicotine metabolites and NNAL to studies of THS exposure, and progress on developing selective biomarkers for THS, including metabolites of NNA (4-(methylnitrosamino)-4-(3-pyridyl)butanal), a THS-selective nitrosamine, and a nicotine pyrolysis product 3-ethenylpyridine will be described. Acknowledgement: The authors thank the California Tobacco-Related Disease Research Program (TRDRP) for support of the studies described in this presentation: TRDRP Grant 20PT-0184 - Thirdhand Tobacco Smoke Exposure and Health Risk Assessment (Phase-1); TRDRP Grant 23PT-0013 - Impacts of Thirdhand Smoke on Public Health (Phase-2). Support from the National Institute on Drug Abuse, P30 DA012393, and from the National Center for Research Resources, S10 RR026437, for laboratory resources at the University of California, San Francisco is gratefully acknowledged. We greatly appreciate the skillful assistance provided by Lawrence Chan, Trisha Mao, and Ethan Yip in performing analytical chemistry.

FUNDING: Federal; State; Academic Institution

SYM26C

GENETIC SUSCEPTIBILITY TO THIRDHAND SMOKE-INDUCED LUNG CANCER DEVELOPMENT IN MICE

Antoine M. Sijnders, Ph.D., Jian-Hua Mao, Bo Hang. Lawrence Berkeley National Laboratory.

Thirdhand smoke (THS), the residual tobacco smoke remaining in the environment after tobacco has been smoked, represents an underestimated public health hazard. Vulnerable populations are considered to include infants and toddlers living in a smoking household exposed to THS. The carcinogenic potential of THS is a critical consideration in risk assessment and remains completely unknown in humans. We first reported that both acute and chronic exposure to THS cause significant DNA damage, including oxidative DNA damage and strand breaks, in human cell lines and mouse skin samples. Our recent focus has been on the THS impact resulting from early life exposure in mouse models, and demonstrated that exposure to THS at early age significantly affects body weight, immunological parameters and cancer development. In A/J mice, the later life lung carcinogenesis upon THS exposure was clearly shown after exposure from 4 to 7 weeks of age. These mice had increased incidence of lung adenocarcinoma, tumor size and, multiplicity, compared with controls, providing the first evidence for THS carcinogenicity in mammalian systems. In vitro studies using cultured human lung cancer cells also showed that THS exposure increases cell proliferation and colony formation. RNA sequencing revealed that THS exposure can activate p53 signaling. These data indicate that early exposure to THS is associated with increased lung cancer risk. We are ascertaining how genetic factors influence susceptibility to THS-induced health effects, especially tumor development and whether there is an age-specific window of susceptibility for these effects. By addressing these key questions, we will provide a better understanding of the effects of THS on human health and disease. Such information would address critical knowledge gaps that are required for the prevention of disease and formulation of policies related to indoor air quality. Acknowledgement: Supported by UC TRDRP grant 24RT-0038 and the LBNL Directed Research and Development program under contract DE AC02-05CH11231.

FUNDING: Federal; State; Academic Institution

SYM26D

THIRDHAND SMOKE POLLUTION AND REMEDIATION IN LOW-INCOME MULTIUNIT HOUSING

Georg Matt, Ph.D., San Diego State University.

Thirdhand tobacco smoke (THS) is the persistent residue resulting from secondhand smoke that accumulates in dust and becomes embedded in objects and on surfaces of indoor environments where tobacco has been used. We have found THS in a wide variety of indoor environments in which tobacco has been smoked regularly as well as occasionally. This includes private homes and cars of smokers with and without smoking bans, homes of nonsmokers who moved into smokers' homes, guest rooms in hotels, rental cars with and without smoking bans, neonatal intensive care units, and pediatric emergency departments. THS pollutants pose exposure risks through inhalation, dermal transfer, and hand-to-mouth ingestion. Young children are especially at risk due to hand to mouth behavior, small body size, immature organ and immune systems, increased inhalation rate, and activity located near the floor where pollutants accumulate. We examined the prevalence of THS in N=200 homes in low-income multiunit housing and tested efforts to remove THS from surfaces and dust. We present data on (a) the prevalence and persistence of THS, (b) the mixture of toxic compounds in THS in homes with smoking bans, and (c) the effectiveness of remediation efforts. Our findings indicate nicotine can be detected in virtually all units of nonsmokers and smokers. Approximately, 19% of homes showing "very high levels" (defined as 1,000 times the level of detection) of which half were home of nonsmokers with indoor smoking bans. Our findings show that THS consists of mixture chemical compounds including several tobacco-specific and other known carcinogens. Finally, our findings show that remediation efforts have limited success and are expensive. Our findings stress the importance of preventing THS pollution by implementing, monitoring, and verifying comprehensive indoor smoking bans. In conclusion, THS is a pervasive and persistent indoor pollutant found in a large proportion of low-income housing, and remediation is challenging and expensive. Acknowledgement: Funded by: U.S. Department of Housing and Urban Development (CAHHU0028-15)

FUNDING: Federal



SRNT Notes



NOTES SRNT



SRNT Notes



PODIUM PRESENTATION 1

PAPER SESSION 1: NICOTINIC REINFORCEMENT: NEW EVIDENCE FROM BASIC SCIENCE

PA1-1

THE MEDIAL PREFRONTAL CORTEX SUPPORTS THE REINFORCING EFFECTS OF NICOTINE

Zheng-Ming Ding, Cynthia Ingraham, William McBride. Indiana University, Indianapolis, IN, USA.

Significance: Identifying brain sites that mediate the reinforcing effects of nicotine is critical toward understanding the mechanisms underlying nicotine abuse. Several studies indicate that nicotine can be self-infused into and produce local reinforcing effects within the ventral tegmental area (VTA), suggesting the VTA as one anatomical substrate mediating nicotine reinforcement. However, the involvement of other brain sites remains unknown. Previous studies suggest that the medial prefrontal cortex (mPFC) may be involved in mediating general motivation and reward processes. The objective of the current study was to test the hypothesis that nicotine would produce reinforcing effects locally within the mPFC. **Methods:** Four groups of female Wistar rats ($n = 6-8$ / group) were surgically implanted with a guide cannula aimed at the prelimbic cortex region of the mPFC and intracranial self-administration (ICSA) started a week later. Rats received either artificial cerebrospinal fluid (aCSF) or one concentration of nicotine for self-infusion (1, 10, or 25 μ M) for 4 sessions with a between-subject design. A fixed-ratio 1 (FR1) reinforcement schedule was used in all experiments. Infusion numbers and responses on both active and inactive levers were recorded. **Results:** Nicotine induced dose-related increase of infusions into the prelimbic cortex ($p < 0.05$). Average numbers of infusions across 4 sessions were significantly greater in rats self-infusing 10 and 25 μ M nicotine ($p < 0.05$), but not in rats self-infusing 1 μ M nicotine ($p > 0.05$), than those in rats self-infusing aCSF (e.g., 25 ± 3 vs. 12 ± 3 infusions/session for the 25 μ M nicotine group and the aCSF group, respectively). Lever discrimination between active and inactive levers were observed in rats self-infusing 10 and 25 μ M nicotine (e.g., 39 ± 5 for average active lever vs. 20 ± 4 responses/session for average inactive lever for the 25 μ M nicotine group, $p < 0.05$). **Conclusion:** These results suggest that nicotine is locally rewarding within the prelimbic cortex of the mPFC, supporting an important role of the mPFC in nicotine abuse.

FUNDING: Federal

PA1-2

ACUTE AND CHRONIC MEMANTINE HAVE OPPOSITE EFFECTS ON NICOTINE SELF ADMINISTRATION IN RATS

Edward D. Levin, PhD, Corinne Wells, Leah Yao, Wendi Guo, Anica Nangia, Sarah Howard, Erica Pippen, Andrew Hawkey, Jed E. Rose, Amir H. Rezvani. Duke University Medical Center, Durham, NC, USA.

Significance: The neurobehavioral bases of tobacco addiction and nicotine reinforcement are complex. More than only nicotinic acetylcholinergic or dopaminergic systems are involved. These complex interactions present the opportunity for developing a variety of pharmacological approaches to aid smoking cessation. The current studies investigated the potential role of NMDA glutamate receptors in nicotine reinforcement. Memantine is an NMDA glutamate antagonist used to improve cognitive function in people with Alzheimer's disease. Glutamate may be an important component of the reinforcing effects of nicotine. Memantine also blocks nicotinic alpha7 receptors. **Methods:** Two studies were conducted in adult female rats, one testing acute effects of memantine over a range of doses (0-30 mg/kg) for changing nicotine self-administration and the other testing the chronic effects of memantine (0 or 10 mg/kg) over time. **Results:** Acute memantine injections significantly increased nicotine self-administration in a dose-related manner. In contrast, chronic memantine treatment significantly reduced nicotine self-administration after the initial increase in nicotine self-administration. Starting in the second week of the chronic treatment there was a significant reduction of nicotine self-administration relative to controls. Chronic memantine prevented the increase in nicotine self-administration shown by controls. There even continued to be a memantine-induced lowered nicotine self-administration during the week after the cessation of treatment. Acute memantine

modestly increased nicotine self-administration, possibly due to short-term behavioral compensation to diminished reinforcement. In contrast, chronic memantine significantly reduced nicotine self-administration over the longer term with persisting efficacy after withdrawal of treatment. **Conclusion:** Memantine or other drugs affecting NMDA glutamate receptors and alpha7 nicotinic receptors may be useful aids to smoking cessation. This research was funded by NIDA P50 Center grant DA027840.

FUNDING: Federal

PA1-3

THE IMPACTS OF ACTUAL AND PERCEIVED NICOTINE ADMINISTRATION ON RESTING STATE FUNCTIONAL CONNECTIVITY BETWEEN THE INSULA AND THE ANTERIOR CINGULATE CORTEX IN SMOKERS

Robin Perry, Hera Schlagintweit, Sean Barrett. Dalhousie University, Halifax, NS, Canada.

Significance: Changes in resting state functional connectivity (rsFC) between the anterior insula (AI) and the dorsal anterior cingulate cortex (dACC) have previously been observed in response to nicotine withdrawal and/or administration. However the extent to which nicotine alters rsFC between these regions independently from withdrawal relief is not clear. Moreover, because many of nicotine's acute effects appear to depend, at least in part, on the belief that nicotine has been ingested, the relative contribution of nicotine's pharmacological actions to any such effects also requires clarification. **Methods:** A balanced placebo design was used to examine the relative impacts of perceived and actual nicotine administration on smokers' neural responses. 26 tobacco dependent smokers (12 women) were randomly assigned to receive either a nicotine inhaler (4mg deliverable) or a nicotine-free inhaler across two sessions following a minimum of 3 hrs of tobacco abstinence. Instructions regarding the inhaler's nicotine content (told nicotine vs. told nicotine-free) and flavour (mint vs. citrus) differed across sessions. rsFC between sub-regions of the insula (anterior, mid, posterior) and the dACC was measured using magnetic resonance imaging before and after inhaler administration. **Results:** Both nicotine administration and the belief that nicotine had been administered independently altered functional connectivity between the AI with the dACC, but these effects were in opposite directions. Specifically, actual nicotine administration was associated with a relative decrease, and perceived administration with a relative increase, in rsFC (corrected p -values <0.05). **Conclusions:** Findings indicate that both pharmacological and non-pharmacological factors impact nicotine-related neural effects and highlight the importance of explicitly considering non-pharmacological factors when examining drug mechanisms of action in humans.

FUNDING: Federal; State; Academic Institution

PA1-4

DEVELOPMENT OF A RHESUS MACAQUE MODEL FOR NICOTINE SELF ADMINISTRATION VIA INHALATION

Matthew M. Ford, PhD, David Jacobs, BS, Thomas Mitchell, BS, Michael Davies, BS, Kathleen Grant, PhD, Eliot Spindel, PhD. OR Health & Science University, Beaverton, OR, USA.

Significance: Preclinical models of nicotine self-administration (SA) and dependence have largely focused on rodents. The rhesus macaque offers significant advantages over rodents with brain reward circuitry, nicotinic acetylcholine receptor function and distribution, and nicotine pharmacokinetics that are highly similar to humans. The goal of this project was to develop the methodology to initiate nicotine intake via inhalation in macaques and support the establishment of vaping patterns consistent with those observed in human smokers. **Methods:** Four 5-year old male macaques were trained to consume all fluids and food through operant panels affixed to the side wall of their home cage, and were further trained to present their legs at the cage front for awake venipuncture. A novel Kool-Aid substitution procedure was conducted to condition animals to inhale vapor from an e-cigarette (Blu Premium 100) interfaced with a portable smoking topography monitor (Borgwaldt CReSS Pocket). Nicotine concentration (1.2% or 2.4%) and session duration (1-4 hours) were manipulated to identify optimal parameters. Dependent variables for nicotine SA included number of puffs, puff volume



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(ml), flow rates (ml/sec), and inter-puff intervals (sec). **Results.** Three animals regularly engaged in vaping whereas a fourth animal largely abstained, regardless of SA session parameters. The low concentration of nicotine and shorter access periods (1-2 hours) culminated in sporadic vaping that was devoid of discernable patterns. In contrast, the high nicotine concentration in combination with 3-hr access periods resulted in a greater number of puffs that clustered into 2-5 'bouts' containing on average 10-30 puffs per bout. Further extension of session durations to 4-hr or longer led to even greater puff numbers, an escalation that was primarily attributable to increased bout frequency whereas bout size remained stable. Increased SA experience was associated with shorter latencies to first puff. **Conclusions.** Macaques develop stable vaping patterns following extended duration access to e-cigarettes. Spontaneous and sustained inhalation of nicotine-containing vapor in rhesus macaques represents a highly translational model to study multiple aspects of nicotine addiction, including therapy development, genetic predisposition, toxicity, cancer risk, and polydrug abuse.

FUNDING: Federal

PA1-5

AN ASSESSMENT OF THE THRESHOLD REINFORCING DOSE OF NICOTINE IN A RAT MODEL OF DEPRESSION

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The FDA is considering reducing the nicotine content in cigarettes to make them less addictive. Understanding individual differences in sensitivity to nicotine reinforcement is important to ensure that the magnitude of reduction in nicotine content set by FDA policy achieves the greatest net population reduction in smoking. There is a higher prevalence of tobacco dependence among both adolescents and adults with depression, which may be due to an enhanced sensitivity to the reinforcing effects of nicotine in depressed individuals. To assess whether the reinforcement threshold for nicotine is moderated by depression, the present study used an established rat model of depression (Fisher Sensitive Line [FSL]) to examine acquisition and behavioral economic demand (i.e., FR 2, 3, 6, 15, 30, etc.) for nicotine in groups of FSL and control Sprague-Dawley (SD) rats across a range of nicotine doses (i.e., 30, 15, 7, 4, 2, 1 ug/kg, N = 11-26 per dose) in male and female rats. At the 30 ug/kg dose, FSL rats acquired self-administration quicker under FR 1 ($p < 0.05$) and showed more inelastic demand (i.e., greater reinforcing efficacy) compared to SD rats ($p < 0.05$). At lower doses, however, there were no significant differences in acquisition or demand elasticity. These findings indicate that the influence of depression on the reinforcing efficacy of nicotine is limited to higher doses and that the magnitude of nicotine reduction set by the FDA will have similar effects in both depressed individuals and the general population.

FUNDING: Federal

PAPER SESSION 2: GENETIC BASIS OF ADDICTION AND TOBACCO-RELATED DISEASES

PA2-1

INFLUENCE OF TAAR1 GENOTYPE ON ORAL NICOTINE SELF ADMINISTRATION IN MICE

David Jacobs, BS, Jamie O. Leitzinger, Matthew M. Ford, PhD. Oregon Health & Science University, Beaverton, OR, USA.

Significance. Activation of the trace amine associated receptor 1 (TAAR1) was recently reported to reduce intravenous nicotine self-administration (SA) and reinstatement of nicotine seeking in rats. The current work extended this characterization by examining TAAR1 and its influence on oral nicotine SA in mice across multiple SA conditions.

Methods and results. Two sub-strains of male DBA/2 mice (n=16 each) with differing TAAR1 genotypes were studied; DBA/2J (J) mice express a nonsynonymous mutation that results in a non-functional TAAR1 receptor whereas DBA/2NrI (NrI) possess a wildtype receptor. In experimental Phase 1, nicotine intake was assessed in an intermittent access, 2-bottle choice (IA-2BC) procedure across a range of nicotine concentrations (20 - 125 ug/ml base). J mice consumed significantly greater amounts of nicotine than NrI mice, with the most pronounced difference at 50 ug/ml. Phase 2 consisted of daily 4-hr 2BC sessions with access to 50 ug/ml nicotine. Group differences largely dissipated under these conditions, and J mice were significantly more sensitive to experimenter handling-induced decreases in nicotine SA. During Phase 3 mice were provided daily 22-hr 2BC access with both the 50 ug/ml nicotine and water solutions sweetened with 0.2% w/v saccharin. When mice handling occurred, the J mice consumed significantly less nicotine than NrI mice. However, J mice self-administered marginally more nicotine when handling was omitted. Lastly, during Phase 4 a sweetened nicotine solution was presented in tandem with plain water under the same access conditions, but no handling. Mice achieved nicotine intakes averaging 6 mg/kg, and the J mice consistently exhibited greater preference for the nicotine solution than NrI mice. **Conclusion.** Consistent with TAAR1 agonist attenuation of nicotine SA in rats, the current studies demonstrated that the absence of a functional TAAR1 receptor was associated with elevated nicotine SA in mice under IA or daily continuous access conditions with no handling. The anxiolytic profile of TAAR1 agonists may partially explain the sensitivity of J mice to experimenter handling, especially given the known interaction of stress and nicotine SA (smoking). Modulation of TAAR1 activity may be a fruitful avenue for future pharmacotherapy development.

FUNDING: Federal

PA2-2

IDENTIFICATION OF A LOCUS ON CHROMOSOME FOUR MEDIATING NICOTINE WITHDRAWAL DEFICITS IN HIPPOCAMPAL LEARNING

Lisa Goldberg, Munir Kutlu, Dana Zeid, Laurel Seemiller, Thomas Gould. Penn State University, University Park, PA, USA.

Cognitive deficits, such as disrupted learning, are a major symptom of nicotine withdrawal. These deficits are heritable, yet the genetic basis is unknown. Mice are valuable for identifying novel genes that contribute to variation in traits associated with various stages of addiction, including withdrawal. Our lab has developed a mouse model of nicotine withdrawal deficits in hippocampus-dependent learning, using chronic nicotine exposure via osmotic minipumps and contextual fear conditioning. Previously, we identified differences between C57BL/6J and DBA2/J mice in cognitive deficits during nicotine withdrawal. Here, we aimed to utilize the recombinant inbred BXD genetic reference panel to identify novel genetic variants underlying nicotine withdrawal deficits in learning. Male and female mice (n=6-11 per sex per strain, 31 strains) received either chronic saline or nicotine (6.3 mg/kg per day for 12 days), and then were tested for hippocampus-dependent learning deficits using contextual fear conditioning. Additionally, using publicly available data from GeneNetwork, we identified genetic correlations between nicotine withdrawal deficits in learning and locomotor stimulant response to phencyclidine (PCP) and cocaine, with strains that were less sensitive to stimulant withdrawal-induced cognitive deficits also being shown to be less sensitive to stimulant-induced increases in locomotor activity. Quantitative trait locus (QTL) mapping analyses using GeneNetwork (1000 permutations) identified a significant QTL on chromosome 4 (82.4 Mb, LRS =23.74, $p < 0.05$). To prioritize candidate genes, we utilized



publicly available hippocampal gene expression data from naive animals to identify potential cis-eQTL. We identified 4 positional candidates (*Ptprd*, *Tyrp1*, *2310067E19Rik*, *Nfib*) that overlapped with our behavioral QTL and correlated with our behavioral data. To expand upon these positional candidates and identify hippocampal transcriptome changes associated with nicotine withdrawal, we will soon complete mRNA-sequencing in the BXD lines exhibiting extreme phenotypic variation.

FUNDING: Federal

PA2-3

COLLABORATION WITH 23ANDME TO STUDY THE GENETIC BASIS OF IMPULSIVITY: IMPLICATIONS FOR SMOKING

Sandra Sanchez-Roige, PhD¹, Pierre Fontanillas, PhD², Sarah L. Elson, PhD², 23andMe Research Team², James MacKillop, PhD³, **Abraham A. Palmer, PhD¹**, ¹University of California San Diego, La Jolla, CA, USA, ²23andMe, Mountain View, CA, USA, ³McMaster University/St. Joseph's Healthcare Hamilton, Hamilton, ON, Canada.

Substance use disorders (SUD) are complex and highly heritable traits. Genome-wide association studies (**GWAS**) of SUD have shown that many genetic variants contribute to critical phenotypes such as smoking initiation, cigarettes per day, and failure to quit smoking. We are studying the role of genetic factors that influence impulsivity, which is part of the NIMH Research Domain Criteria (**RDoC**). In collaboration with the personal genetics company 23andMe, Inc., we performed several GWAS that examine a number of traits related to impulsivity and drug use history using ~25,000 male and female adult research participants of European ancestry. We used the Barratt Impulsiveness Scale (**BIS**) and Impulsive Behavior Scale (**UPPS-P**) to assess impulsivity. These traits showed statistically significant chip-heritability (~10%). We showed a significant association between the gene *CADM2* and sensation seeking ($P = 8.3 \times 10^{-9}$, rs139528938) and a trend towards an association between another SNP in *CADM2* and lifetime drug use; ($P = 3.0 \times 10^{-7}$, rs2163971). We identified strong genetic correlations between impulsivity and several smoking behaviors, other drug use phenotypes, educational attainment, obesity and psychiatric disorders (e.g. attention-deficit/hyperactivity disorder; **ADHD**). Our study is the first to demonstrate a role for common genetic variation in these measures of impulsivity, and is the first to show genetic correlation between impulsivity and various traits, including smoking. We continue to work with 23andMe to increase our sample size, which will provide greater statistical power and thus further our understanding of the genetic interaction between impulsivity, smoking, and other forms of drug abuse.

Collaborator List for the 23andMe Research Team: Michelle Agee, Babak Alipanahi, Adam Auton, Robert K. Bell, Katarzyna Bryc, Sarah L. Elson, Pierre Fontanillas, Nicholas A. Furlotte, David A. Hinds, Bethann S. Hromatka, Karen E. Huber, Aaron Kleinman, Nadia K. Litterman, Matthew H. McIntyre, Joanna L. Mountain, Carrie A.M. Northover, J. Fah Sathirapongsasuti, Olga V. Sazonova, Janie F. Shelton, Suyash Shringarpure, Chao Tian, Joyce Y. Tung, Vladimir Vacic, Catherine H. Wilson, Steven J. Pitts

FUNDING: Unfunded; Academic Institution

PA2-4

PREDILECTION OF CHRNA5 SNP TO SMOKING-RELATED CARDIOTOXICITY USING PATIENT-SPECIFIC IPSCs

Joe Zhang, MD, PhD, Tomoya Kitani, Ning Ma, Joseph Wu. Stanford University, Stanford, CA, USA.

Significance: Smoking increases risk of cardiovascular disease is well established. However, mechanisms underlying cardiac dysfunction caused by nicotine intake remain elusive. Recent genome-wide population studies have clearly demonstrated a genetic contribution to nicotine-related disease. CHRNA5 SNP (D398N) has been identified as an allelic risk factor for nicotine dependence, cancer and cardiovascular disease after exposure to nicotine. According to the NCBI database, the frequency of CHRNA5 SNP is over 20% in the general American population. Therefore understanding the predilection of CHRNA5 SNP to nicotine-related cardiotoxicity is urgently required prior to development of preventative strategies and personalized treatment. **Methods:** We recruited several CHRNA5 SNP carriers. Human induced pluripotent stem cells (iPSCs)-derived cardiomyocytes were generated from the CHRNA5 SNP carriers and characterized for their phenotype with and without exposure to nicotine. **Results:** Short term exposure of iPSC-derived cardiomyocytes to nicotine (the dose is equivalent to plasma nicotine concentration after 2 cigarettes) led to prolongation of action potential duration, which is a risk factor of arrhythmias. Moreover, nicotine caused abnormal Ca^{2+} handling and increased the propensity for Ca^{2+} -associated arrhythmias. Furthermore, genome-edited isogenic lines by removing the CHRNA5 SNP enabled to ameliorate nicotine-associated

cardiac dysfunction at the cellular level. **Conclusion:** Our study is the first step toward delineating molecular mechanisms underlying the genetic predilection of CHRNA5 SNP to nicotine-related cardiotoxicity using patient-specific iPSC model.

FUNDING: Unfunded; Nonprofit grant funding entity



PAPER SESSION 3: SMOKING, CESSATION, AND MENTAL HEALTH

PA3-1

CAUSAL EFFECTS OF LIFETIME SMOKING ON RISK FOR DEPRESSION AND SCHIZOPHRENIA. EVIDENCE FROM A MENDELIAN RANDOMISATION STUDY

Robyn E. Wootton, PhD, Marcus Munafo, University of Bristol, Bristol, United Kingdom.

Introduction: Smoking is highly co-morbid with several psychiatric conditions, but understanding the causal nature of this relationship is complicated by confounding and reverse causality. Mendelian randomisation uses genetic variants to examine causal pathways between an exposure (e.g. smoking) and outcomes. Previous genetic instruments for smoking have only captured discrete aspects (e.g., initiation, heaviness), limiting power and requiring individual level data on smoking status. To overcome these issues, we developed a novel genetic instrument for comprehensive smoking exposure, which captures smoking duration, heaviness and cessation and includes both smokers and non-smokers, removing the need to stratify on smoking status. **Method:** We conducted a genome-wide association study (GWAS) of our comprehensive smoking measure in the UK Biobank (N=463,003) and identified 124 independent SNPs associated at the genome-wide level of significance. Having established the validity of our instrument, we used bi-directional two-sample Mendelian randomisation to explore its effects on schizophrenia and depression. **Results:** We found evidence that higher smoking exposure caused increased risk of both schizophrenia (OR = 2.33, 95% CI = 1.71 - 3.18, $P = 8.71 \times 10^{-6}$) and depression (OR = 2.03, 95% CI = 1.74 - 2.37, $P = 3.77 \times 10^{-19}$). There was also evidence of a causal effect of higher schizophrenia risk on increased lifetime smoking ($\beta = 0.021$, 95% CI = 0.005 - 0.037, $P = 0.009$) and higher depression risk on increased smoking ($\beta = 0.098$, 95% CI = 0.037 - 0.160, $P = 0.002$). This is consistent with the self-medication hypothesis however the effects in this direction were weaker. **Conclusions:** These findings indicate that the co-morbidity between smoking and both depression and schizophrenia is due, at least in part, to a causal effect of smoking on these outcomes. Our genetic instrument of comprehensive smoking exposure has the potential to be used widely in Mendelian randomisation to explore many other outcomes.

FUNDING: Other

PA3-2

COMORBID DRUG USE DISORDERS AND AFFECTIVE DISORDERS AS VULNERABILITIES TO CURRENT SMOKING

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Significance: Individuals with mental illness or drug use disorders have a higher prevalence of cigarette smoking than adults without these disorders. This study aims to identify subgroups of adults based on comorbid conditions, important vulnerabilities for current smoking. **Methods:** The National Epidemiologic Survey on Alcohol and Related Conditions-III, 2012-2013, sampled, recruited, and assessed 36,309 adults, with interviews on drug use and other characteristics. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-5 Version (AUDADIS-5) was used to identify psychiatric conditions and latent class models were developed based on various diagnoses (i.e., opioid, cannabis, alcohol, and cocaine use disorders; depression, anxiety). Multinomial logistic regression estimated the significance of covariates in predicting class membership. **Results:** Four latent classes optimally distinguished the population: no comorbid conditions (62%), comorbid affective disorders (17%), those with alcohol use disorder (17%), and a highly comorbid subgroup (4%). The highly comorbid class was more than two times as likely to be current smokers compared to all other classes. They were also younger and lower income compared to the other three classes. The class distinguished by alcohol use disorder had a higher proportion of females compared to the three other classes. Interestingly, a higher prevalence of those in the class with comorbid affective disorders lived in a rural setting compared to the two other comorbid classes. **Conclusions:** The class with the highest concurrent past year drug use and affective disorders reported the highest prevalence of smoking and other vulnerabilities to smoking, including younger age and lower income. Reducing

tobacco use in this group with comorbidities may require targeted efforts in young adults, those of lower income, and individuals with affective disorders, as well as addressing concurrent drug use in tobacco or drug treatment.

FUNDING: Federal

PA3-3

SMOKING CHARACTERISTICS, HARM REDUCTION BEHAVIOURS AND ATTEMPTS TO QUIT SMOKING IN SMOKERS WITH SEVERE MENTAL DISTRESS

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Background: Smokers with mental health problems have often been underserved by cessation research and practice. Aims were to 1) characterise smoking and harm reduction behaviours among smokers with and without mental health problems; 2) assess associations between mental health and attempts to quit smoking. **Methods:** Data were collected January 2016 - December 2017 as part of the Smoking/Alcohol Toolkit Study in monthly cross-sectional household surveys of representative samples of the population in England aged 16 years and over. The K6 screener measured level of mental distress. Socio-demographics, frequency of smoking, type of cigarette; dependence (urges to smoke; HSI), use of other nicotine-containing products and quit attempts in the past year were compared for past-year smokers (n=6354) with and without severe distress using chi-square tests, as were proportions of current smokers (n=5906) cutting down cigarettes and being motivated to stop smoking. Having made at least one quit attempt was regressed onto mental distress, adjusting for socio-demographics and smoking characteristics in logistic regressions. **Results:** Past-year smokers experiencing serious distress (9.5%) were more likely to be young ($\chi^2=87.3$), female ($\chi^2=29.4$) and from low socio-economic grades ($\chi^2=147.8$) than those not experiencing serious distress (all $p<0.001$). Proportion smoking daily was similar ($\chi^2=0.7$, $p=0.40$), but those with distress were more likely to be highly dependent ($\chi^2=125.9$; 89.9) and to be smoking roll-your-own ($\chi^2=74.6$, all $p<0.001$). Those with distress were somewhat more likely to be using other nicotine-containing products ($\chi^2=5.4$, $p=0.02$). Smokers with distress were more likely to be cutting down ($\chi^2=15.1$, $p<0.001$) and their motivation to stop smoking was as high as other smokers' ($\chi^2=1.8$, $p=0.2$). Those with distress were more likely to have made at least one quit attempt in the past year even after adjustment for smoking and socio-demographic characteristics ($OR=1.4$, 95% CI: 1.1-1.7, $p=0.004$). **Conclusions:** Smokers experiencing severe mental distress are more likely to be young, female and poor. They are more highly dependent, but no less motivated to quit smoking, and more likely to engage in harm reduction and to have made quit attempts. Harnessing and supporting these behaviours would help reduce inequalities in health and life expectancy.

FUNDING: Nonprofit grant funding entity

PA3-4

THE EFFECTS OF VARENICLINE, BUPROPION, NICOTINE PATCH, AND PLACEBO ON CESSATION AMONG SMOKERS WITH CURRENT AND PAST MAJOR DEPRESSION

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Significance: Smoking and major depressive disorder (MDD) are strongly comorbid conditions and smokers with MDD are less likely to quit than those without MDD. Evaluating the comparative safety and effectiveness of first-line pharmacotherapies for this subgroup will aid in treatment selection. **METHODS:** Data from the EAGLES trial (Anthenelli *et al.*, Lancet, 2016) were used to evaluate the safety and efficacy of smoking cessation pharmacotherapies in smokers with MDD (n = 2625) and those without psychiatric disorders (NonPHx) (n = 4028). Smokers were randomized to 12 weeks of varenicline (1 mg twice/d), bupropion (150 mg twice/d), nicotine replacement therapy (21-mg/d patch), or placebo. **RESULTS:** We found that incidence of a composite measure of moderate-to-severe neuropsychiatric adverse events (NPSAEs) was higher for the MDD subcohort vs. NonPHx by end of treatment (EOT) + 28 days (5.3% vs. 2.1%; $p < 0.001$), with no significant treatment-by-cohort interaction or treatment main



effect. Week 9-12 continuous abstinence for the overall MDD and NonPHx groups were 22.3% vs. 24.1%, respectively, but the difference was not significant ($p = 0.101$). At 6 months (week 9-24), abstinence rates for MDD vs. NonPHx did significantly differ (14.4% vs. 16.8%; $p = 0.010$) with no treatment-group interaction observed at either time point. The main effects of treatment on abstinence were significant at EOT (varenicline = 34.6%; bupropion = 24.2%; NRT = 24.2%; placebo = 13.3%; $p < 0.001$), and at 6 months (varenicline = 22.1%; bupropion = 17%; NRT = 15.5%; placebo = 9.7%; $p < 0.001$), with varenicline outperforming all other treatments. **CONCLUSION:** Smokers with MDD were more likely to experience clinically significant NPSAEs but were able to quit smoking in the short-term at rates similar to NonPHx smokers. Incidence of NPSAEs did not differ between treatments or within cohorts. The significant abstinence effects favoring varenicline were found independent of psychiatric condition. The findings suggest that risk of moderate-to-severe NPSAEs with smoking cessation medications is comparable to placebo among smokers with stably-treated MDD and that their efficacy is invariant to this diagnosis.

FUNDING: Industry Source

PA3-5

BARRIERS AND SUPPORTS FOR SMOKING CESSATION AMONG LATINOS IN SUBSTANCE USE DISORDER TREATMENT

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INTRODUCTION: This qualitative study examined tobacco use behaviors and barriers to/supports for smoking cessation among low-income Latinos in treatment for substance use disorders (SUD). While high smoking rates have been documented among persons with SUD, little is known about the smoking behaviors and cessation needs of ethnic minority smokers in SUD treatment. **METHODS:** Bilingual researchers interviewed Latino/a clients ($n=30$, 6 female) at five community-based SUD treatment programs in the San Francisco Bay Area. Eligibility criteria included being a current smoker or having quit smoking within the past month; self-identifying as Hispanic or Latino/a; and having been in the treatment program for at least two weeks. Confidential semi-structured interviews were conducted in Spanish or English at treatment program sites and were digitally recorded and transcribed. Interview transcripts were analyzed thematically using ATLAS.ti software. Study procedures were approved by the Institutional Review Board of the Pacific Institute for Research and Evaluation. **RESULTS:** Interviewees described cigarette smoking as a social bonding activity among SUD treatment clients. All interviewees reported smoking combustible cigarettes as opposed to other tobacco products, and most preferred mentholated cigarettes. Cigarettes per day (CPD) smoked by interviewees ranged from 5 to 20, with 10 (half a pack) being the most common response. The most commonly reported barriers to cessation were: (1) the belief that quitting would lead to a relapse of alcohol or other drug use; (2) being around family, friends, or other SUD treatment clients who smoked; and (3) stress from everyday struggles as an immigrant (specifically, fear of being deported, difficulty securing work, and worries about not being able to economically support family members locally and in the country of origin). The most commonly reported supports for cessation were: (1) belief in one's "will power" (self-efficacy to quit); (2) not wanting to smoke in front of parents or children; and (3) applying Twelve Step principles (especially an emphasis on abstinence from all drugs, including nicotine) to tobacco cessation. **CONCLUSION:** These findings represent a first step toward designing culturally and linguistically appropriate smoking cessation services that address the specific needs of low-income Latino smokers with SUD comorbidity.

FUNDING: State; Academic Institution; Nonprofit grant funding entity

PA3-6

SERIOUS MENTAL ILLNESS AND CESSATION TREATMENT UTILIZATION: THE MEDIATING ROLE OF HEALTHCARE PROVIDER INTERACTIONS

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Significance: The US is facing widening mental health disparities in smoking prevalence. Low rates of physician-delivered cessation care for patients with serious mental illness (SMI) may be contributing to this problem. The purpose of this study was to examine how healthcare provider interactions influence the cessation process among smokers with SMI.

Methods: Data for this study were taken from OPTIN, a trial that demonstrated the effectiveness of proactive outreach for boosting smoking abstinence among socioeconomically disadvantaged smokers enrolled in publicly-subsidized health care programs in Minnesota. ICD-9 codes consistent with schizophrenic disorders, psychotic disorder, bipolar disorders, and/or major depressive disorder were used to categorize participants in groups of smokers with SMI ($n=1044$) and without SMI ($n=1277$). Mediation analyses assessed whether the effect of SMI on cessation treatment utilization at 12-month follow-up was mediated by baseline measures of physician-delivered cessation advice and perceptions of physician bias. **Results:** Smokers with SMI reported higher rates of physician-delivered advice to use cessation treatments, an effect that in turn was associated with higher rates of cessation treatment utilization. The effect of SMI on cessation treatment utilization was partially mediated by advice to use medications (Proportion Mediated=11.9%) and by advice to use other forms of treatment (Proportion Mediated=5.9%). Mediation by physician bias was not present. **Conclusion:** The association between physician-delivered advice to use treatment and subsequent treatment utilization highlights the role that healthcare providers play in the cessation process. These results suggest that the patient/physician relationship is a potentially important point of intervention for socioeconomically disadvantaged smokers with SMI.

FUNDING: Federal



SRNT Notes



NOTES SRNT



SRNT Notes



PODIUM PRESENTATION 2

PAPER SESSION 4: PULMONARY TOXICITY OF ELECTRONIC CIGARETTES AND COMBUSTIBLE CIGARETTES

PA4-1

E-CIGARETTE USE CAUSES ENHANCED LUNG PROTEASE LEVELS

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Introduction: Proteolysis is a key aspect of the lung's innate immune system. However, excessive proteolysis is causative for bronchiectasis, emphysema and several types of cancer and as such, protease activity is normally tightly regulated by a series of protease inhibitors. Chronic combustible tobacco use increases protease levels in the lung lumen, which contributes to the development of chronic lung disease. However, knowledge of the impact of e-cigarette exposure (vaping) on proteolysis is still limited. We analyzed the effects of vaping on pulmonary protease-antiprotease balance to assess the impact of e-cigarette use on lung. **Methods:** We analyzed bronchoalveolar lavage fluid (BALF) from healthy non-smokers, cigarette smokers (smoker) and e-cigarette users (vaper) for protease activity to identify cysteine, serine and matrix metalloproteinases (MMPs). We also performed western blotting and zymography of concentrated BALF to evaluate anti-protease levels along with validation of the protease assays. We further used *in vitro* exposure of e-liquid component to blood neutrophils and bronchoalveolar lavage (BAL) macrophages to validate *in vivo* observations. **Results:** We found that elastase and MMP-2/9 activity were significantly enhanced in both smokers and vapers. Western blotting and zymography data confirmed these findings. No change was observed in the level of antiproteases tested. Nicotine increased intracellular calcium levels in both blood neutrophils and BAL macrophages in a dose-dependent fashion. Elastase release from blood-derived neutrophils was nicotine dependent. Additionally, nicotine caused MMP-2/9 release from BAL macrophages with an EC50 of 37.4 nM. Our observations suggest that vaping potentiates protease release from inflammatory cells and disrupts protease-antiprotease balance. **Conclusion:** Chronic vaping may contribute towards enhanced protease levels in lung and may act as an etiological factor for pulmonary diseases. We propose further investigation on the effects of long-term use of these products. **Acknowledgement:** Funded by the NIH/FDA HL120100 and HL135642.

FUNDING: Federal

PA4-2

FLAVOR SOLVENT ADDUCTS IN ELECTRONIC CIGARETTE LIQUIDS ARE MODULATORS OF RESPIRATORY IRRITANT RECEPTORS AND CYTOTOXIC TO HUMAN LUNG EPITHELIAL CELLS

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Significance: The major ingredients of the liquids used in E-cigarettes are nicotine, the solvents propylene glycol (PG) and vegetable glycerin (VG), and flavorants. Some of the popular flavors in E-liquids are cherry, cinnamon and vanilla flavors which are reactive aldehydes that may undergo chemical reactions with other E-liquid constituents under storage conditions. Using Gas Chromatography (GC) to chemically analyze E-liquids and their vapors, we recently discovered the presence of novel flavor-solvent (PG) adducts called aldehyde-PG acetals. These aldehyde-PG acetals were formed in the E-liquids after mixing of the parent E-liquid constituents and at normal storage conditions. The toxicological properties of these PG-acetals have not been studied systematically. Flavor aldehydes cause respiratory irritation and pain through activation of irritant receptors expressed in sensory neurons innervating the airways called the Transient Receptor Potential (TRP) ion-channels (TRPA1 and TRPV1). It is unknown whether

the detected aldehyde-PG acetals also activate these irritant pathways. **Methods and Results:** Using calcium microfluorimetry in cultured HEK 293t cells transfected with cloned human TRPA1 or TRPV1, we observed that the many aldehyde-PG acetals triggered robust activation of these TRP channels, some more efficaciously than their parent flavor aldehyde. While some PG acetals are categorized as GRAS (Generally Recognized As Safe) for scent (perfume) and food applications, their cellular and systemic toxicities, especially in the respiratory system, remain to be examined. Using BEAS-2B cells, a normal human bronchial epithelial cell line, as a cellular model, we conducted a range of cellular toxicity assays and transcriptional approaches to examine inflammatory transcriptional responses. In live/dead and LDH assay, some aldehyde-PG acetals demonstrated more cytotoxicity than parent aldehydes at several concentrations tested. Gene expression analysis demonstrate that PG acetals induce a transcriptional program leading to expression of several pro-inflammatory genes. **Conclusions:** Our data demonstrates that chemical reaction products formed at normal storage conditions in E-liquids like aldehyde-PG acetals have potent pharmacological and toxicological effects that are different from parent constituents.

FUNDING: Federal

PA4-3

EVALUATION OF CELLULAR PROLIFERATION AND MUCUS PRODUCTION IN THE MURINE LARYNX FOLLOWING SHORT TERM WHOLE BODY CIGARETTE SMOKE EXPOSURE

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Significance: The larynx is a vital organ situated at the divergence of the upper and lower respiratory tract that helps coordinate important human functions including swallowing, breathing, coughing and voice production. Despite the high frequency of benign and malignant tobacco product-induced laryngeal diseases, the mechanisms by which cigarette smoke (CS) affect the health of the larynx have been largely unexplored. In order to identify key cellular events that result in smoke-induced laryngeal disease, we examined the early responses of the laryngeal mucosa to cigarette smoke-induced injury. Specifically, we investigated cell proliferation and mucus production in the murine larynx in order to determine the histologic regions of greatest mucosal injury after short-term exposure to mainstream cigarette smoke. **Methods:** Adult C57BL/6J male mice were assigned to a cigarette smoke exposure (CSE), reversibility (REV), or air exposed control group. CSE mice were exposed to CS for 2h/day for 1, 5 or 10 days. REV mice were exposed to CS for 5 days then air-exposed for an additional five days. All mice were administered 5-Bromo-2'-deoxyuridine (BrdU), 2h before euthanasia. Laryngeal tissues were harvested and stained with Alcian blue/Periodic acid schiff (AB/PAS) to evaluate mucus production and BrdU to label proliferative cells. **Results:** The AB/PAS-stained mucus-producing glands of the larynx had a phenotypic area expansion, but was not significantly increased in the CSE or REV groups. Area of AB-positive acidic and PAS-positive neutral mucins were unaltered in CSE group at days 1 and 5. Acidic mucins significantly decreased in the CSE and REV groups ($p \leq 0.0001$) and neutral mucins increased in CSE group ($p \leq 0.05$) on day 10. Cellular proliferation expressed as a measure of BrdU labeling was significantly increased in the laryngeal mucosa of the CSE group at 5 days ($p < 0.0001$) and at 10 days ($p < 0.01$) as compared to the control group. Proliferative index of the REV group was lower than the CSE group ($p < 0.01$) and comparable to the controls. **Conclusion:** Short-term mainstream CS exposure promotes cellular proliferation and alters mucus production in the laryngeal mucosa. These finding may identify the location and types of cells at risk for injury during prolonged exposure and provide insights into the mechanisms underlying tobacco-product induced laryngeal diseases.

FUNDING: Academic Institution



SRNT 2019 PAPER SESSIONS

PA4-4

ASSOCIATION OF ELECTRONIC CIGARETTES USE WITH WHEEZING AND OTHER RESPIRATORY SYMPTOMS IN ADULTS: RESULTS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY, WAVE 2

Dongmei Li, PhD¹, Isaac K. Sundar, PhD¹, Scott McIntosh, PhD¹, Deborah Ossip, PhD¹, Maciej L. Goniewicz, PhD, PharmD², Richard J. O'Connor, PhD², Irfan Rahman, PhD¹. ¹University of Rochester Medical Center, Rochester, NY, USA, ²Roswell Park Comprehensive Cancer Center, Buffalo, NY, USA.

Significance: Wheezing is a symptom of potential respiratory disease and known to be associated with smoking. Electronic cigarettes use, referred as vaping, has increased exponentially in recent years, but no study has examined the association of vaping with wheezing and other respiratory symptoms in adults. The objective of this investigation was to examine the association of vaping with wheezing and other respiratory symptoms in adults from the Population Assessment of Tobacco and Health (PATH) Study. **Methods:** The PATH Wave 2 data collected from October 2014 to October 2015 with 28,171 adults were used to investigate the association of vaping with self-reported wheezing and other respiratory symptoms. Multivariable logistic regression models and cumulative logistic regression models were used with consideration of complex sampling design. **Results:** Among the 28,171 adult participants, 641 adults (1.2%) were established exclusive vapers, 8,525 adults (16.6%) were established exclusive cigarette users, 1,106 adults (2.0%) were dual users, and 17,899 adults (80.2%) were non-users. Compared to non-users, exclusive vapers have significantly elevated risks of wheezing or whistling in chest at any time in the past (aOR, 1.64; 95% CI, 1.30-2.07) or in past 12 months (aOR, 1.61; 95% CI, 1.29-2.00), more than 12 wheezing attacks in past 12 months (aOR, 1.60; 95% CI, 1.24-2.07), sleep disturbed at one or more nights per week due to wheezing (aOR, 1.64; 95% CI, 1.26-2.13), speech limitations to one or two words between breath due to wheezing in past 12 months (aOR, 1.67; 95% CI, 1.28-2.18), dry cough at night not associated with a cold or chest infection (aOR, 1.46; 95% CI, 1.11-1.92), after adjusting age, sex, race, ethnicity, education, income, BMI, duration of vaping, and second-hand smoke exposure. Further analysis including ex-smokers who quitted smoking indicated the prolonged effect of previous smoking on wheezing and other respiratory symptoms. Exclusive vapers who were ex-smokers had doubled the risk of wheezing and other respiratory symptoms compared to never smokers. Current vapers had significantly lower risk in wheezing and other respiratory symptoms compared to established exclusive smokers and dual users. No significant differences in risk of wheezing and other respiratory symptoms were found between dual users and smokers. **Conclusion:** Vaping was associated with increased risk of wheezing and other respiratory symptoms in adults. Dual use does not reduce the risk of wheezing and other respiratory symptoms compared to smoking.

FUNDING: Unfunded; Federal

PA4-5

EXPOSURE TO ELECTRONIC CIGARETTE AEROSOL INCREASES CISPLATIN RESISTANCE IN PHARYNGEAL CANCER CELLS

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Significance: Tobacco smoking is the main risk factor for lung and head and neck cancer. Moreover, continued smoking after cancer diagnosis increases drug resistance and reduces overall survival rate by approximately 50%. Aware of the challenges of smoking cessation and the negative consequences of continued smoking, cancer patients are questioning clinicians on whether they should switch to electronic cigarettes, which are being promoted as a safer alternative to tobacco smoking. To help answer that question, we examined the effects of electronic cigarette aerosol exposure on cisplatin resistance in head and neck cancer cells. **Methods:** Pharyngeal cancer epithelial cells were exposed for 48 hours to electronic cigarette aerosol extracts at doses yielding less than 40 ng/ml of nicotine. Mainstream (MS) smoke was used as a positive control. To assess cisplatin chemosensitivity, cancer cells were subsequently treated with cisplatin (0.1-100 μ M) for 48 h in the presence of electronic cigarette aerosol extracts. Cell viability was assessed by the MTT assay. Data were analyzed by student's *t*-tests and one-way analysis of variance (ANOVA). To determine the half-maximal inhibitory concentration (IC50) values, data were analyzed using GraphPad Prism software. **Results and Conclusions:** Cancer cells exposed to electronic cigarette aerosol, at doses similar to those observed in experienced vapers, and treated with cisplatin showed a significant increase in cell viability compared to those not exposed to extracts. The concentrations of cisplatin needed to induce a 50% reduction in cell growth relative to no cisplatin control cells (IC50 values) were also significantly increased in the presence

of electronic cigarette aerosol extracts. These observations suggest that exposure to electronic cigarette aerosol might increase chemotherapy resistance. Additional studies are needed to fully assess the impact of electronic cigarette use in cancer patients. Nonetheless, our data emphasize the urgent need to further evaluate electronic cigarette safety to ensure evidence-based public health policies and regulations.

Grant support: This work was supported by the Oklahoma Tobacco Research Center, NIH/NCI (R33), Presbyterian Health Foundation, and OCAST. Dr. Queimado holds a Presbyterian Health Foundation Endowed Chair in Otorhinolaryngology.

FUNDING: Federal; State; Academic Institution; Nonprofit grant funding entity



PAPER SESSION 5: ASSESSING THE PROMISE OF NOVEL PHARMACOLOGIC AND NEUROSTIMULATOR THERAPIES

PA5-1

PSYCHEDELIC (5-HT2AR AGONIST) PSILOCYBIN-FACILITATED SMOKING CESSATION: COMPARATIVE EFFICACY VS. NRT

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Significance: We conducted an open-label pilot study testing psilocybin in combination with manualized cognitive behavioral therapy (CBT) in 15 treatment-resistant smokers. Data showed no serious adverse events attributable to psilocybin, and a very promising cotinine-verified point-prevalence abstinence rate of 80% at 6-month follow-up. A 2.5-year follow-up showed a cotinine-verified abstinence rate of 60%. **Methods:** We are currently conducting a comparative efficacy trial randomizing treatment-resistant smokers to a single psilocybin session (on their target quit date) or the transdermal nicotine patch (using FDA guidelines, beginning 24 hours after their target quit date), both in combination with a 13 week program of manualized CBT. Before their target quit date, and after 24 hours of nicotine abstinence, participants undergo fMRI, during which they complete the Multi-Source Interference Task (MSIT), a measure of cognitive control. Participants also complete the task 24 hours after the target quit date. **Results:** Interim results show substantially higher cotinine-verified 12-month abstinence rates with psilocybin (50%, n=10) vs. nicotine patch (n=9, 20%). MSIT results show significant pre vs. post target quit date reductions in the reaction time congruency effect in psilocybin participants (n=9), and no changes in the nicotine patch group (n=7). MSIT congruency effect reaction time was significantly, positively correlated with superior parietal cortex activation during the task for the pre-psilocybin scan for psilocybin participants, but not for the post-psilocybin scan. **Conclusions:** Interim smoking cessation efficacy analyses suggest promising results for psilocybin in comparison to transdermal nicotine patch when both are delivered in combination with CBT. Moreover, preliminary neurocognitive analyses suggest significantly improved cognitive control and a reduction of fMRI response in the superior parietal cortex the day after quitting for the psilocybin group, suggesting psilocybin may improve smoking cessation outcomes by enhancing cognitive control. **Acknowledgements:** NIDA-IRP, Heffter Research Institute, and Beckley Foundation.

FUNDING: Federal; Nonprofit grant funding entity

PA5-2

EXOGENOUS PROGESTERONE FOR SMOKING CESSATION IN MEN AND WOMEN; A DOUBLE-BLIND, PLACEBO-CONTROLLED RANDOMIZED TRIAL

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INTRODUCTION: Women have greater nicotine dependency, have higher rates of relapse, are less likely to achieve long-term abstinence and have greater difficulty quitting than men. One factor that may help explain this sex difference is progesterone. The overall goal of this double-blind, placebo-controlled randomized trial was to examine the effect of oral exogenous progesterone compared to placebo on smoking cessation in treatment-seeking men and women. We hypothesized that participants randomized to active progesterone would be more likely to achieve abstinence compared to those randomized to placebo. **METHODS:** Participants were randomized (1:1 within sex group) to either oral micronized progesterone (200mg twice daily) or placebo. Participants were assigned a quit date approximately 7 days after starting medication (during luteal phase of the menstrual cycle for women) and were followed for 12 weeks to assess relapse. Baseline characteristics were compared between groups. Means with standard deviations (\pm SD) and medians with interquartile ranges (IQR) were reported. Primary abstinence outcomes, including seven-day point prevalence abstinence and days to relapse, were compared between treatment groups using logistic regression (binary variables) or the Kruskal-Wallis Test (continuous variables). **RESULTS:** Participants (N=216; 48% women) were on average 37.1 (\pm 9.6) years of age and smoked an average of 14.2 (\pm 6.6) cigarettes/day. No baseline characteristics differed significantly by randomization within sex group. Compared to women on placebo, women on active

progesterone were two times more likely to be abstinent at week 4 (18 [35.3%] vs. 9 [17.3%] respectively, $p=0.041$) and averaged six more days to relapse than women on placebo (20.5 ± 29.6 vs. 14.3 ± 26.8 respectively, $p=0.03$). No significant differences were found in men. **CONCLUSION:** Exogenous progesterone improved smoking cessation outcomes in women, but not in men. This discovery may be vital to help understand the complex factors that contribute to sex differences in smoking cessation. Our findings may help to inform future research and the further development of exogenous progesterone as a possible smoking cessation aid for women.

FUNDING: Federal

PA5-3

LACK OF EFFECT OF TRANSCRANIAL DIRECT CURRENT STIMULATION ON SHORT TERM SMOKING CESSATION

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Significance: Transcranial direct current stimulation (tDCS) has been shown to improve measures of executive cognitive function and reduce cigarette consumption. Studies conducted to date have been small and the results are mixed. This randomized, double-blind, parallel arm clinical trial tested the effects of active anodal tDCS targeted to the left dorsolateral prefrontal cortex (versus sham) on 7-day smoking cessation in 106 treatment-seeking smokers. **Methods:** Participants received three sessions of sham (n = 35), 1mA (n = 35), or 2mA (n = 36) tDCS in the context of a validated smoking lapse paradigm, then received brief smoking cessation counseling and a monitored quit attempt. The primary outcome was total number of days of abstinence confirmed via exhaled carbon monoxide. **Results:** During the quit period, there were no effects of condition on days of abstinence (sham, M (SD): 2.5 days (\pm 2.5); 1mA: 2.5 days (\pm 2.5); 2mA: 2.4 days (\pm 2.3); $F(2,103) = 0.24$, $p = 0.79$) or on change in daily smoking rate (sham, M (SD): -12.6 CPD (\pm 4.8); 1mA: -11.8 CPD (\pm 4.4); 2mA: -11.7 CPD (\pm 5.3); $F(2,94) = 0.37$). Nor were there effects of condition on latency to smoke or number of cigarettes smoked during the smoking lapse paradigm. Side effects of tDCS were generally mild (<5 out of 10) and participants were not able to distinguish between active and sham treatment. **Conclusion:** These results do not support the efficacy of tDCS for smoking cessation.

FUNDING: Federal

PA5-4

THE IMPACT OF GENDER, OVARIAN HORMONES AND OXYTOCIN ON STRESS REACTIVITY, CIGARETTE CRAVING, AND SMOKING IN A LABORATORY RELAPSE PARADIGM

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Significance: Female cigarette smokers show greater cessation failure compared to male smokers in clinical studies. The maintenance of smoking and relapse is multifactorial; several variables demonstrate impact including stress reactivity, craving, gender, and ovarian hormones. Oxytocin may attenuate stress reactivity and cigarette craving in daily smokers, but work is limited in this area. The current study assessed the influences of gender and ovarian hormones, as well as oxytocin, on stress reactivity, cigarette craving, and smoking behavior among nicotine-deprived, daily cigarette smokers in a laboratory relapse paradigm. **Methods:** Male and female adult (ages 18-45) daily cigarette smokers were enrolled (women oversampled 2:1). This study involved a laboratory session preceded by 14 days of cue and stress reactivity assessments in the natural environment. During the laboratory session, intranasal oxytocin or matched placebo was administered followed by a laboratory-based stressor (Trier Social Stress Test). The roles of gender, ovarian hormones, and oxytocin administration were assessed on measures of stress reactivity, cigarette craving, latency to smoke in a smoking resistance task (proxy of relapse), and ad-libitum smoking. **Results:** Participants were 144 adult smokers (Mean age=31; SD=7.4; 64% female). Following the stressor, female smokers evidenced greater subjective stress and craving than men. However, men demonstrated greater neuroendocrine reactivity (cortisol) and smoking intensity than women. Ovarian hormone levels were not related to stress, craving, or smoking behavior, and oxytocin did not attenuate any aspect of stress, craving, or smoking compared to placebo. **Conclusion:**



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clusions: Gender differences emerged in the current study in predicted directions, but ovarian hormone levels and oxytocin appeared to exert little impact on stress, craving, or smoking metrics following stress induction. Results highlight the complex relationships between gender, ovarian hormones and smoking behavior, as well as the implications for using oxytocin as a potential pharmacological treatment for smoking cessation.

FUNDING: Federal

PA5-5

SOCIOEMOTIONAL PROCESSING TRAITS MODERATE THE ACUTE EFFECTS OF INTRANASAL OXYTOCIN ON SMOKING WITHDRAWAL

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SIGNIFICANCE: Though previous studies indicate that smokers with trait socioemotional processing dysfunction (e.g., hostility) are at increased risk for relapse, there are few systematic studies examining these factors for pharmacological treatment. Here we examined the interaction of social functioning and the acute effects of a novel medication: intranasal oxytocin (inOT), a hormone implicated in social behavior and drug reward. **METHODS:** In this within-subjects study, adult smokers (N=56) completed a baseline session and then 3 experimental sessions following 12-hour smoking abstinence. At baseline participants completed self-report measures of rejection sensitivity, loneliness, fear of negative evaluation, and hostility, as well as a task assessing self-esteem following simulated social exclusion. At each abstinent session, they received a single inOT dose (20, 40 IU) or placebo. Once before and regularly after drug administration, they reported withdrawal symptoms, smoking urge, and anxiety. Ability to refrain from smoking (i.e., latency to smoke [minutes]) was assessed at session's end. **RESULTS:** Overall, analyses of Drug x Trait interactions indicated that inOT had a greater therapeutic effect for participants with higher scores on several measures of socioemotional processing dysfunction. For example, only those with higher hostility reported greater oxytocin-related increases in latency to smoke (Mean[SE]: 40 IU=18.0[3.8] vs. placebo=11.5[3.6]; p=.03). Further, those with higher hostility reported relatively greater oxytocin-related reductions in feelings of anxiety, and those with higher rejection sensitivity and higher reactivity to social exclusion reported greater oxytocin-related reductions in withdrawal symptoms and smoking urge (ps<.01). There were no other significant Drug x Trait interactions. **CONCLUSION:** These data indicate that inOT may be an effective pharmacological treatment for smoking cessation, especially for individuals who may have social processing dysfunctions. Future studies should test the efficacy of this drug in larger-scale phase-II randomized clinical trial of the effectiveness of inOT for smoking cessation in targeted populations. Supported by ACS MRSG-16-165-01 and TRDRP 394035.

FUNDING: State; Nonprofit grant funding entity

PAPER SESSION 6: NUANCES IN NICOTINE REDUCTION

PA6-1

EVALUATING HETEROGENEITY IN THE EFFECT OF REDUCED NICOTINE CONTENT CIGARETTES

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Background: On average, participants randomized to reduced nicotine content (RNC) cigarettes exhibit reduced cigarette use, dependence, and biomarkers of exposure. However, understanding the potential public health impact requires characterizing how individuals respond to reduced nicotine. Machine learning techniques provide powerful tools for simultaneously evaluating a large number of covariates as potential effect modifiers of RNC cigarettes. **Methods:** We analyzed data from two randomized trials. Study 1 (n=661) compared 6 weeks of control (usual brand or 15.8 mg/g SPECTRUM) vs. RNC (0.4 - 2.4 mg/g SPECTRUM) cigarettes. Study 2 (n=443) compared 20 weeks of 15.5 mg/g vs. 0.4 mg/g SPECTRUM among participants with biochemically verified adherence. Our analysis used the Virtual Twins algorithm. Individual treatment effects (i.e. cigarettes per day (CPD) if a participant were randomized to the control group minus CPD if a participant were randomized to the RNC group; TEs) were estimated using the LASSO and regression trees were used to identify sub-groups of the population with differential TEs. **Results:** The mean TE in Study 1 was 6.25 CPD with a standard deviation (SD) of 2.27. No participants had an estimated TE less than 0 while 4% had an estimated TE greater than 10 CPD. The optimal regression tree for summarizing individual TEs was defined by FTND, expired carbon monoxide, and WISDM tolerance and social/environmental goods subscales. Among adherent smokers in Study 2, the mean TE was 4.91 CPD with a SD of 3.48. 8% of adherents had an estimated TE less than 0 and 6% had an estimated TE greater than 10 CPD. The optimal regression tree for predicting individual TEs among adherent participants was defined by age, MNWS score, and total nicotine equivalents. **Discussion:** Our results suggest that there is heterogeneity in the effect of RNC cigarettes on CPD but that the vast majority of smokers benefit from the intervention. Among adherent participants, older smokers with low withdrawal symptoms at baseline had the least benefit, while younger smokers with high withdrawal symptoms had the greatest.

FUNDING: Federal

PA6-2

DO NON-DAILY SMOKERS COMPENSATE FOR REDUCED CIGARETTE CONSUMPTION WHEN SMOKING VERY-LOW-NICOTINE-CONTENT CIGARETTES?

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Significance: The Food and Drug Administration is considering severely restricting the nicotine in cigarettes, to reduce smoking. A study showed that non-daily, intermittent smokers (ITS) randomized to very-low-nicotine-content cigarettes (VLNCCs) reduced their cigarette consumption. **Objectives:** To assess whether increased smoking intensity of VLNCCs compensated for some of the reduced cigarette consumption. **Methods:** After a two-week baseline smoking their own-brand cigarettes, 118 ITS were randomized to VLNCCs (0.07 mg/g nicotine), and 120 to normal-nicotine-content cigarettes (NNCCs; 0.8 mg) for 10 weeks. Laboratory measures of smoking intensity - total puff volume, and carbon monoxide (CO) boost - assessed single cigarettes smoked in up to three laboratory topography sessions. Field measures assessed returned cigarette butts, averaged over up to five two-week intervals: the mass of tobacco burned (computed from residual mass of butts), and the intensity of smoking (by scanning of returned filters). Analysis was by mixed-model random effects models using baseline values as covariates. **Results:** ITS in the VLNCC group puffed less smoke in topography sessions (-38.50 mL [-75.21, -1.78]; p<0.04), but showed no difference in CO boost. Participants in the VLNCC group burned 0.02 [0.04, 0.002] grams less tobacco per cigarette (p<0.03). Analysis of filters showed their smoking intensity declined over time, compared to NNCC participants (p<0.04). "Cheating" by smoking normal cigarettes did not moderate these effects. **Conclusion:** ITS did not increase their smoking intensity



when switched to VLNCs; indeed, their smoking intensity decreased. Reductions in cigarette consumption seen when ITS are switched to VLNCs were not compensated by increased smoking intensity.

FUNDING: Federal

PA6-3

CLINICAL OUTCOMES FROM A RANDOMIZED TRIAL TO COMPARE REDUCING NICOTINE WITH VERY LOW NICOTINE CONTENT CIGARETTES VERSUS REDUCING NUMBER OF CIGARETTES PER DAY

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Significance: Reducing nicotine by switching to very low nicotine content (VLNC) cigarettes has been proposed. Reducing nicotine via number of cigarettes per day (CPD) is common. This trial tests which strategy decreases dependence more, which is more acceptable, and which increases quit attempts (QAs) more. **Methods:** 68 adult smokers of ≥ 10 CPD who were not ready to quit smoked full nicotine study cigarettes ad-lib for one week (baseline). Participants were then randomized to gradually reduce to 3% of baseline nicotine over 4 weeks by either 1) transitioning to lower nicotine content VLNC cigarettes or 2) reducing the number of full nicotine CPD. We provided all participants with nicotine patches to aid reduction. We instructed participants to attempt to smoke only study cigarettes and report use of all (study + non-study) cigarettes via nightly surveys. Participants' percent non-study cigarettes/day was used as a proxy for acceptability. Participants completed the Nicotine Dependence Syndrome Scale (NDSS) at weekly visits and reported QAs lasting any length on nightly surveys. We used multi-level modeling to test change during the study period and condition by time interactions. We used logistic regression and Cox regression survival analyses to test QAs. **Results:** Dependence declined over time for both VLNC and CPD participants but declined more for VLNC (mean decrease in z-score of 1.0) than CPD (mean decrease in z-score of 0.5) participants over time (interaction $p<.05$). CPD participants increased use of non-study cigarettes over time (mean 65.1% increase) but VLNC participants did not (interaction $p<.001$). However, CPD participants were more likely to make a QA during the study period (OR=3.3, $p<.05$) and had a shorter time to first QA (OR=3.2, $p<.05$) than VLNC participants. **Conclusion:** This is the first comparison of VLNC cigarettes vs reducing CPD. Though reducing CPD prompted more QAs, VLNC cigarettes were more feasible and effective at decreasing dependence. One explanation is that VLNC cigarettes disrupted conditioning, which decreased dependence. Reducing CPD could have provided practice not smoking in the presence of cues to smoke, which increased QAs.

FUNDING: Federal

PA6-4

THE EFFECTS OF MENTHOL FLAVORING ON SMOKING BEHAVIOR AND BIOMARKERS OF EXPOSURE IN SMOKERS USING VERY LOW NICOTINE CONTENT CIGARETTES FOR 20 WEEKS

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Background: Nearly 30% of cigarettes sold in the US are menthol flavored. If the FDA moves forward with implementing a low nicotine product standard for cigarettes, it is important to understand how interactions between menthol flavoring and nicotine content may affect the potential benefits of a nicotine reduction policy. **Methods:** Non-treatment seeking smokers at 10 different sites were randomly assigned to an immediate nicotine reduction condition (0.4 mg/g nicotine cigarettes; VLNC), a nicotine step-down condition, or a normal nicotine control (NNC) condition (15.5 mg/g) for 20 weeks. Based on preference, participants received menthol or non-menthol research cigarettes. For this secondary analysis, we used linear and logistic regression to examine if menthol flavoring moderated smoking behavior (cigarettes per day [CPD], abstinence) and biomarkers of toxicant exposure (breath carbon monoxide [CO]; urinary total nicotine equivalents [TNE], 3-hydroxypropylmercapturic acid [3-HPMA] and phenanthrene tetraol [PheT]) in those assigned to the immediate VLNC vs NNC conditions (step-down condition excluded). Regression models included the corresponding baseline values

of the outcome, site, dependence, nicotine metabolite ratio, employment, age, race, education, smoking duration, and baseline values of TNE, CPD, and CO as covariates.

Results: At baseline, menthol (N=346) smokers reported fewer CPD (14.9 vs 19.2), had lower TNE (52.8 vs 71.6 nmols/mg) and CO levels (17.7 vs 20.5 ppm) compared to non-menthol smokers (N=406). 90% of Black participants used menthol cigarettes compared to 26% of White participants. At Week 20, there were significant condition by flavor interactions such that menthol VLNC smokers had smaller reductions in TNE (0.34 vs. 0.19, $p=.035$) and trended toward smaller reductions in CPD (-6.3 vs -9.0, $p=.082$) and CO levels (-2.4 vs -5.3 ppm, $p=.051$) compared to non-menthol VLNC smokers. Odds ratios for CO-verified abstinence at Week 20 were 1.88 (95% CI=0.8, 4.4) for menthol and 9.11 (95% CI=3.3, 25.2) for non-menthol VLNC smokers ($p=.02$). No significant interaction effects were found for 3-HPMA or PheT. **Discussion:** Menthol smokers experienced smaller reductions in cigarette use and spontaneous quitting when using VLNC cigarettes. Future research is needed to determine if a menthol flavor ban would augment the effects of nicotine reduction in order to maximize the public health benefits for menthol smokers.

FUNDING: Federal

PA6-5

HOW TO INTRODUCE NICOTINE REDUCTION TO THE PUBLIC WITHOUT CAUSING MISPERCEPTIONS: EFFECTS OF NICOTINE CONTENT DESCRIPTIONS ON PERCEIVED NICOTINE QUANTITY, ADDICTIVENESS, AND RISK

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Significance: Previous research has indicated that the public misunderstands the harms of very low nicotine content (VLNC) cigarettes. Utilizing best practices for numeric risk communication, we sought to learn how different descriptions of VLNC cigarettes could improve the accuracy of public understanding and perceived risk.

Methods: Participants were a national online convenience sample of 1,352 adults (smokers and nonsmokers) randomized to receive either a control message (FDA's current description of VLNC cigarettes as having a "minimally or non-addictive" nicotine level) or one of 6 experimental descriptions of VLNC cigarettes. Our experimental descriptions tested: 1) use of plain language (e.g., "lower nicotine"), 2) numeric information (e.g., "95% less nicotine"), 3) interpretive information (e.g., "this would make cigarettes nearly nicotine-free"), 4) numeric plus interpretive information, 5) numeric information plus pictographs (images representing the reduction), and 6) numeric information plus pictographs and interpretive information. The survey then asked about the perceived nicotine content and perceived addictiveness compared to current cigarettes (range 1-5). It also asked about the perceived cancer risk of smoking these cigarettes for 30 years, compared to current cigarettes (range 1-5).

Results: The numeric information condition resulted in lower perceived nicotine content (1.91 vs. 2.67), lower perceived addictiveness (2.79 vs 3.73), and lower perceived cancer risk of regular smoking (3.57 vs. 3.96) than the FDA's current wording (all $p<.05$). The conditions adding the pictograph and/or interpretive information to the numeric information were not statistically significantly different from the numeric condition (nicotine content: 1.68-1.91, addictiveness: 2.64-2.69, risk: 3.52-3.68). The plain language condition without numeric information was the least effective. **Conclusions:** Compared to FDA's current language, using numeric information made it clearer that VLNC cigarettes have lower nicotine content and addictiveness than current cigarettes. However, numeric information also increased misperceptions that VLNC cigarettes are less carcinogenic than current cigarettes. More research is needed to optimize communications about VLNC cigarettes to ensure the public understands them accurately.

FUNDING: Federal



PA6-6

QUIT RATES AMONG SMOKERS WITH MOOD AND ANXIETY DISORDERS PARTICIPATING IN A RANDOMIZED CONTROLLED TRIAL OF REDUCED NICOTINE CONTENT CIGARETTES

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Significance: One rationale for reducing the nicotine content in cigarettes is that existing smokers may be more likely to make quit attempts. However, there have been few trials that provide evidence for this hypothesis, particularly in smokers with mood and/or anxiety disorders. **Methods:** Using a randomized double-blind controlled trial design, 188 participants with mood and/or anxiety disorders, who were not planning to quit in the next 6 months, were assigned to receive either Usual Nicotine Content (UNC, 11.6mg/cigarette) cigarettes (n= 94), or a series of gradually Reduced Nicotine Content (RNC, n=94) cigarettes over the course of 18 weeks (last dose 0.2mg/cigarette for 6 weeks). Basic demographics and cigarette behaviors were collected at baseline. At the end of the randomization phase, participants were encouraged to quit and those interested in making a quit attempt were provided with nicotine replacement therapy and brief counseling. A 3 month, intent to treat quit rate was biochemically verified with exhaled CO <9ppm. T-tests, Chi-square, and Fisher's Exact tests were used to determine differences between the groups. **Results:** 188 participants who were randomized (94 UNC, 94 RNC). Groups were similar regarding mean number of cigarettes smoked per day (18.5, SD=9.9), exhaled carbon monoxide (mean 27.7, SD=16.7), time to first cigarette of the day (18.6 minutes, SD=24.9), and nicotine dependence (FTND=5.9, SD=2.3) at baseline. 143 participants were offered cessation treatment (69 RNC group and 74 UNC group). There were no differences between the groups for those who chose to make a quit attempt (33.8% [n=25/74] UNC v. 47.9% [n=33/69] RNC; p=0.12). Among those who chose to quit, participants in the RNC group were significantly more likely to be quit at 3 months (12.0% [n=3/25] UNC v. 45.5% [n=15/33] RNC; p=0.009). The overall ITT quit rate for all randomized participants was 4.3% (4/94) UNC v. 18.1% (17/94) RNC (p=0.004). **Conclusions:** A reduced nicotine content cigarette policy may contribute to additional successful quit attempts among smokers with mood and anxiety disorders.

FUNDING: Federal



NOTES SRNT



SRNT Notes



NOTES SRNT



PODIUM PRESENTATION 3

PAPER SESSION 7: HEALTH WARNINGS: HISTORY AND HOW THEY WORK

PA7-1

EXPLAINING WHY CIGARETTE PACK MESSAGES ABOUT TOXIC CHEMICALS INCREASE FORGOING CIGARETTES: APPLYING THE TOBACCO WARNINGS MODEL

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Significance. In the Tobacco Warnings Model (TWM), pictorial tobacco warnings change behavior through 5 key mechanisms (attention, negative affect, social interactions, cognitive elaboration, and quit intentions). We examined the impact of text-only messages about chemicals in cigarette smoke using the TWM. **Methods.** We recruited 719 adult cigarette smokers in California, US from September 2016 through March 2017. Participants were randomized to receive messages about toxic chemicals in cigarette smoke (intervention) or messages about not littering cigarette butts (control), placed on the side of their cigarette packs for 3 weeks. At the final study visit, surveys assessed the 5 TWM mediators and the outcome of forgoing cigarettes. We examined three types of mediation models: single mediator models; the TWM model with all 5 mediators; and a trimmed model that excluded variables that were not statistically significant mediators in the full model. **Results.** Chemical messages increased smokers' forgoing of cigarettes ($p < .05$). In single mediator analysis, the effect of chemical messages on forgoing was due to negative affect, social interactions, and cognitive elaboration (all $p < .05$). The full TWM model fit the data poorly. After dropping variables that were not mediators in the full model (attention, intentions and social interactions), the trimmed model fit the data well (RMSEA=.04; CFI=.99; chi-square=4, ns). In this model, chemical messages increased negative affect, which was associated with more forgoing, directly as well as indirectly through cognitive elaboration. **Conclusions.** Negative affect plays a central role in explaining the effect of cigarette pack chemical messages on smokers' forgoing of cigarettes. The TWM offers new insights into the mechanisms through which text-only cigarette pack messages do and do not change smoking behavior.

FUNDING: Federal

PA7-2

TESTING MESSAGES COMMUNICATING ABOUT NICOTINE AND COMPARATIVE RISK OF ELECTRONIC AND COMBUSTED CIGARETTES

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Objective: FDA requires e-cigarettes to carry an addiction/nicotine warning. However, because most people incorrectly believe nicotine causes smoking-related disease, this warning may offset the intended effects of comparative risk messages that communicate that e-cigarettes are less harmful than cigarettes. This research evaluates that and tests if providing a nicotine facts sheet might mitigate potentially negative effects of the addiction warning on comparative risk messages about e-cigarettes. **Method:** In an online experiment, 1,906 U.S. adult smokers or recent quitters were randomized to 1 of 5 message conditions: 1) comparative risk messages about e-cigarettes and cigarettes, 2) comparative risk messages with an addiction warning, 3) comparative risk messages with an addiction warning and a nicotine facts sheet, 4) a nicotine facts sheet alone, and 5) control messages. General linear models and logistic regressions analyzed participants' beliefs and behavioral intentions measured after message exposure. **Results:** Comparative risk messages with an addiction warning (condition 2) produced lower dual use intentions than messages without a warning (condition 1). Compared to control, all message conditions (except condition 4, the nicotine fact sheet alone) increased smokers' beliefs that using e-cigarettes can reduce health-related risks,

intentions to switch completely to e-cigarettes, and lowered perceived comparative risk of e-cigarettes. Comparative risk messages with an addiction warning and a nicotine facts sheet (condition 3) produced higher self-efficacy belief about completely switching to e-cigarettes than control and increased efficacy beliefs that using e-cigarettes can reduce health-related risks compared to other comparative risk messages (condition 1 & 2). **Discussion:** Addiction warning did not reduce the intended effects of comparative risk messages on smokers. Communicating facts about nicotine health effects in conjunction with comparative risk messages and addiction warnings might be particularly effective.

FUNDING: Federal

PA7-3

EFFECTS OF PLAIN PACKAGING AND GRAPHIC HEALTH WARNING LABELS ON COMBUSTIBLE CIGARETTE USE, RISK PERCEPTIONS, AND HARM EXPOSURE: RESULTS FROM A RANDOMIZED TRIAL

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Significance: Placing plain packaging and graphic health warning labels on combustible cigarettes are potential regulatory strategies that may be implemented to improve public health. There is limited data, however, rigorously addressing how these actions affect cigarette use, exposure, and risk perceptions. We examined the effects of cigarette packaging and health warning labels on cigarette smoking behaviors (i.e., daily cigarette consumption), carbon monoxide (CO) exposure, and risk perceptions using data from the first experimental period of a 50-day randomized trial.

Methods: Participants (67.1% male, 74.7% White, mean age = 42.8, mean cigarettes per day [CPD] = 16.2) were 160 non-treatment-seeking, non-menthol, daily smokers. After using their own preferred brand cigarettes for a 5-day baseline period, smokers were randomly assigned to unknowingly receive their preferred cigarettes in gold, red, or plain packages affixed with either pictorial or text-only health warnings for a 15-day experimental period free-of-charge. Analysis of covariance models examined effects of packaging, warning label, and their interaction on each outcome averaged across the experimental period, controlling for baseline values.

Results: Daily cigarette consumption during the 15-day experimental period differed marginally by cigarette packaging ($p = .09$), independent of warning label: smokers randomized to the plain packages smoked fewer CPD compared to the gold ($p = .04$) and red packages ($p = .15$). There were no significant effects on onset CO or CO boost. Smokers' risk perceptions during the experimental period differed significantly by warning label ($p = .002$): regardless of packaging color, smokers randomized to receive cigarettes with text-only (vs. graphic) warning labels held more incorrect product risk perceptions.

Conclusions: Findings suggest that plain packaging may decrease smoking behaviors while graphic warnings may increase knowledge of negative consequences of smoking. These results may be used to inform regulatory decisions regarding cigarette packaging and health warning labels.

FUNDING: Federal

PA7-4

ASSUMPTION OF RISK AND THE ROLE OF HEALTH WARNINGS LABELS IN THE UNITED STATES

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Objective: The full story of how cigarette health warning labels (HWLs) came about in the mid-1960s in the United States is not very well known. This paper examines the origins of the 1966 cigarette pack warning and the cigarette industry's effort over the past 60 years to shift the responsibility for the harms caused by cigarettes to smokers and away from the manufacturer. **Methods:** The data for this paper come from four main sources: 1) the 1989 Surgeon General's Report on smoking and health and information on the history of HWLs; 2) information pertaining to HWLs on cigarette packages as required by the 2009 Family Smoking Prevention and Tobacco Control Act (FSPTCA); 3)



previously secret and confidential tobacco industry documents (e.g., memoranda, etc.) from cigarette manufacturers that describe their efforts to craft legislation on cigarette HWLs; and 4) a review of the legal challenges by cigarette manufacturers that shaped the final language used in corrective statements as originally ordered by a federal judge as a result of the 2006 ruling in the US Department of Justice (DOJ) case against cigarette manufacturers. **Results:** Eleven days after the Surgeon General's Advisory Committee (SGAC) issued its 1964 Report, the US Federal Trade Commission (FTC) proposed a rule that would have required HWLs in cigarette advertising and on cigarette containers telling smokers that cigarettes may cause cancer and premature death. However, this rule was preempted by Federal legislation passed by the US Congress which instead mandated a single watered down cigarette pack HWL which excluded cigarette advertising, just as industry lawyers had recommended days after the SGAC Report was released. Congress continued to exert its control over HWLs over the next several decades. The more recent history surrounding HWLs as mandated in the 2009 FSPTCA and the language in the court-ordered corrective statements shows again how cigarettes companies continue to work to deflect responsibility for their failure to tell the truth about their products to their customers. **Conclusion:** It appears the cigarette companies had a role in shaping and perhaps even drafting the law that resulted in the original 1966 HWL on cigarette packs since the legislation included virtually everything the cigarette industry's lawyers had originally decided should be part of any congressional action taken.

FUNDING: Unfunded

PA7-5

THE EFFECT OF GRAPHIC WARNING LABELS ON THE SENSITIVITY TO CIGARETTES PACK PRICES

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SIGNIFICANCE: Cigarette packaging contains tobacco marketing. A World Health Organization (WHO) treaty has mandated graphic health warnings on cigarette packaging, but these have not been implemented in the US. We investigate US smokers' sensitivity to cigarettes pack prices across 1) current US packaging, 2) blank packaging, and 3) approved Australian graphic warning packaging. **METHOD:** Adult daily smokers in the San Diego metropolitan area (N=288; 49% Female; Mean age=39.5 [SD=12.4]; Mean Fagerström Test for Nicotine Dependence score=3.9 [SD=2.3]) completed a conjoint analysis study (a marketing technique to determine the relative importance of product packaging attributes) and surveys of nicotine dependence, avoidance of displaying smoking behavior, and sociodemographics. Repeated measures general linear models tested the hypothesis that smokers would require significant price discounts to willingly purchase cigarettes packaged without marketing materials or with graphic warning labels relative to their standard US pack. We also modeled dependence and avoidant behavior by packaging type interactions. **RESULTS:** Significant main effects were observed with smokers requiring an estimated \$0.63 price discount ($b=-0.63 \pm 0.22$, 95%CI=-1.07, -0.20, $p<0.01$) to purchase blank packaging and a \$4.67 price discount ($b=-4.67 \pm 0.22$, 95%CI=-5.11, -4.23, $p<0.001$) to purchase graphic image packaging compared to current US packaging. Significant interactions with the graphic warning pack (vs. US pack) were observed with more dependent smokers less influenced ($b=0.24 \pm 0.09$, $p<0.05$) and smokers with avoidant behavior more influenced ($b=-1.28 \pm 0.37$, $p<0.001$). **CONCLUSION:** US daily smokers indicate a need for significant price discounts if they were to purchase packs labeled with graphic warnings compared to current US packs and this association was moderated by both dependence and avoidance of displaying smoking behavior. These data suggest that, were the FDA to mandate graphic warning labels on US cigarette packs, then this would influence smoking behavior. We are testing this hypothesis in a randomized trial where US smokers buy their cigarettes re-packaged into plain or Australian-like graphic warning packs.

FUNDING: Federal; State

PAPER SESSION 8: IMPACT OF TOBACCO CONTROL POLICIES ON BEHAVIOR

PA8-1

IMPACT OF LARGE AND SUSTAINED RECENT INCREASES IN TOBACCO TAXES ON AUSTRALIAN SMOKING PREVALENCE

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Significance: Large increases in tobacco excise have been a crucial component of Australia's approach to reducing smoking prevalence since 2010.

Method: We used data from a monthly survey of those aged 14+ years from Australia's five largest capital cities from May 2001 to April 2017 to investigate effects on smoking prevalence. Using segmented regression analysis we examined monthly smoking prevalence interruptions and trends for the total population, for population subgroups and for use of tailor-made cigarettes (TMC) and roll-your-own tobacco (RYO) for (a) May 2001 to April 2010, with no real excise increases, (b) May 2010 to November 2013, following a 25% excise increase in late April 2010, and (c) December 2013 to April 2017, with December 2013 being the start of two sets of four annual 12.5% excise increases pre-announced in August 2013 and May 2017. We adjusted for other tobacco control policies and variation in exposure to mass media campaigns.

Results: The 25% increase was associated with an immediate and sustained drop in overall smoking prevalence, largely driven by a drop in TMC prevalence, but RYO prevalence increased over the period. In general, effects were more pronounced among younger smokers and those of lower socio-economic status (SES). The start of annual 12.5% increases was also associated with an immediate drop in overall prevalence. Prevalence then declined more steeply than during the 25% increase period, driven by both a decline in TMC prevalence and an arrest of the previously increasing RYO prevalence. Immediate effects were evident especially among older and low SES smokers, but ongoing effects were more universal.

Conclusion: Tobacco excise increases continue to reduce Australian smoking prevalence particularly among disadvantaged groups. To maximise effectiveness of large and ongoing excise increases and reduce product substitution, nations should structure taxes so that RYO prices increase in line with price increases in TM cigarettes. Standardization of pack/pouch size and imposition of floor prices would further reduce ability of companies to market product offerings that are cheaper upfront or which otherwise confuse price signals after tax increases.

FUNDING: Nonprofit grant funding entity

PA8-2

INVESTIGATING SWITCHING BETWEEN TOBACCO PRODUCTS IN RELATION TO IMPLEMENTATION OF PLAIN PACKAGING LEGISLATION IN THE UNITED KINGDOM

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Background and aims: In 2016 the United Kingdom implemented plain packaging legislation with an aim to further reduce smoking prevalence by discouraging uptake and encouraging quitting among existing smokers. Current evidence suggest that the new legislation was associated with considerable changes in tobacco market and pricing which is likely to lead to switching between products and brands. The aim of this study was to investigate switching patterns between various tobacco products over time and explore whether implementation of plain packaging was associated with changes in switching behaviour. **Methods:** We used data from Kantar Worldpanel (KWP) which follows a representative panel of households from Great Britain. For this study we used data from 2011 to 2018. KWP data allow to identify changes in tobacco products purchasing among households and infer switching between tobacco products, brands and price quartiles. We also commissioned KWP to conduct a survey with panel members who had changed their tobacco purchasing behaviour within six months after the legislation was fully in place, and asked them to explain the reasons for their behaviour. **Results:** Our results from graphical analysis showed that switching between brands, pack sizes and price increased around implementation of plain packaging legislation. Our survey data analysis suggested that when they were asked about hypothetical changes in their



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behaviour (n=130) main reason for buying a different brand was price (for more than 70%). For 45% of those who actually switched between brands or brand variants (n=46) the main reason for doing so was product availability. **Conclusions:** This study used dataset that has not been used before in tobacco research and allows tracking of tobacco product purchasing behaviour over time. It appears that switching behaviour has intensified with the implementation of the plain packaging legislation. However, switching was mainly associated to changes in product sizes and pricing but not directly due to plain packaging. **Funding:** This work was supported by Cancer Research UK [grant number C45256/A20606]

Funding: Federal; Nonprofit grant funding entity

PA8-3

CHANGES IN MENTHOL AND NONMENTHOL CIGARETTE SALES IN ONTARIO AFTER THE 2017 MENTHOL SALES RESTRICTION

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SIGNIFICANCE: The Canadian province of Ontario prohibited the sale of menthol tobacco products, including cigarettes, beginning January 1, 2017. Analyzing the impact of these restrictions can inform potential FDA regulatory actions on flavored tobacco products. We assessed initial changes in unit sales of menthol cigarettes to determine the degree to which the menthol restriction had its intended impact on sales of these products in Ontario. **METHODS:** We acquired Universal Product Code-level retail scanner data from The Nielsen Company for cigarette sales in food, department, convenience, and gas stores in Ontario and a comparison province without a menthol restriction (British Columbia). We assessed changes in unit sales of menthol cigarettes from the first 24 weeks of 2016 (pre-restriction) to the first 24 weeks in 2017 (post-restriction) to control for seasonal effects and possible pre-restriction hoarding behavior by menthol cigarette smokers. **RESULTS:** In Ontario, sales of menthol cigarettes decreased from 596 packs per capita pre-restriction to 41 packs per capita post-restriction, a 93.2% reduction. By comparison, per capita pack sales of menthol cigarettes decreased by 2.3% in British Columbia during the same period. We did not see evidence of widespread substitution of non-menthol cigarettes; indeed, sales of non-menthol cigarettes increased by only 0.4% in Ontario from pre- to post-restriction compared with a 3.2% decrease in per capita non-menthol pack sales in British Columbia. **CONCLUSIONS:** Ontario's menthol restriction resulted in a dramatic decrease in sales of menthol cigarettes in the months following the restriction's implementation, a different pattern from sales in a comparison province. Ontario did not experience a compensatory shift to sales of non-menthol cigarettes. This suggests that fewer menthol cigarettes were consumed after Ontario's restriction, which could have positive public health impacts.

Funding: Federal

PA8-4

IMPACT OF THE 'STOPTOBER' SMOKING CESSATION CAMPAIGN IN ENGLAND FROM 2012 TO 2017: A QUASI-EXPERIMENTAL REPEAT CROSS-SECTIONAL STUDY

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Significance: The national 'Stoptober' campaign for collective quitting was implemented in 2012 in England. We aimed to assess overall impact of the Stoptober campaign over its first 6 years, the consistency of impact over the campaign years and the role of the campaign budget. **Methods:** We used data of 51,399 adult smokers and ex-smokers in 132 monthly surveys to compare past-month quit attempt rates between 1) October and other months in the year in 2007-2011 compared with 2012-2017, 2) October and other months across the years 2012-2017, and 3) October and other months in high-budget (2012-2015) compared with low-budget Stoptober campaigns (2016-2017). Logistic regression analyses were adjusted for month of the year, month of the study, socio-demographics, tobacco control policies, tax increases, and mass media campaign expenditure. For non-significant results, Bayes factors (BF) were calculated to differentiate insensitive data and evidence to support the absence of an effect. **Results:** The data were somewhat insensitive, but supported there being an overall change between pre-2012 and 2012 onwards in the difference between quit attempts in October and

other months (OR: 1.30, 95%CI: 0.97 to 1.75; BF=2.1): in 2012-2017, quit attempts were more prevalent in October vs. other months (OR: 1.24, 95%CI: 1.00 to 1.53), whereas the prevalence was similar in 2007-2011 (OR: 0.95, 95%CI: 0.76 to 1.18; BF=0.2). The difference in attempts between October and other months was large in 2012 (OR: 1.92, 95%CI: 1.23 to 2.98) and 2015 (OR: 1.84, 95%CI: 1.14 to 2.95), but similar in 2013-2014 and 2016-2017 (0.36<BF<1.02). The data were somewhat insensitive, but supported an interaction with campaign budget (OR: 1.50, 95%CI: 0.92 to 2.44; BF=2.2): the difference between attempts in October and other months was higher in years with high campaign budgets (OR: 1.35, 95%CI: 1.06 to 1.73) than years with low campaign budgets (OR: 0.90, 95%CI: 0.59 to 1.39). **Conclusion:** Over the first 6 years of Stoptober campaigns, there appears to have been an overall increase in past month quit attempts during October in England. The associated increase was inconsistent across campaigns and appears to have been greater when the campaign budget was higher.

Funding: Nonprofit grant funding entity

PA8-5

DO LOCAL TOBACCO-21 LAWS REDUCE SMOKING AMONG 18 TO 20 YEAR-OLDS?

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Introduction: In the United States, more than 300 sub-state jurisdictions have raised their minimum legal sales age for tobacco to 21. Yet evidence suggests that consumers routinely evade local tobacco policies by driving to neighboring regions with less restrictive laws. Thus, local tobacco-21 policies' effectiveness remains unclear. To address this, we consider the relationship between such policies and smoking among 18 to 20 year-olds in U.S. urban areas.

Methods: Data are from the 2011 - 2016 Behavioral Risk Factor Surveillance System's Selected Metropolitan/Micropolitan Area Risk Trends datasets, with consideration limited to pre-June-2016 interviews to sidestep the influence of California's state-wide tobacco-21 law. (Hawaii, the only state that implemented a tobacco-21 law before California, was not represented in these data.) Quasi-experimental regression analyses estimate how exposure to local tobacco-21 laws is related to current established smoking among 18 to 20 year-olds.

Results: For all MSAAs in these data, residents were at most partially exposed to a tobacco-21 law; that is, these policies covered only a subset of their MSAAs. Accounting for partial exposure, regression estimates indicate that the average 18 to 20 year-old who was exposed to a tobacco-21 policy exhibited a 1.1 percentage point drop in their likelihood of being a current established smoker at interview, relative to unexposed respondents of the same age.

Conclusions: Exposure to local tobacco-21 policies yields a substantive reduction in current established smoking among 18 to 20 year-olds in U.S. urban areas. This result provides support for such policies, and suggests that state regulations preempting sub-state tobacco-21 laws may hinder public health.

Funding: This research was supported by the Robert Wood Johnson Foundation Evidence for Action Program.

Funding: Nonprofit grant funding entity



PAPER SESSION 9: ASSOCIATION OF E-CIGARETTE USE WITH SMOKING AND CESSATION

PA9-1

THE EFFECTIVENESS AND SAFETY OF COMBINING NICOTINE PATCHES WITH E-CIGARETTES (WITH AND WITHOUT NICOTINE) AND BEHAVIORAL SUPPORT, ON SMOKING ABSTINENCE: FINDINGS FROM A LARGE RANDOMISED TRIAL

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Background: Combination cessation treatments (e.g. long-acting nicotine patch plus fast-acting nicotine gum) show additive cessation benefits, as does the inclusion of moderate intensity behavioral support. However, the combination of nicotine patches with nicotine e-cigarettes (ECs) has not yet been evaluated, nor has their use with more intensive behavioral support. **Aim:** To assess the effectiveness and safety of combining nicotine patches with ECs (with and without nicotine) and behavioral support on smoking abstinence at six months. **Method:** Pragmatic, three-arm, community-based randomized trial undertaken in New Zealand (2015-2018). Daily/non-daily smokers who were aged ≥ 18 years, naive EC users, and motivated to quit smoking, were recruited using multi-media advertising. Participants were randomized by computer, using stratified block randomization (1:4:4 ratio), to 14 weeks of 21mg nicotine patches, 21mg nicotine patches and 18mg nicotine ECs, or 21mg nicotine patches and nicotine-free ECs. All participants received six weeks of weekly withdrawal-oriented behavioural support calls. Participants/researchers were masked to the nicotine content of the e-cigarettes. The primary outcome was six month, carbon monoxide-verified continuous abstinence from smoking. Secondary outcomes, measured at quit date, then one, three, six and 12 months post-quit date included seven-day point prevalence abstinence, continuous abstinence, time to relapse, self-efficacy, compliance, and side effects/serious adverse events. **Results:** 1,124 smokers were randomized (125 to patches, 500 to patches plus nicotine ECs, and 499 to nicotine plus nicotine-free ECs). At six months, verified abstinence was 2.4% (3/125) with patches, 7.0% (35/500) with patches plus nicotine ECs, and 4.0% (20/499) with patches plus nicotine-free ECs (risk difference for patch vs patch plus nicotine ECs: 4.60, 95% CI 1.11-8.09; and for patch plus nicotine ECs vs patch plus nicotine-free ECs: 2.99, 95% CI 0.17-5.81). No significant differences in serious adverse events (SAEs) was found (4 events in the patch group, 18 events in the patch plus nicotine ECs group, 27 events in the patch plus nicotine-free ECs group), and no evidence of an association between any SAEs and study products. **Conclusion:** When combined with moderate intensity behavioral support, patches plus nicotine ECs are superior to both patches combined with nicotine-free ECs and patches alone at helping smokers quit smoking, with no significant increase in self-reported SAEs

FUNDING: Other

PA9-2

A RANDOMIZED PLACEBO-CONTROLLED TRIAL OF THE EFFECTS OF ELECTRONIC CIGARETTES IN CIGARETTE SMOKERS: CIGARETTE SMOKING AND CARBON MONOXIDE

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Significance: Electronic cigarettes (ECIGs) are a heterogeneous tobacco product class used by increasing numbers of cigarette smokers despite uncertain health effects. This randomized placebo-controlled trial examined the influence of ECIG use among current cigarette smokers on measures that included cigarette use behavior and toxicant exposure. **Methods:** Current smokers (N=520; $>=10$ cigarettes/day [CPD] for $>=1$ year) interested in reducing cigarette intake (but not quitting) were randomized to one of four 6-month conditions and received either an eGO-style ECIG paired with 0, 8, or 36 mg/ml nicotine liquid (administered double-blind) or a cigarette-shaped plastic tube (CIG-SUB). Self-reported CPD and expired air carbon monoxide (CO) were measured at 8 study visits (among other outcomes). This preliminary analysis uses linear mixed models followed-up

by Bonferroni-adjusted mean comparisons to examine the influence of condition and time on CPD and CO ($p<0.05$). Analyses were completed 1) using all available data and 2) restricted to those who attended 1-, 4-, and 6-month post-randomization study visits.

Results: On average (SD), participants were 46 years old (12), 41% male, 68% White, 32% AA/Black or Other, and smoked 20 CPD (8) at baseline (no significant between-condition differences). Main effects and a significant interaction of condition and time were observed for CPD, and significant main effects of condition and time were observed for CO. Mean CPD was significantly lower in the ECIG conditions relative to CIG-SUB with the greatest effects in the 36 mg/ml ECIG condition in both analyses. Mean CO was lower for the 8 and 36 mg/ml ECIG conditions relative to the 0 mg/ml ECIG and CIG-SUB conditions at most timepoints in both analyses. **Conclusions:** This preliminary analysis of data from a trial using ECIGs with known nicotine delivery profile indicates that ECIGs can alter cigarette use behavior and associated toxicant exposure. Greater effects observed for the nicotine-containing ECIG conditions highlight the importance of nicotine delivery. Further analyses of other outcomes, including ECIG use behavior and urinary biomarkers of tobacco exposure, will augment these findings.

FUNDING: Federal

PA9-3

PREVALENCE AND CORRELATES OF SWITCHING TO EXCLUSIVE E-CIGARETTE USE AMONG DAILY SMOKERS: FINDINGS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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Significance: Completely substituting e-cigarettes (e-cigs) for combusted tobacco reduces a smoker's exposure to many toxicants and may result in reduced adverse health outcomes. We sought to examine demographic differences in this harm reduction behavior among daily smokers to assess its potential impact on health disparities.

Methods: Using adult data from Waves 1 and 2 of the PATH Study (2013/14 - 2014/15), we documented tobacco use transition patterns among individuals who were daily smokers of a combusted product at Wave 1 (n=7,604). Chi-square tests examined associations between demographic characteristics and the prevalence of (1) remaining a smoker, (2) neither smoking nor using e-cigs, or (3) exclusively using e-cigs at Wave 2.

Results: Overall, 92.3% of daily smokers at Wave 1 were still using a combusted product at Wave 2, 5.7% were neither smoking nor using e-cigs, and 2.1% had switched to exclusive e-cig use. Harm reduction via complete e-cig substitution was significantly more common among adults ages 18-34 (2.7%, $p=0.003$) and those with some college education or more (2.8%, $p=0.003$). Indeed, adults with at least some college education constituted 42% of the overall sample, but 57% of those who became exclusive e-cig users. The prevalence of switching to exclusive e-cig use was lowest among non-Hispanic Black adults (1.6%, $p=0.013$), those with a household income below the federal poverty level (1.5%, $p=0.002$), and those with less than a high school education (1.3%, $p=0.003$). The prevalence of neither smoking nor using e-cigs at Wave 2 followed similar patterns. **Conclusions:** Mirroring well-documented disparities in smoking cessation, harm reduction among daily smokers via switching to exclusive e-cig use was less common among vulnerable populations. Though e-cigs have the potential to help heavily addicted smokers quit, population-level differences in product substitution may ultimately widen existing smoking-related health inequities.

FUNDING: Federal

PA9-4

IS THE USE OF E-CIGARETTES ASSOCIATED WITH RELAPSE TO SMOKING?

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Background: After an attempt to quit smoking, 84 to 98% relapse. There is no evidence whether the use of e-cigarettes ('vaping') increases or decreases relapse. This study aimed to assess 1) the association of vaping and subsequent relapse to smoking among ex-smokers; 2) the association of socio-demographics, vaping characteristics and subsequent relapse in a sample of vapers. **Methods:** Data came from a longitudinal web-based survey of smokers, ex-smokers and vapers in the UK, focusing on wave 4 (baseline, 2016, n=3334) and wave 5 (follow-up, 2017, n=1720). Only those abstinent from smoking ≥ 2 months at wave 4 and followed-up at wave 5 were included. Adjusted and unadjusted logistic regressions were conducted. For aim 1 (n=374), relapse was



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regressed onto: vaping status, demographics and current NRT use. For aim 2 (n=224), relapse was regressed onto: vaping frequency, socio-demographics, current NRT use, e-cigarette type and nicotine strength. **Results:** Among ex-smokers, there was some evidence that compared with non-use of e-cigarettes, non-daily use was associated with increased relapse (unadjusted: OR=3.32, 95% CI:1.23-8.96, $p=0.018$; adjusted: OR=2.71, 95% CI:0.98-7.51, $p=0.055$). Among vapers, weekly use compared to non-use was associated with increased relapse (unadjusted: OR=3.38, 95% CI:1.07-10.64, $p=0.037$; adjusted: OR=3.54, 95% CI:1.10-11.40, $p=0.034$). Daily and ever/past use were not significantly associated with relapse. For aim 1, younger age groups were more likely to relapse than those aged 55+, with the highest odds in the 18-24 group (adjusted OR=3.96, 95% CI:1.69-9.25, $p=0.001$). For aim 2, those aged 18-39 were more likely to relapse than the over 40s, but only in unadjusted analysis (OR=0.53, 95% CI:0.30-0.96, $p=0.036$). Modular devices were associated with reduced relapse compared to disposable and refillable devices (adjusted OR=0.28, 95% CI:0.09-0.89, $p=0.030$). **Conclusion:** Non-daily users of e-cigarettes were more likely to relapse than non-users, daily and ever/past users were not. Younger ex-smokers had an increased risk of relapse.

FUNDING: Nonprofit grant funding entity

PA9-5

CONFLICTING E-CIGARETTE RECOMMENDATIONS INCREASE CYNICAL BELIEFS IN CURRENT AND FORMER SMOKERS: EVIDENCE FROM A RANDOMIZED CONTROL TRIAL

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Significance: Smokers receive conflicting recommendations (CR) from credible scientific health organizations (e.g., American Heart Association, American Cancer Society 2018) about e-cigarettes for smoking cessation. CR may affect cynical beliefs (CB) about e-cigarettes, including distrust in manufacturers for keeping vapers addicted to nicotine and luring children to vape. This paper develops a scale of e-cigarette CB and measures the impact of CR on CB amongst current and former smokers. Methods: Current (N=408) and former smokers (N=309) were recruited in an online sample from Survey Sampling International and randomly assigned to one of five conditions: 1) CR about e-cigarettes for cessation, recommendations 2) favoring and 3) not favoring e-cigarettes for cessation, 4) information about e-cigarettes without recommendations, and 5) a no-message control. All messages were from credible scientific health organizations and attributed as such. After randomization to condition and message exposure for the four message conditions, subjects responded to a four-item scale of CB about e-cigarettes (5-point Likert scale, 1="strongly disagree," 5="strongly agree," mean=3.87, standard deviation=0.88, alpha=0.84). Results: Analysis of variance was used, with planned contrasts between exposure to CR and both the information message and no-message control conditions. There was a main effect of condition on CB, $F(4,697)=3.28$, $p<.01$, partial eta-squared=.03. Planned contrasts revealed exposure to CR increased CB compared to the no-message control, $F(1,697)=4.22$, $p=.01$. There was a significant interaction between condition and current smoking status ($F(4,697)=2.835$, $p=.02$, partial eta-squared=.01) such that former smokers exposed to CR hold more CB than current smokers exposed to CR. There was no interaction effect for ever-vapers by condition. Conclusion: This project contributes a valuable scale for CB and demonstrates the impact of CR on CB for current and former smokers, a pressing question as credible scientific organizations remain in disagreement. Further research should explore the causal link between CB and e-cigarette intentions, especially amongst current smokers.

FUNDING: Federal



NOTES SRNT



SRNT Notes



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PODIUM PRESENTATION 4

PAPER SESSION 10: BIOLOGICAL AND COGNITIVE EFFECTS OF NICOTINE

PA10-1

SINGLE-CELL RNA-SEQUENCING OF HUMAN EMBRYONIC STEM CELL DIFFERENTIATION DELINEATES ADVERSE EFFECTS OF NICOTINE ON EMBRYONIC DEVELOPMENT

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Maternal smoking during pregnancy is an established risk factor for a range of gestational complications and organ disorders in the offspring, including miscarriage, low birth weight, preterm birth, and perinatal death. Furthermore, there are known links between maternal smoking and adverse neurobehavioral, cardiovascular, respiratory, endocrine and metabolic outcomes in the offspring, which can persist into adulthood. However, the underlying mechanisms for these pathologies are not completely understood. Human embryonic stem cells (hESCs), derived from human blastocysts, can undergo spontaneous differentiation and form a three-dimensional structure called embryo body (EB), which contains cells from all three germ layers. hESCs and EBs are powerful models to simulate early developmental process *in vitro*, from pre-implantation epiblasts to lineage-committed progenitors. In this study, we use high throughput single-cell RNA-sequencing (scRNA-seq) to profile the adverse effects of nicotine on early differentiation lineages within human EBs. We present a single cell resolution genetic landscape of early hESCs differentiation that includes multiple important lineages such as neural, muscle, endothelial, stromal, liver, and epithelial cells. Through gene expression analysis, we find that nicotine causes cell death and mitochondrial dysfunction, increases response to reactive oxygen species and inflammatory in all cell lineages. Nicotine also causes lineage-specific effects, and affects chaperone-mediated autophagy and the astrocyte development in neurons; microRNA transport and blood vessel maturation in endothelial cells; non-canonical Wnt, BMP, MAPK signaling pathway and epithelial tube formation in epithelial cells; JUN kinase and p53 binding and calcium-mediated signaling in muscle cells; glycolytic process and toxin transport in liver cells; fibril organization and nutrient levels in stromal cells. Our single-cell analysis reveals the cellular-state effects of nicotine exposure during hESCs early differentiation, offering new insights that can be harnessed to evaluate drug or environmental factor toxicity on early human development.

FUNDING: Unfunded

PA10-2

GUT, BRAIN, AND NICOTINE ADDICTION: NICOTINE SELF-ADMINISTRATION IS ASSOCIATED WITH CHANGES IN GUT MICROBIOTA AND ACCUMBENS PRO-INFLAMMATORY CYTOKINES

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Nicotine addiction produces long lasting changes within the reward circuitry, including the nucleus accumbens core (NAcore). As well, we have recently found that nicotine seeking motivation induces rapid increases in the pro-inflammatory cytokine, tumor necrosis-alpha (TNF α) within the NAcore. An emerging field of study indicates a potential relationship between gut microbiota and exposure to drugs of abuse, however, it is unknown if changes in gut microbiota occur due to nicotine self-administration, and if these changes are associated with neuroinflammation within the NAcore. Male Sprague-Dawley rats were trained to self-administer nicotine (0.02 mg/kg/infusion, paired with conditioned cues) or were administered non-contingent saline infusions. Rats were then moved into extinction, followed by cue-induced reinstatement. Rats were then sacrificed for Western blot analysis. Fecal samples were collected prior to behavioral sessions, as well as immediately following their last self-administration session, on the first day of extinction (early withdrawal), the last day of extinction (late withdrawal), and immediately following reinstatement. Samples were then analyzed for microbiome composition. Prior to behavioral sessions, rats from the nicotine and saline groups showed no differences in gut microbiome composition. Following nicotine self-administration and during

every withdrawal timepoint, the gut microbe Prevotellaceae was present. However, this microbe was rarely present in saline-administered animals (Post Saline 0.005% vs Post Nicotine 7.5%, relative frequency, $p < 0.05$). As well, frequency of Prevotellaceae positively correlated with NAcore TNF α protein expression immediately following self-administration ($p < 0.001$) and at early withdrawal ($p < 0.05$), indicating a potential relationship between Prevotellaceae and pro-inflammatory signaling within the reward pathway. These results show that nicotine self-administration is associated with colonization of Prevotellaceae, a gut microbe associated with chronic inflammatory conditions such as arthritis and inflammatory bowel disease. This suggests that the prevalence of Prevotellaceae in the gut could potentially contribute to expression of brain pro-inflammatory cytokines which may lead to increased nicotine relapse vulnerability. Taken together, our results are the first to show a potential role of Prevotellaceae as a pathobiont that might enhance nicotine addiction through promoting neuroinflammatory signaling within the NAcore.

FUNDING: Federal; Nonprofit grant funding entity

PA10-3

NEUROINFLAMMATORY MODULATION OF NICOTINE DEPENDENCE

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Introduction: Neuroinflammation and associated gliosis has been demonstrated to be a primary mediator of many neurological disorders, including in CNS trauma, ischemia, stroke, and neurodegenerative diseases. However, while their role has been extensively examined in neurology, this is much less true in psychiatry, especially in substance use disorders. It is thought that discrete microenvironments in the select brain regions may polarize the immune effector cells, namely microglia, to a reactive state. We examined these changes in the nucleus accumbens (ventral striatum), which is a region reliably shown to underpin many behavioral characteristics of substance use disorders as well as the withdrawal symptomatology. **Methods and Results:** Our preliminary IHC and qPCR data indicates that significant neuroinflammation can be detected in the ventral, but not the dorsal striatum, following withdrawal from chronic nicotine in mice. Furthermore, previous studies have suggested that microglial activation can contribute to neuronal damage through release of reactive oxygen and nitrogen species and inflammatory cytokines. In line with these findings, we detect significantly increased levels of both reactive oxygen species as well as pro-inflammatory cytokines in the ventral, but not dorsal, striatum. Furthermore, treatment with antioxidant compounds result in prevention of anxiety-like nicotine withdrawal phenotypes. **Significance and Conclusions:** Our current experiments investigate whether pharmacological compounds possessing both structurally and mechanistically distinct mechanisms for inhibiting microglial activation, such as ibudilast and minocycline, will reduce the molecular and behavioral hallmarks of neuroinflammation during nicotine withdrawal. Further, because these processes are known to be able to regulate nicotine-induced upregulation and assembly of nicotinic acetylcholine receptors, a phenomenon that can be correlated to anxiety-like nicotine withdrawal behaviors, future studies will examine the effects of these inhibitors on modulating nicotinic receptor expression. **Funding:** NIH/NIDA 1-R00-DA032681 and 1-R01-DA044311, 2017 PhRMA Foundation **Funding:** Research Starter Grant; Federal; Nonprofit grant funding entity

PA10-4

NICOTINE EFFECTS ON DEPENDENCE-RELATED ASSOCIATIVE LEARNING MECHANISMS IN HUMAN NON-SMOKERS

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Significance: Nicotine is considered the primary constituent responsible for tobacco addiction. Given its relatively weak primary reinforcing effects, its abuse potential is paradoxically high, possibly reflecting the behavioral control exerted by drug-associated cues. Cue-controlled behavior appears to play a larger role for tobacco dependence than for any other abused drug. We tested a potential explanation, hypothesizing that nicotine enhances associative learning, the mechanism underlying the conditioning of drug-associated stimuli. **Methods:** On two separate days, 32 non-smokers were administered

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a transdermal nicotine patch (7 mg/24 hrs) and a placebo in a double-blind cross-over study. After an absorption period, participants were tested with behavioral paradigms designed to isolate incidental stimulus-stimulus or stimulus-response learning. The stop signal task required speeded gender judgments of face stimuli. In 24% of trials, a tone signaled that the response should be withheld. The stop-signal delay (SSD) between face stimulus and tone onset varied from trial to trial as a function of response inhibition performance. Unbeknownst to participants, some faces were always paired with stop trials. The Conditional Associative Learning (CAL) task required feedback-based learning of associations between pairs of shape stimuli. Five pairs were made from either ten unique stimuli, or from different combinations of two identical sets of five stimuli, with correct associations depending on contextual information. Results: In the stop signal task, stop-responses to stimuli paired with stop trials were facilitated over time, as indicated by longer SSDs. When previously stop-associated stimuli were paired with go trials, go-responses were slowed. Nicotine significantly enhanced the facilitation of stop-responses to stop-paired stimuli, and the slowing of go-responses to previously stop-paired stimuli. In the CAL task, nicotine specifically increased incorrect choices of stimuli that were associated with the test stimulus in a different context. Conclusion: The results indicate that nicotine can enhance incidental associative learning. Stronger associations at the expense of flexible context-adaptive behavior mimics the behavioral control exerted by drug-associated stimuli, thought to unfold at the expense of frontoexecutive control. By promoting the formation of smoking-associated stimuli and habitual, cue-controlled drug-taking, this mechanism may explain nicotine's paradoxically high abuse potential.

FUNDING: Federal

PA11-1**A MULTI-SITE DOSE-RANGING RANDOMIZED CONTROLLED
TRIAL OF VARENICLINE FOR ADOLESCENT SMOKING
CESSATION: EFFICACY AND SAFETY FINDINGS**

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Significance: Varenicline is an established smoking cessation pharmacotherapy in adults, but its role in adolescent cessation has, to date, not been systematically evaluated. This trial was conducted to assess varenicline's efficacy and safety in adolescent smokers. **Methods:** Adolescent smokers (12-19 years old, 5 or more cigarettes per day, FTND = 4 or greater) interested in quitting ($N=312$) were enrolled across 57 centers in 6 countries and randomized in a 1:1:1 ratio to receive a double-blind, 12-week course of 1) high-dose varenicline (target dose 1 mg twice daily [0.5 mg twice daily if weighing 55 kg or less], $n=109$), 2) low-dose varenicline (target dose 0.5 mg twice daily [0.5 mg once daily if weighing 55 kg or less], $n=103$), or 3) placebo ($n=100$), added to brief weekly smoking cessation counseling. The primary efficacy outcome, continuous abstinence from week 9 through 12, was assessed via the Nicotine Use Inventory and confirmed via urine cotinine. Safety was assessed via detailed clinician assessment of treatment-emergent adverse events. **Results:** Continuous abstinence rates from week 9 through 12 were 20.2% in the high-dose varenicline group, 27.2% in the low-dose varenicline group, and 18.0% in the placebo group. High-dose varenicline versus placebo (odds ratio [OR] 1.18; 95% confidence interval [CI] 0.59-2.37; $p=0.63$) and low-dose varenicline versus placebo (OR 1.73; 95% CI 0.88, 3.39; $p=0.11$) group differences in abstinence were not statistically significant. Secondary abstinence endpoints and sensitivity analyses did not reveal significant between-group differences. Treatment-emergent adverse events rated as severe were experienced by 3 high-dose varenicline, 3 low-dose varenicline, and 1 placebo participants, and 6, 2, and 4 participants in each group discontinued study medication due to adverse events. Serious adverse events, all deemed unrelated to study drug, occurred in 3, 1, and 1 participants in each group. **Conclusions:** Varenicline was well-tolerated among adolescent smokers, but did not yield significant advantages, at either high or low dose, in abstinence compared to placebo when added to weekly cessation counseling.

FUNDING: Industry Source

PA11-2**DOES EVERY TRY REALLY COUNT? DO FAILED QUIT ATTEMPTS
FACILITATE OR PREVENT FUTURE QUIT ATTEMPTS AMONG
ADOLESCENT SMOKERS?**

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Background. A recent FDA campaign, 'Every Try Counts,' encourages multiple quit attempts among smokers. However, there is limited research exploring whether previous quit attempts facilitate or inhibit future quit attempts in adolescents. **Methods.** Participants were part of the Adolescent Cessation Evaluation Study ($N = 195$; mean age = 16.4 years) and were caught with cigarettes at schools in the Mid-South. The sample was 75% male, 55% Caucasian, and 40% African American. Participants were not asked to quit smoking but were introduced to different cessation program components during 4 weekly 50-minute sessions with a health evaluator. At baseline, participants responded to questions about potential barriers that might interfere with future smoking cessation, smoking status, and quitting history. Quitting status was identified at each subsequent session. Logistic regressions were used to assess the association between identifying more cessation barriers and the likelihood of a previous quit attempt at baseline. Among baseline smokers, we also assessed if identifying more barriers, having made a previous quit attempt, or if the number of previous number of quit attempts were predictive of making a quit attempt at future sessions. **Results.** At baseline, 68.5% reported previously trying to quit, and 72.3% had made 2 or more attempts. Most students (97.4%) endorsed at least 1 cessation barrier. With each additional perceived barrier at baseline, there was a 13% increased likelihood of having made a previous quit attempt ($OR =$



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1.13, $p = .034$). Approximately 20% of smokers made at least 1 quit attempt over the subsequent 3 sessions. Endorsing more barriers at baseline ($p = .56$), a previous quit attempt ($p = .60$), and number of previous quit attempts ($p = .26$) were not significantly related to the likelihood of a future quit attempt. **Conclusion.** Adolescents who made a past quit attempt were more likely to endorse more barriers that would interfere with future cessation. However, anticipating more quitting barriers and past failed quit attempts were not related to future quitting. Results suggest that although experiencing failed quit attempts might make adolescents more aware of quitting difficulties, it does not necessarily prevent them from making future attempts.

FUNDING: Federal

PA11-4

"ISN'T THERE A BUNCH OF SIDE EFFECTS?": A FOCUS GROUP STUDY ON YOUNG ADULT SMOKERS' BELIEFS ABOUT CESSATION TREATMENTS

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Background: Smoking remains a serious public health problem in the United States and is more prevalent among less-educated young adults. Smokers who quit smoking between 24 and 35 years old could avoid many health consequences of smoking. However, less-educated young adult smokers are less likely than their more-educated counterparts to use FDA-approved cessation treatments when attempting to quit. **Aim:** Examine less-educated young adult smokers' perceptions and beliefs about various cessation treatments. **Methods:** 75 18-29-year-old current smokers were recruited from DC-Maryland-Virginia area and attended moderated focus groups to discuss their perceptions, beliefs, and experiences with cessation treatments. Focus groups were stratified based on race/ethnicity (Non-Hispanic white, non-Hispanic black, vs. Hispanic) and education (high school or less vs. some college). We used a thematic approach to explore beliefs and experiences pertaining to smoking cessation and cessation treatment use. **Results:** Many participants reported previously using nicotine replacement therapy and electronic cigarettes to quit smoking. Contrarily, few participants were aware of cessation programs (such as counseling) but once explained, had an intention to use them. Participants were likely to have heard about cessation treatments from their friends and family. Participants had no intention to use prescription medications due to side effects. However, participants agreed that using prescription medication was an effective cessation treatment despite its consequences. **Conclusion:** There is a need to promote FDA-approved cessation programs and make them fit to less-educated young adult smokers' needs. Addressing negative perceptions about smoking cessation medications through tailored media campaigns may increase treatment use in this population.

FUNDING: Federal



NOTES SRNT



SRNT Notes



NOTES SRNT



PODIUM PRESENTATION 5

PAPER SESSION 12: USING MOBILE HEALTH TO TARGET HARD-TO-REACH SUBGROUPS

PA12-1

DEVELOPMENT AND EFFICACY OF AN MHEALTH TOBACCO INTERVENTION TARGETING AFRICAN AMERICANS

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SIGNIFICANCE: African American smokers have greater difficulty quitting compared to Whites, in part due to culturally specific factors (e.g., minority stress, targeted marketing). This study sought to address barriers that prevent low-income African Americans from accessing culturally specific, evidence-based smoking cessation assistance, and apply appropriate technology to increase reach. **METHODS:** We developed a culturally specific mobile health (mhealth) intervention, and tested its efficacy in a pilot RCT. *Path2Quit* has a comparable structure to NCI's SmokefreeTXT, yet sends video-texts infused with cultural specificity. We conducted a 2-arm semi-pragmatic randomized design among low-income tobacco users (N=119). Participants (42% public housing residents) were randomly assigned to receive (1) the *Path2Quit* or (2) SmokefreeTXT (standard control) combined with a brief behavioral counseling session plus 2 weeks of NRT. Primary outcomes included feasibility (recruitment, enrollment, and retention), acceptability (intervention ratings), engagement (intervention recall and use, responding to assessments). Secondary variables included 24-hour quit attempts, self-reported one-month continuous abstinence, and biochemically verified tobacco use abstinence at the 6-week follow-up. **RESULTS:** Participants were 51% female/49% male, mostly single (60%), completed \geq 12 years of education (83%), middle-aged, and (68%) reported household income < \$10k/year. Participants smoked 12 (SD=7.9) cigarettes/day for 25 (SD=17) years, and were moderately nicotine dependent. Both interventions were feasible and highly acceptable ($p>.05$). *Path2Quit* led to significantly greater intervention engagement, in terms of recall, program use, and responding to assessment items ($p<.05$). There was no difference in quit attempts ($p>.05$). *Path2Quit* resulted in a 3-fold increase in (self-reported) one-month continuous abstinence rates compared to SmokefreeTXT ($p<.05$), and a 42.5% increase in carbon monoxide confirmed point prevalence abstinence at the 6-week follow-up. **CONCLUSIONS:** Our culturally specific mHealth intervention demonstrated significant promise. Additional research in a larger sample is warranted.

FUNDING: Federal

PA12-2

A COMPARISON OF FACEBOOK CAMPAIGN SUCCESS IN RECRUITING ETHNICALLY DIVERSE SMOKERS INTO A SOCIAL MEDIA-BASED TOBACCO TREATMENT TRIAL

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Facebook (FB) remains the leading social network site with 2.2 billion monthly users globally. In the US, 2 in 3 adults use FB, with 74% using FB daily. FB is more popular among women (74%) than men (62%) and younger (18-29, 81%) than older (65+, 41%) adults. Latino adults (72%) use social media more than white (68%) and African American (AA, 69%) adults. Given its popularity, FB has become a dominant recruitment channel for research. We ran and analyzed 5 campaigns to recruit an ethnically diverse sample of US adults aged 21-59 for a social media-based quit smoking trial. The campaigns used the same interest categories (e.g., smoke, cigarette, tobacco, vape, nicotine) and ran ads on the FB feed. The 3 main campaigns were general market, Latino-, and AA-focused. The general market covered all continental US zip codes, whereas the ethnic-focused campaigns targeted the top 1000 zip codes by % Latino (or AA) and smoking expenditures per household. A minor FB campaign ran for 13 wks, covered all US zip codes, and focused on users with a Spanish-language FB interface. Another minor campaign sought to create a Lookalike Audience from FB pixel data; however, it

only ran for 2 wks due to privacy concerns. Together, the 5 campaigns ran from August 2016-2018, with total expenditures of \$81,257, generating ~7.5 million total impressions (# of times ads were on screen); 2.4 million unique views; and 14,717 registered adults (at a per cost of \$5.52). The general and Lookalike campaigns attracted mostly white (78% and 71%) with few Latino (3%) or AA (11-17%) adults; the Latino (16%) and Spanish language campaigns (30%) attracted the highest proportion of Latinos; and the AA-focused campaign (39%) attracted the largest proportion of AA adults. N=836 were study eligible and enrolled into the trial. Cost per participant enrolled ranged from \$90 (general market) to \$146 (Latino-focused). The resulting sample is 76.6% white, 5% Latino, 10.6% AA, and 13.5% other. FB was effective at attracting adults to the study. Racial/ethnic targeting by Spanish language and crossing zip codes with regional smoking expenditures were most effective at engaging Latino and AA adult smokers.

FUNDING: Federal; Academic Institution

PA12-3

INITIAL PILOT STUDY OUTCOMES OF THE PUT IT OUT PROJECT: A FACEBOOK SMOKING CESSATION INTERVENTION FOR SEXUAL AND GENDER MINORITY YOUNG ADULTS

Erin A. Vogel, PhD¹, Gary L. Humfleet, PhD¹, Judith J. Prochaska, PhD, MPH², Meredith Meacham, PhD, MPH¹, Alina Belohlavek¹, Danielle E. Ramo, PhD³, ¹University of CA, San Francisco, San Francisco, CA, USA, ²Stanford University, Stanford, CA, USA, ³UC San Francisco, San Francisco, CA, USA.

Significance: Tailored smoking cessation interventions may produce greater engagement and quit rates among sexual and gender minority (SGM) young adult smokers. We report treatment outcomes from a pilot of the Put It Out Project. **Methods:** Participants were SGM young adult smokers in the U.S. (N=165, age 18-25, M age=21.8, 85.2% non-Hispanic White, M cigs/day = 7.9, 70.3% daily smokers, 25.5% ready to quit in next 30 days). The sample was diverse in sexual orientation (17.6% gay, 18.2% lesbian, 55.2% bisexual/pansexual, 9.1% other) and gender identity (52.1% cisgender, 17.6% transgender, 30.3% non-binary). Participants were randomized to 1 of 2 treatment groups: the Put it Out Project (POP; SGM-tailored intervention) or the Tobacco Status Project (TSP; non-tailored control intervention) and placed in private Facebook groups based on their readiness to quit smoking (not ready/ready to quit in the next 30 days). Both 3-month interventions included daily Facebook posts and weekly live counseling sessions. POP posts were tailored to the SGM community using images, symbols, and content. At treatment end (3 months), participants who reported quitting smoking and not smoking in the past 7 days were coded as abstinent. Participants also rated the usefulness of the intervention. Differences in outcomes were examined by group. **Results:** Participants in the POP condition were nearly twice as likely to have quit smoking (21.4%) as those in the TSP group (12.2%), $\chi^2=2.22$, $p=.136$, Odds Ratio [OR]=1.97. POP participants were somewhat more likely to agree that the posts gave them something new to think about (POP: 90% agreed; TSP: 78% agreed; $\chi^2=3.62$, $p=.057$, OR=2.48) and that they thought about what they read in the posts (POP: 93% agreed; TSP: 84% agreed; chi-square=2.84, $p=.092$, OR=2.51). **Conclusion:** In this pilot study, SGM young adult smokers who received the SGM-tailored intervention were nearly twice as likely to report abstinence at the end of treatment than those who received the non-tailored intervention, and found the intervention content more thought-provoking. Future research will aim to examine the efficacy of POP in a fully-powered RCT.

FUNDING: Federal; State

PA12-4

PRELIMINARY OUTCOMES FROM THE SMOKING TOBACCO AND DRINKING STUDY AT THREE MONTH FOLLOW UP

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Significance: Young adults who smoke cigarettes are likely also to report heavy episodic drinking (HED); addressing both may enhance the efficacy of a smoking cessation intervention delivered via Facebook. **Methods:** U.S. smokers aged 18-25 years were recruited online and randomized to either the 90-day smoking cessation intervention Tobacco Status Project (TSP) or the Smoking Tobacco and Drinking (STAND). Both interventions included assignment to a private Facebook group tailored to readiness to



quit smoking, daily Facebook contacts, weekly motivational interviewing counseling, and nicotine patches. In addition, STAND added content on contexts of HED and combined use of tobacco and alcohol. Statistical analyses compared smoking and drinking patterns in TSP vs. STAND at 3-month follow-up. **Results:** Three-month follow-up rates were 84.0% for TSP (n=79) and 81.2% for STAND (n=69). The sample was 93.2% white and 45.9% female; at baseline, 81.1% were daily smokers, 33.1% intended to quit smoking in the next 30 days. On average, participants commented on 47 ($SD=35.1$) vs. 52 ($SD=36.1$) days on Facebook posts ($p=.444$). A greater engagement was not associated with higher smoking cessation. Biochemically-verified smoking 7-day point prevalence of abstinence was 5.1% for TSP (n=4) and 4.3% for STAND (n=3; $p=.105$). Self-reported 7-day point prevalence of smoking abstinence was 11.4% for TSP (n=9) and 21.7% for STAND (n=15; $p=.069$). There were no significant differences in the number of cigarettes smoked in the week prior to the three-month follow-up. The mean number of alcoholic drinks in the week prior to follow-up was higher TSP than STAND: 10 ($SD=13.9$) vs. 6 ($SD=7.8$); $t=2.015$, $p<.050$. **Conclusion:** Adding an alcohol component to a smoking cessation intervention delivered via Facebook was not associated with abstinence from tobacco nor with a reduction in cigarette smoking at three months. However, participants in the combined STAND intervention reported fewer drinking occasions. Lower exposure to alcohol may impact smoking patterns at six- and twelve-month follow-up; these data are currently being collected.

FUNDING: Federal

PAPER SESSION 13: CANNABIS AND TOBACCO CO-USE: BEHAVIOR AND BIOMARKERS

PA13-1

PREVALENCE OF MARIJUANA USE IN ELECTRONIC CIGARETTES AMONG YOUTH UNITED STATES 2017

Katrina Trivers, PhD, MSPH, Andrea Gentzke, PhD, MS, Elyse Phillips, MPH, Gillian Schauer, PhD. CDC, Atlanta, GA, USA.

Significance: Electronic cigarettes (e-cigarettes) are the most commonly used tobacco product among US youth and can be used to aerosolize a variety of substances, including marijuana. E-cigarette use among youth is unsafe, regardless of the substances used, and youth marijuana use can adversely affect learning and memory and may impair later academic achievement and education. Limited national data exist examining US youth use of marijuana in e-cigarettes. This study assessed the prevalence of ever marijuana use in e-cigarettes among US middle and high school students. **Methods:** Data were from the 2017 National Youth Tobacco Survey, a national, cross-sectional, school-based survey of US youth in grades 6-12. Respondents were asked, "Have you ever used marijuana, marijuana concentrates, marijuana waxes, THC, or hash oils in an e-cigarette?" Weighted descriptive statistics were calculated among all students (N=16,872) and ever e-cigarette users (n=8,930) overall and by demographics and tobacco use behaviors. Differences were assessed using chi-square tests. **Results:** Ever use of marijuana in an e-cigarette was reported by 11.1% (95% CI=9.8%-12.6%) of all students and 21.4% (19.2%-23.7%) of ever e-cigarette users. Patterns were similar for all students and ever e-cigarette users. Among ever e-cigarette users, marijuana use in e-cigarettes was higher in high school (29.4%) than middle school (9.2%) students, current e-cigarette users (53.9%) than non-current users (15.3%), and those who used e-cigarettes on 20-30 of the past 30 days (75.2%) than those using on 1-5 days (45.7%) ($p<.05$ for all). Marijuana use was also higher in those who currently used other tobacco products (among ever users, 60.5%) and those living with a tobacco product user (among ever users, 28.4%). **Conclusion:** About 1 in 5 ever e-cigarette users and 1 in 9 students overall reported ever using marijuana in an e-cigarette in 2017. These findings reinforce the importance of evidence-based strategies to reduce youth e-cigarette use. Given the evolving e-cigarette landscape, continued surveillance can help capture the diversity of products and substances being used in e-cigarettes among youth.

FUNDING: Federal

PA13-2

CO-USE OF MARIJUANA AND TOBACCO PRODUCTS AMONG YOUNG ADULTS

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Significance: As an increasing number of states within the U.S. legalize marijuana for recreational sale and possession, it is important to understand if certain methods of use are associated with increased risk for heavy marijuana and tobacco use (including e-cigarettes) and poorer psychosocial functioning among young adults. This study examines the prevalence of different methods of co-using marijuana with tobacco, as well as compares different types of co-users (concurrent, simultaneous, co-administration) with marijuana-only and tobacco-only users in terms of their use, consequences from use, and areas of psychosocial functioning such as delinquency, physical and mental health, and social functioning. **Methods:** A diverse and predominantly California sample of 2,429 young adults (mean age = 21) completed an online survey. Analysis of covariance tests and follow-up post-hoc tests were used to compare five mutually exclusive groups: past year marijuana use only [or tobacco use only], concurrent use only (used both substances, but not on same occasion), co-administration only (mixing marijuana and tobacco in same device), simultaneous use only (used both substances on same occasion, one right after the other), and simultaneous use + co-administration. **Results:** Half of respondents reported past year marijuana use, 43% past year tobacco use, and 34% past year co-use of both substances. The most prevalent methods of co-use were related to smoking combustible products (e.g., marijuana joints or blunts, combustible cigarettes) either alone or co-administered with both drugs. Overall, co-users reported heavier use and greater problem behaviors than those who did not co-use; however, differences in physical, mental and social functioning varied by co-user subgroup. Among the co-users, simultaneous users (especially if they also engaged in co-administration)



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typically had a higher risk profile than those who used each substance separately. **Conclusions:** Findings help to illuminate both the prevalence and risks associated with co-use of marijuana and tobacco products and can be used to inform policies for states considering regulation of marijuana and tobacco products.

FUNDING: Federal; State; Academic Institution

PA13-3

BIOMARKERS OF EXPOSURE AMONG CONCURRENT USERS OF TOBACCO AND CANNABIS FINDINGS FROM WAVE 1 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

Danielle Smith, Richard O'Connor, Binnian Wei, Mark Travers, Andrew Hyland, Maciej Goniewicz. Roswell Park Comprehensive Cancer Center, Buffalo, NY, USA.

Background: Cannabis is most commonly smoked, and is used more frequently by tobacco users. There is a paucity of data related to toxicant exposures among concurrent users of tobacco and cannabis ("co-users"). **Methods:** Data are from the PATH Study Wave 1 Biomarker Restricted Use Files. Analyses focused on adults who provided urine samples and met criteria for membership to one of five tobacco use groups (n=4,189). Urine samples were analyzed for biomarkers of exposure to nicotine, tobacco specific nitrosamines, polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs) using mass spectrometric methods. Creatinine-adjusted geometric means were calculated for each biomarker and stratified by self-reported past 30 day cannabis use. Urinary concentrations of 12 biomarkers associated with tobacco and cannabis smoke exposure were compared within each group according to past 30 day cannabis use using weighted linear regression modelling adjusted for demographics, frequency of tobacco use, and urinary cotinine. **Results:** Prevalence of past 30 day cannabis use was: e-cigarette-only users (15.5%, 95%CI:10.5-22.2), cigarette-only smokers (16.2%, 95%CI:13.9-18.7), dual users (13.2%, 95%CI: 11.0-15.9), hookah-only smokers (23.1%, 95%CI:18.3-28.7), all cigar users (18.0%, 95%CI: 13.7-23.1). Daily or some days tobacco use was not significantly different by past 30 day cannabis use. Past 30 day cannabis users in all groups exhibited significantly higher levels of CYMA (biomarker for acrylonitrile) than non-users. Among e-cigarette-only, cigarette-only, dual users, and hookah-only users, co-users exhibited greater urinary concentrations of biomarkers for PAHs (3-hydroxyfluorene, 2-hydroxyfluorene, 1-hydroxyphenanthrene, and 1-hydroxypyrene.) **Conclusions:** Co-users exhibited significantly higher concentrations of biomarkers of exposure to many combustion byproducts. More robust measurement of cannabis use frequency, intensity, and modes of delivery is needed to better assess health effects of co-use, and address potential confounding in assessing direct exposure to tobacco-related constituents.

FUNDING: Federal

PA13-4

ASSOCIATIONS OF RECREATIONAL AND MEDICAL CANNABIS USE WITH QUIT OUTCOME AMONG PRIMARY CARE PATIENTS ENROLLED IN A SMOKING CESSATION PROGRAM

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SIGNIFICANCE: Tobacco and cannabis use frequently co-occur and some studies suggest cannabis use among tobacco smokers leads to poorer smoking cessation outcomes. However, medical and recreational use of cannabis may impact smoking cessation differently. We examined whether recreational versus medical cannabis use was associated with smoking cessation treatment outcome. **METHODS:** The sample was 36,737 patients who enrolled from 2014 to 2016 in a smoking cessation treatment program offered at primary care settings in Ontario, Canada that provided counselling and up to 26 weeks of NRT. Current (past 30 day) use of cannabis for medical or recreational purposes was assessed at baseline and patients were categorized into 4 groups: no cannabis use; recreational use only; medical use only; or dual medical and recreational use. Quit outcomes were self-reported at 3 and 6 months after enrollment via online or telephone survey. Logistic regression was used to compare odds of 30-day point prevalence abstinence at each time point for the three cannabis user groups versus non-users. **RESULTS:** In total, 29,521 (80%) patients reported no current cannabis use, 5,886 (16%) reported recreational use only, 719 (2%) reported medical use only, and 611 (2%) reported dual-purpose use. In unadjusted analyses, all 3 cannabis user groups were associated with lower odds of smoking cessation at 3 months (ORs=0.53-0.69, all $p < .001$) and 6 months (ORs=0.67-0.74, all $p < .05$). In adjusted analyses, recreational cannabis use was associated with lower odds of cessation at

both 3 months (OR=0.78, 95% CI=0.70-0.88, $p < .001$) and 6 months (OR=0.82, 95% CI=0.73-0.92, $p = .001$). Medical use was associated with lower odds of cessation at 3 months (OR=0.72, 95% CI=0.53-0.98, $p = .04$) but not at 6 months (OR=0.74, 95% CI=0.54-1.01, $p = .06$). Dual-purpose use was also associated with lower odds of cessation at 3 months (OR=0.63, 95% CI=0.43-0.91, $p = .02$) but not 6 months (OR=0.72, 95% CI=0.50-1.03, $p = .08$). **CONCLUSION:** Recreational cannabis users in primary care are less likely to quit smoking compared to non-users, while medical and dual-purpose users experience lower odds of quit success in the shorter term only.

FUNDING: Other

PA13-5

CANNABIS USE AND INCREASED RISK OF CIGARETTE SMOKING INITIATION, PERSISTENCE, AND RELAPSE AMONG ADULTS IN THE UNITED STATES: DATA FROM TWO WAVES OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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Significance. Cannabis use is increasing in the United States (US) and there is a strong relationship between cannabis and cigarette use. Despite the increasing use of cannabis, changes in cannabis-related legislation in the US and other countries, and the well-documented finding that cannabis and cigarettes are commonly used together, it is unclear whether and how cannabis use may impact cigarette use among current, former and lifetime non-cigarette smokers. The purpose of this study was to investigate the impact of cannabis use on cigarette smoking initiation, persistence, and relapse one year later among a nationally representative sample of US adults.

Methods: Longitudinal US data came from the Population Assessment of Tobacco and Health (PATH) Study (Wave 1, 2013-2014, n=32,320; Wave 2, 2014-2015, n=28,362). Logistic regression models were used to calculate the odds of Wave 2 incident smoking among Wave 1 never smokers, smoking cessation among Wave 1 smokers, and smoking relapse among Wave 1 former smokers by Wave 1 cannabis use.

Results. Wave 1 cannabis use was associated with increased odds of initiation of non-daily (adjusted odds ratio (AOR)=6.7; 95% confidence interval (CI)=4.8-9.5) and daily cigarette smoking (AOR=5.5; 95% CI=4.0-7.6) among Wave 1 never smokers, reduced odds of smoking cessation among Wave 1 daily smokers (AOR=0.4; 95% CI=0.3-0.7), and increased odds of smoking relapse among former daily (AOR=1.9; 95% CI=1.1-3.3) and non-daily (AOR=2.3; 95% CI=1.6-3.4) smokers.

Conclusion: Educating smokers about the role of cannabis in efforts to quit cigarettes may be a necessary step to ensure that increases in cannabis use do not compromise progress in tobacco control.

FUNDING: Federal



PAPER SESSION 14: IMPROVING CESSATION IN VULNERABLE SMOKERS: ADDRESSING RACIAL AND SOCIOECONOMIC DISPARITIES

PA14-1

BREATHEFREE: PARTNERING WITH RESIDENTS TO INCREASE SMOKING CESSATION IN LOW-INCOME NEIGHBORHOODS

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Background: Smoking is the leading cause of preventable death in the United States, and rates remain stubbornly high among low-income smokers. While low-income smokers attempt to quit, their success rate is lower than those of a higher SES. We describe the process and outcomes of engaging residents in co-development of a multi-level intervention to promote cessation in three low-income neighborhoods. **Methods:** The intervention aimed to increase use of cessation supports through media messaging and shift social norms through adoption of 100% tobacco-free policies by libraries, churches and daycares. Residents engaged in a series of meetings to inform selection of neighborhood organizations, messaging materials to promote cessation resources, and the mechanism by which to share cessation information. **Results:** Residents identified organizations, prioritized media messages, and developed their own radio ads to hear voices from their own community. Residents advised the research team to partner with the United Way's 2-1-1 program, a reputable and trusted community support sensitive to the needs of low-income residents, to make cessation resource available. Callers contacting 2-1-1 were assisted by Navigation Specialists who provided guidance in selecting from evidence-based cessation resources as well as resources to address other existing needs. Overall, 4 organizations adopted and promoted tobacco-free campus policies. Call volume to 2-1-1 increased from <2 calls per week to >5 calls per week. Nearly two-thirds of callers requested referral to the QuitLine; 57.4% received 2 or more cessation referrals, and 52.7% received referrals for cessation and other needs. **Conclusion:** To be truly effective, tobacco control interventions must reach people and be meaningful in their daily lives. By engaging residents in intervention design, shifting norms by engaging neighborhood organizations, and bridging barriers to cessation through 2-1-1's ability to offer cessation services as well as address other social needs, information is provided in a trusted environment and a culturally relevant way that can begin to shift tobacco social norms and promote cessation.

FUNDING: State

PA14-2

RACE DIFFERENCES IN EFFICACY OF PHARMACOTHERAPIES FOR SMOKING CESSATION: SUBGROUP ANALYSIS OF THE RANDOMIZED, ACTIVE- AND PLACEBO-CONTROLLED EAGLES TRIAL

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SIGNIFICANCE: Race differences in smoking cessation pharmacotherapy efficacy are not well understood. This study compared efficacy of varenicline (VAR), bupropion (BUP), nicotine patch (NP), and placebo (PB) among US Blacks and Whites in the Evaluating Adverse Events in a Global Smoking Cessation Study (EAGLES). **METHODS:** Participants in these *post-hoc* analyses were Black (n=1065, VAR=255, BUP=259, NP=286, PB=265) and White (n=3044, VAR=778, BUP=769, NP=738, PB=759) smokers with and without psychiatric disorders. General linear models tested the effects of treatment group, psychiatric cohort, race, and interactions on continuous abstinence at week 24 (CAR 9-24). Odds ratios (OR, 95% CI) assessed race differences for treatment efficacy. **RESULTS:** Only treatment and race main effects significantly predicted CAR 9-24. Abstinence was 4.9% less for Blacks relative to Whites after adjusting for psychiatric cohort and treatment (-6.8, -3.1). Pooling psychiatric cohorts, CAR 9-24 for Blacks versus Whites were 10.3% vs. 18.1% for VAR (0.52; 0.33, 0.82), 5.8% vs. 12.9% for BUP (0.42; 0.24, 0.74), 7.9% vs. 11.4% for NP (0.67; 0.41, 1.09), and 4.2% vs. 7.8% for PB (0.52; 0.27, 1.01). In Blacks, only VAR vs. PB efficacy was significant (2.7; 1.3, 5.6). This contrast was also significant for Whites (2.6; 1.9, 3.6). In Blacks, no statistical

differences were found in ORs of VAR vs. BUP (1.9; 1.0, 3.7), VAR vs. NP (1.4; 0.8, 2.6), BUP vs. PB (1.4; 0.6, 3.2), or NP vs. PB (1.9; 0.9, 4.1). In contrast, significant efficacy was seen for Whites for these comparisons. The relative efficacy of BUP vs NP was non-significant for Blacks (0.7; 0.4, 1.5) and Whites (1.2; 0.8, 1.6). **CONCLUSIONS:** Black smokers were less likely to quit overall than White smokers in the US. There was no interaction of race with treatment or psychiatric cohort. Difference in efficacy between races is demonstrated across all treatments; this difference is somewhat greater with VAR or BUP compared to NP or PB. A better understanding of why treatment is less efficacious for Black smokers in the US is needed to reduce race differences in tobacco-related health disparities.

FUNDING: Industry Source

PA14-3

ICAN QUIT IN PREGNANCY: A MULTI-COMPONENT INTERVENTION FOR SMOKING CESSATION CARE AMONG PREGNANT INDIGENOUS AUSTRALIAN WOMEN

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Significance: Smoking prevalence in Indigenous Australian pregnant women is high at 43%. Health providers (HPs) in Australia lack knowledge and skills in addressing smoking with pregnant women. This study explored the feasibility and impact of a co-designed multi-component intervention at Aboriginal Medical Services (AMS) in culturally-targeted pregnancy-specific smoking cessation care (SCC). **Methods:** Indigenous Counselling and Nicotine (ICAN) Quit In Pregnancy was developed in 2 phases. The intervention, developed collaboratively with AMS included resources for HPs webinar training and a Flipchart to guide the consultation using evidence-based SCC; and pregnant women: booklets with embedded augmented reality videos. Free oral NRT and carbon monoxide meters were to be supplied. After pre-testing the resources, a feasibility step-wedge randomised trial was conducted in 6 services. We collected data at service-level (numbers of pregnant smokers attending services, NRT patch prescriptions, oral NRT dispensed, HPs trained), HP-level (changes in knowledge, attitudes, practices) and patient-level (quit attempts, quit rates). **Results:** Pregnant women (n=22; 47% eligible) and HPs (n=50; 54% eligible) were recruited over 6 months; retention rates of 77% and 40% respectively. At 12 weeks, self-reported 7 day point-prevalence biochemically-validated abstinence (of all women pre and post) was 13.6% (n=3); 41% (9/22) made a quit attempt. Service-level data revealed only one service increased NRT patch prescriptions, but 55% (12/22) of all women were offered oral NRT. HPs improved scores of general (p=0.011), and NRT-specific (p=0.004) knowledge; general attitude (p=0.017) and NRT-specific attitude (p=0.005). Self-reported practices were unchanged, including prescribing NRT. **Conclusion:** A culturally sensitive intervention in AMS can have an impact on service provision, HP knowledge and attitudes about smoking in pregnancy, and potentially practices of offering NRT. Other considerations to strengthen the approach will be discussed.

FUNDING: State; Nonprofit grant funding entity

PA14-4

MULTILEVEL INTERVENTIONS TO REDUCE CALIFORNIA TRIBAL YOUTH COMMERCIAL TOBACCO USE

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Significance: Respectfully distinguishing between the ceremonial use of traditional tobacco on the one hand, and misuse of commercial tobacco on the other, constitutes a long-recognized imperative for nuanced commercial tobacco prevention by and for American Indians. Rates of cigarette smoking among California Indians vary regionally and by tribe, but were double that of non-Hispanic whites (28% vs. 14%) between 2011-14 (CA Dept of Public Health, 2018). **Aim:** Building upon a multilevel alcohol use reduction intervention among 9 Tribes in Southern California, we lay out in this paper a set of strategies to reduce commercial tobacco use among underage Tribal members. **Methods:** Individual-level Tribal youth interventions consisted of brief motivational interviewing and psychoeducation sessions. Community-level interventions included community mobilization activities, and apparent underage purchase attempts at reservation stores. Assessing effects, we compared 7 waves of California Healthy Kids Survey (CHKS)



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data (2002–2015) for 9th and 11th-grade AI/AN and non-AI/AN students in intervention area schools with California AI/AN students outside the intervention area (n = 617, n = 33469, and n = 976, respectively). Results. Relative to comparison groups, pre- to postintervention mean past 30-day drinking frequency declined among current drinkers in the intervention group (8.4–6.3 days). Similarly, heavy episodic drinking frequency among current drinkers declined in the intervention group (7.0–4.8 days) versus the comparison groups. Conclusions. Evaluating commercial tobacco intervention programs would be accomplished by analyzing: (a) motivational interviewing and psychoeducation outcome data, (b) reservation store attempted cigarette and ENDS reward and reminder purchase data and (c) data from CHKS on commercial tobacco use, both prior to and following the interventions. Because multilevel community-partnered interventions can effectively reduce underage alcohol use in this population, we hypothesize that they should also work synergistically to lower the rates of commercial tobacco use, provided that sacred and commercial tobacco are distinguished throughout.

FUNDING: Federal

PA14-5

CULTURALLY SPECIFIC SERVICES INCREASE ENGAGEMENT AMONG AFRICAN AMERICAN QUITLINE ENROLLEES

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SIGNIFICANCE: Intervention engagement is a key precursor to reducing racial disparities in tobacco cessation. An ongoing trial is testing the incremental effectiveness of a culturally specific intervention as a component of tobacco quitline care. Here, we hypothesized increased treatment engagement via the integration of an evidence-based video intervention (Pathways to Freedom: Leading the Way to a Smoke-Free Community©; PTF) into quitline services, compared to control conditions. **METHODS:** This 3-arm semi-pragmatic RCT randomly assigned self-identified African American quitline enrollees (N=554) to receive (1) usual care - 4 proactive quit coaching calls and two-weeks of nicotine patch therapy; (2) usual care plus a standard cessation video; or (3) usual care plus PTF - both on DVD and private YouTube channels. Participants received bi-weekly text messages from research staff, and were encouraged to watch the videos by quit coaches. Outcomes were assessed at 3-months post-enrollment, and included coaching call completion and satisfaction, text messaging use, video intervention recall, sharing, and views (DVD and online). **RESULTS:** Participants were mostly female, single, completed ≥ 12 years of education, middle-aged, and low-income. In the overall sample, there were no differences in coaching call completion, coaching satisfaction, or reading text-messages among the three groups. However, there were significant differences in engagement between the two video conditions. Compared to the usual care plus standard video condition, usual care plus the PTF video resulted in greater views of intervention videos, recall of the video content, and sharing the video with others (all p-values <.05). YouTube meta-data demonstrated that PTF had 91% more online views than the standard video. **CONCLUSIONS:** Participants reported high satisfaction with quitline counseling. Access to a culturally specific video significantly increased engagement compared to a standard cessation video. One implication of our findings is that culturally specific coaching might also incrementally increase quitline engagement. Our future research will test whether PTF increases smoking abstinence.

FUNDING: Nonprofit grant funding entity



NOTES SRNT



SRNT Notes



NOTES SRNT



PODIUM PRESENTATION 6

PAPER SESSION 15: EMERGING EVIDENCE ON E-CIGARETTE TOXICITY

PA15-1

IN UTERO EXPOSURE TO E-CIGARETTES MODULATES PLATELET FUNCTION AND INCREASES THE RISK OF THROMBOGENESIS, IN MICE

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Significance- Cardiovascular disease is the main cause of death in the United States with smoking being the primary preventable cause of premature death, and thrombosis being the main mechanism of cardiovascular mortality in smokers. We have previously shown that short term exposure, of adult mice, to electronic/e-cigarettes increases the risk of thrombosis, in part, by enhancing platelet function. However, whether *in utero*/prenatal exposure exerts similar detrimental health effects is yet to be investigated.

Methods- We employed a passive e-Vape TM vapor inhalation system, and performed whole-body e-cigarette exposures on pregnant mice (*in utero*)- under exposure conditions that mimic real-life human exposure scenarios/conditions- and investigated the effects of e-cigarettes and clean air on platelet function and thrombogenesis.

Results- Our results show that platelets from *in utero* e-cigarette exposed mice are hyperactive with enhanced: aggregation, dense and alpha granule secretion, activation of the *dll1b3* integrin, and phosphatidylserine expression, when compared to clean air exposed platelets. Furthermore, the *in utero* e-cigarette exposed mice exhibited a shortened thrombosis occlusion and bleeding times, in comparison to the clean air control mice. **Conclusion-** Taken together, our data demonstrate for the first time that *in utero* exposure to e-cigarettes alters physiological hemostasis, and increases the risk of thrombogenic events. This is due, at least in part, to the hyperactive state of platelets. Thus, the negative health consequences of e-cigarette exposure should not be underestimated, and warrant further investigation.

FUNDING: Unfunded; Academic Institution

PA15-2

RELATIVE ENDOTHELIAL TOXICITY OF TOBACCO SMOKE AND E-CIGARETTE AEROSOL: A FUNCTIONAL AND MECHANISTICAL ASSESSMENT

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Background: Smoking cigarettes decreases expression of eNOS in the endothelium, resulting in lower nitric oxide (NO) secretion and decreased flow-mediated dilation in the conducting arteries. In contrast, the effects of e-cigarettes (e-cigs) on endothelial function are just beginning to be studied and the mechanisms of action are unclear. **Aim:** To test the hypothesis that circulating factors from e-cigarette users decrease endothelial eNOS protein levels and NO secretion in primary endothelial cell cultures, relative to nonsmokers and cigarette smokers. **Methods:** 36 healthy individuals were recruited and grouped as nonsmokers (n=12), cigarette smokers (n=7), and e-cig users (n=17). Human umbilical vein endothelial cells (HUVECs) were cultured at 20,000 cells per well in 24-well culture plate. Serum samples from individual subjects and endothelial growth media were added at a 1:1 ratio to confluent cells and incubated for 12 hours (basal condition), followed by fresh medium containing VEGF at 50 ng/ml for 30 min (stimulated condition). The amount of NO liberated from cells was measured in culture supernatants by the chemiluminescence method using a NO analyzer. Endothelial NO synthase (eNOS) protein levels in HUVECs was measured in cell lysates by ELISA. NO and eNOS results were normalized to cell number. **Results:** The cells treated with serum from e-cig users vs. nonsmokers produced less NO upon stimulation ($P < .03$) and contained less eNOS protein ($P < .03$). eNOS protein level was lower in the e-cig user serum group than in the cigarette smoker serum group ($P < .05$), although stimulated NO production was decreased less by e-cig user serum than by smoker serum. Lower eNOS

levels in the cigarette group vs. non-smoker group was not significant, but stimulated NO was significantly lower in the cigarette group vs. nonsmoker ($P < .006$). **Conclusion:** Exposure of cultured endothelial cells to circulating factors from e-cig users, relative to non-users, leads to lower eNOS protein levels and decreased NO production.

FUNDING: Federal

PA15-3

VAPING Deregulates CANCER-RELATED GENES AND ASSOCIATED MOLECULAR PATHWAYS IN THE ORAL EPITHELIUM

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Electronic cigarettes (e-cigs) are promoted as safe alternatives to tobacco cigarettes. E-cigs are increasingly popular among adult smokers and adolescent never smokers. Despite the known presence of carcinogens in e-cig liquid and vapor, the cancer-causing potential of e-cig use (otherwise known as vaping) is not known. We have investigated the extent of gene deregulation and the affected pathways in oral cells of e-cig users and cigarette smokers as compared to nonsmokers. Interrogation of the oral transcriptome by RNA-seq analysis showed numerous aberrantly expressed transcripts in both e-cig users and smokers relative to nonsmokers; although smokers had ~50% more differentially expressed transcripts than vapers (1,726 vs. 1,152). Molecular pathway and functional network analyses revealed that cancer was the top disease associated with the deregulated genes in both e-cig users and smokers (~62 vs. 79%). Examination of the canonical pathways and networks that were modulated in either e-cig users or smokers identified the 'Wnt/Ca⁺ pathway' in vapers and the 'integrin signaling pathway' in smokers as the most affected pathways. Amongst the overlapping functional pathways that were impacted in both e-cig users and smokers, the 'Rho family GTPases signaling pathway' was the top disrupted pathway, although the number of affected targets was three times higher in smokers than vapers. We conclude that vaping, similarly to smoking, alters the expression of crucial cancer-related genes, though to a different extent and via both overlapping and unique pathways as compared to smoking. Our findings have significant implications for public health and tobacco regulatory science.

FUNDING: Federal; State

PA15-4

ASSESSING CARDIOVASCULAR RISKS ASSOCIATED WITH E-CIGARETTES WITH HUMAN INDUCED PLURIPOTENT STEM CELL-DERIVED ENDOTHELIAL CELLS

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Significance: Marketed since 2007, electronic cigarettes (e-cigarettes) have experienced a tremendous increase in use despite the scarcity of scientific evidence pertaining to their safety. Unlike conventional cigarette smoking, the effects of e-cigarette products and their constituents on mediating vascular health remain poorly understood. Given the increasing popularity of flavored e-cigarettes, it is imperative to carefully study the ingredients, especially nicotine and different flavorings, so that potential health risks of e-cigarettes may be evaluated. The aim of the present study was to investigate the biological effects of e-cigarette flavored liquids on endothelial health. The inclusion of serum from smokers of e-cigarettes serves to further corroborate the *in vitro* results.

Methods: We used human induced pluripotent stem cell-derived endothelial cells (iPSC-ECs) and a high-throughput screening approach to assess endothelial integrity following exposure to 6 different e-liquids with varying nicotine concentrations and to serum collected from e-cigarette users. **Results:** The cytotoxicity varied greatly among the e-liquids, with the cinnamon-flavored product being most potent that led to signifi-



cantly decreased cell viability, increased reactive oxygen species (ROS) and caspase 3/7 activity, activation of oxidative stress-related pathway, and impaired tube formation, confirming endothelial dysfunction. Interestingly, we observed an increasing trend of endothelial toxicity associated with higher nicotine concentration, though the overall differences were not significant. In addition, after exposure of iPSC-ECs to serum of e-cigarette users, we observed increased ROS linked to endothelial dysfunction as indicated by interrupted angiogenesis in iPSC-ECs. We also noted a decrease in the number of platelets and an increase in inflammatory cytokine expression in serum of e-cigarette users. **Conclusions:** Taken together, these results indicate that acute exposure to flavored e-liquids or e-cigarette use exacerbates endothelial dysfunction, which may alter the progression of cardiovascular diseases.

FUNDING: Federal; State; Academic Institution

PA15-5

NEUROTOXIC REACTIVE ASTROCYTES AS ELECTRONIC CIGARETTES EXPOSURE AND INJURY BIOMARKERS

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Electronic cigarettes (EC) are emerging tobacco products that deliver nicotine vapor by heating a liquid containing a mixture of nicotine and other flavorings and humectants. Epidemiological studies demonstrated that the frequency of exposures to e-cigarettes among young children is increasing rapidly, and severe outcomes are being reported. EC are designed to be refilled with nicotine-containing e-liquid that is often sold in bottles containing up to 1 g of nicotine. High dose nicotine exposure has been shown to have significant deleterious effects on brain development and function, including alterations in brain metabolism and neurotransmitter systems which could have negative impacts on adolescents' learning, memory, attention, behavior problems, and addiction. However, the molecular mechanisms of impact of EC on brain development are poorly understood. Utilizing the established protocol for deriving neuron and astrocyte networks from human embryonic stem cell, toxicological testing of EC smoke solutions were studied *in vitro*. The EC smoke solutions are in puff equivalents (PE), meaning a puff of smoke dissolved into 1mL of media. The concentrations tested were 1.0PE, 0.1PE, and 0.01PE. Equal to 0.18 μ g/ml 1.8 μ g/ml 18 μ g/ml of nicotine concentrations. Our results indicated EC smoke solutions exposure altered glutamate transporter GLAST expression and induced astrocyte activation. Low concentration exposure (0.1PE) increased astrocyte GLAST expression. The increased expression of GLAST may have been due to glutamate build up in the synaptic cleft. In contrast, under high concentration (1.0PE) EC smoke solutions exposure, the expression of GLAST decreased and increased expression of GFAP and C3, a biomarker of reactive astrocyte, indicated that EC smoke solutions impaired glutamate homeostasis and converted resting astrocytes into reactive astrocytes. A1 astrocytes lose many typical astrocyte functions. They no longer promoted neuronal survival, outgrowth, and synapse formation. Our studies implicated that stem cell neuronal differentiation is an excellent platform to understand the impact of EC to the brain development at the molecular and cellular level, and it would also potentially identify biomarkers for EC exposure and injury assessment.

FUNDING: Academic Institution

PAPER SESSION 16: CIGAR USE: IMPLICATIONS FOR PROGRAM AND POLICY

PA16-1

TRENDS IN CIGAR USE IN THE UNITED STATES BY RACE/ETHNICITY: 2002 TO 2016

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Significance: The use of cigars is increasing in the United States (US). While racial/ethnic differences related to cigarette use have been identified, little is known about how non-cigarette tobacco product use differs by racial/ethnic groups or whether trends in use have changed among over time by racial/ethnicity. The current study investigated changes in cigar use, by racial/ethnic group, from 2002 to 2016 in nationally representative US data.

Methods: Data were drawn from the 2002-2016 National Survey on Drug Use and Health (NSDUH) public use data files (total analytic sample N=54,060 current cigar users). Linear time trends of current cigar use were assessed for persons age 12 and older by racial/ethnic group (Non-Hispanic (NH) White, NH Black, Hispanic, NH Other) using logistic regression models.

Results: In 2016, the prevalence of current cigar use was significantly higher among NH Black respondents than among NH White, Hispanic, and NH Other respondents. The year by racial/ethnic group interaction was significant. Current cigar use decreased significantly from 2002 to 2016 among NH White and Hispanic respondents while no change in prevalence was observed among NH Black and NH Other respondents.

Conclusions: Cigar use remains significantly more common among NH Black adults in the US and is not declining among NH Black and NH Other persons over time in contrast to a decline among NH White and Hispanic persons.

FUNDING: Federal

PA16-2

FLAVORED CIGAR SMOKING AMONG AFRICAN AMERICAN YOUNG ADULT DUAL USERS: AN ECOLOGICAL MOMENTARY ASSESSMENT

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Background The prevalence of smoking cigars (i.e., large cigars, cigarillos, and filtered little cigars) has been on the rise among African American young adults. Research examining the predictors of flavored cigar smoking among African American young adults (who also smoke cigarettes) is needed to inform the efforts to reduce high cigar smoking prevalence among this group. **Methods** Using Ecological Momentary Assessment (EMA), this study collected data from eight surveys per day over 14 days. Sixty-three African American young adult (ages 18-29) dual users of cigarettes and cigars recorded near real-time affect (stressed, bored, and relaxed), smoking cues (location and companionship), and use of substances (smoking blunts, cigarettes, and cigars). Participants logged 1,205 cigar smoking moments. Multivariable Generalized Estimating Equations were used to assess the predictors of flavored cigar smoking in general and specific flavor types (i.e., alcohol, sweet, and mint), controlling for participant socio-economic backgrounds and tobacco use history. **Results** Almost all (98.4%) participants smoked flavored cigars over 14 days, and 64.2% of the 1,205 cigars smoked were flavored. Alcohol (34.4%) was the most frequently smoked flavor type followed by sweet (23.4%) and mint (5.7%). Smoking in vehicles (AOR=2.06; CI=1.32-3.20) and with others in view (AOR=1.63; CI=1.06-2.49) were associated with flavored cigar use (vs. at home and alone, respectively). Feeling stressed (AOR=1.07; CI=1.01-1.14) and bored (AOR=1.09; CI=1.03-1.24) predicted smoking alcohol flavors. Blunt smoking was positively associated with smoking sweet flavors (AOR=3.78; CI=2.24-6.38) but negatively associated with smoking alcohol flavors (AOR=0.44; CI=0.29-0.68). **Conclusions** Smoking flavored cigars, especially alcohol-flavored cigars, is prevalent among African American young adult dual users in this study. This group might use specific



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cigar flavors for various purposes including smoking blunts and boosting mood. Efforts to reduce cigar use among this group need to tackle the risk factors for flavored cigar smoking and the availability of flavors.

FUNDING: Federal; Academic Institution

PA16-3

REASONS FOR LCC USE AMONG A NATIONAL SAMPLE OF YOUTH AND YOUNG ADULTS

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Significance: Cigar, little cigar, and cigarillo (LCC) use is higher among young populations compared to adults, and misperceptions regarding their harm is common. This study assesses reasons for LCC use among youth and young adults and identifies differences by demographics and use of flavored LCCs. **Methods:** A national, probability-based sample (ages 15-34) was recruited via ABS with additional subsamples recruited from an existing, probability-based, online panel (N=14,379). Data were collected online from February-May 2018. Surveys assessed demographics, LCC use, and reasons for use among ever users. Participants reported the importance of each on a scale from 1 (not important) to 5 (very important): 1) come in flavors I like, 2) help me relax, 3) enjoy the smell, 4) give me a buzz, 5) more affordable than cigarettes, 6) help me quit cigarettes, 7) less harmful than cigarettes, and 8) better store promotions. Responses were dichotomized into 1=4-5 and 0=1-3. Logistic regression models assessed associations between reasons for use and demographics and use of flavored LCCs. **Results:** Overall, 29.1% reported ever LCC use. Those ages 15-17 had significantly higher odds of rating the buzz and lower perceived harm as important reasons for use, compared to older ages. Compared to whites, Blacks and Hispanics had significantly higher odds of rating the buzz, affordability, and store promotions as important reasons. Blacks also had higher odds of rating the lower harm as an important reason (OR=2.39, p<.001). Those who reported ever use of flavored LCCs had higher odds of rating flavors (OR=4.08), smell (OR=2.08), affordability (OR=1.92), and relaxing effect (OR=1.91) (p<.001) of LCCs as important, compared to those who never used flavors. Those reporting less financial comfort had higher odds of rating the affordability (OR=1.93), use as a cessation tool (OR=2.71), and store promotions (OR=3.69) (p<.05) as important reasons for use, compared to those reporting more financial comfort. **Conclusion:** Results suggest certain subpopulations may hold different beliefs regarding the benefits of using LCCs. Findings could provide insight into effective prevention efforts targeted to subpopulations more at risk for use.

FUNDING: Nonprofit grant funding entity

PA16-4

"PHANTOM SMOKERS": SMOKER IDENTITY AMONG TEEN USERS OF CIGAR PRODUCTS

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Significance: "Phantom smokers" are individuals who smoke tobacco products but do not self-identify as smokers. They often share tobacco products and maintain consistent but nondaily smoking habits while underestimating their own health risks and feeling little need to quit. Young cigar, cigarillo, and little cigar (CCLC) users often exhibit these behaviors and may be particularly prone to phantom smoker beliefs and associated risks. **Methods:** Data were collected as part of the 2017 Youth Risk Behavior Surveillance System questionnaire administered to 13,907 students in grades 9-12 in 45 schools in Cuyahoga County (Cleveland), OH. Questions assessed use of CCLCs, cigarettes, hookah, e-cigarettes, and marijuana. Those reporting any tobacco use were asked, "Do you consider yourself a smoker?" Response options included Yes, No, and Don't know. Students were also asked about age of initiation to tobacco products and attempts to quit. They also completed a nicotine dependence measure comprised of PROMIS items modified to be product-neutral. Associations with smoker identity were tested using design-adjusted chi-square tests, ANOVA, and multinomial logistic regression. **Results:** 1,704 (13.3%) students reported current CCLC use. Of those, 33.9% were self-identified smokers, 48.7% were phantoms, and 17.4% were unsure. Grade level, race, and sexual orientation were related to smoker identity (p<.05). Phantom status was most common among 12th graders (58.7%), Whites (59.4%), and Hispanics (57.6%). GLBT students were more likely to self-identify as smokers (43.9%). Self-identified smokers were more likely than phantoms to have used tobacco before age 13 (45.2%

vs. 22.0%). Phantoms were less likely to have used cigarettes, hookah, or marijuana and also scored lower on nicotine dependence. **Conclusion:** Two-thirds of students who reported current CCLC use did not self-identify as smokers. Smoker identity was related to products used, smoking history, and demographic factors such as age, race, and sexual orientation. Findings can inform the development of messages concerning the health risks associated with tobacco use.

FUNDING: Federal

PA16-5

SPATIAL ASSOCIATIONS BETWEEN STATE LEVEL CURRENT CIGAR USE AND CIGAR TAX TYPE

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Significance: Cigars are popular tobacco products in the U.S., particularly among younger populations. Higher cigarette taxes are associated with decreases in the prevalence of cigarette smoking. However, compared to cigarette taxes, taxes on cigars are less consistent across states and due to efforts from the tobacco industry to circumvent higher taxes. Moreover, measures used to assess cigar use are inconsistent across national surveys. This study aimed to assess the spatial association between current cigar use prevalence and cigar tax type at the U.S. state level. **Methods:** Data for state-level current cigar use prevalence were obtained the 2006-2007 and 2010-2011 Tobacco Use Supplement to the Current Population Survey (TUS-CPS) and the 2009-2010 National Adult Tobacco Survey (NATS). State level tax type (ad valorem/specific) for traditional cigars, cigarillos, and little cigars were obtained from a 2005-2014 Tobaccconomics Chartbook. QGIS 2.18.2 was used to produce bivariate choropleth maps of adult cigar prevalence and cigar tax type. **Results:** Regardless of the cigar product specific tax applied, states that changed from an ad valorem to specific tax generally had lower cigar use prevalence while states that did not tax cigars had higher cigar use prevalence in 2010-2011. The direction and magnitude of associations in 2009-2011 differed between TUS-CPS and NATS data, which could possibly be attributed to differences in cigar measures. **Conclusions:** Specific taxes on cigar products may be associated with lower current cigar use prevalence at the state level. Additional research is needed and more consistent tax policies and cigar measurement will be instrumental.

FUNDING: Unfunded

PA16-6

CHANGES IN SALES OF EXPLICIT- AND CONCEPT-FLAVORED CIGARS IN PROVIDENCE, RHODE ISLAND FOLLOWING IMPLEMENTATION OF A CITYWIDE SALES RESTRICTION POLICY

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SIGNIFICANCE. On January 3, 2013, the city of Providence, RI began enforcing a restriction on the retail sale of all non-cigarette tobacco products with a characterizing flavor other than the taste or aroma of tobacco, menthol, mint, or wintergreen. We assessed the impact of this policy on retail sales of flavored products with explicit-flavor names (e.g., cherry) and concept-flavor names (e.g., Jazz) in Providence and a rest-of-state (ROS) comparison area. We report on cigar sales, which comprise 95% of flavored non-cigarette tobacco products subject to the policy and sold in Providence. **METHODS.** Weekly retail scanner sales data from convenience stores and other outlets were obtained from The Nielsen Company for January 2012 through December 2016. Cigar sales were further categorized into products labeled with explicit-flavor or concept-flavor names. Segmented regression models accounting for autocorrelation and heteroscedasticity assessed changes in sales trends before and after implementation of the policy in Providence and the ROS. **RESULTS.** Average weekly unit sales of all flavored cigars decreased by 51% in Providence from pre- to post-policy periods, while sales of these products increased by 10% in ROS (both p<.01). There was a 93% reduction in average weekly sales of cigars labeled with explicit-flavor names in Providence (p<.01) while sales of explicit-flavor named products did not change significantly in ROS. In contrast, average weekly sales of cigars labeled with concept-flavor names increased across the periods by 74% in Providence and 119% in ROS (both p<.01). Additionally, average weekly



sales of all cigars—flavored and otherwise—declined by 31% in Providence and 6% in ROS from pre- to post-policy periods (both $p<.01$). CONCLUSIONS. The Providence policy had a substantial city-specific impact on retail sales of flavored and all cigars. The results are encouraging; however, the effect was muted by an increase in sales of cigars labeled with concept-flavor names, which may avoid enforcement agency detection. Continued sale of concept-flavor named products undermines the policy intended to restrict sales of flavored non-cigarette tobacco products.

FUNDING: Federal

PAPER SESSION 17: EFFECTS OF ANTITOBACCO MASS MEDIA INTERVENTIONS

PA17-1

EFFECTS OF MASS MEDIA AND SOCIAL MEDIA COVERAGE OF ANTITOBACCO CONTENT ON YOUTH AND YOUNG ADULT SMOKING INTENTIONS

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Significance: A prior study showed that US newspaper tobacco-related coverage predicted lower youth smoking prevalence (Clegg-Smith et al, 2008); it is unknown how today's increasingly complex media environment influences youth and young adults' (YYA) tobacco use and intentions. With more user-generated content, exposure to pro-tobacco perspectives is more likely. We ask whether exogenously measured media coverage from several mass media and social media sources predicts YYA cigarette smoking intentions over a three-year period. **Methods:** Smoking intentions for non-smokers and quitting intentions for smokers were collected from May 2014-June 2017 in weekly rolling nationally representative phone surveys of US 13-25 year olds. Concurrently, an automated content analysis measured anti-tobacco media coverage in (1) 19,939 texts from 50 major US newspapers, the Associated Press, broadcast news transcripts, and over 100 websites popular among YYA, (2) 50,981,301 tweets, and (3) 3,094 YouTube videos. Daily scores of media coverage against tobacco use (excluding e-cigarettes) were tested for their association with YYA survey-reported smoking intentions, using ordinal regression models that were weighted to the population and adjusted for complex sample design and potential confounders. **Results:** Anti-tobacco content in the past week from Twitter and four other sources (not YouTube) made a reliable scale ($\alpha=.77$). More opportunities for exposure to anti-tobacco content in the past week predicted lower intentions to smoke among YYA non-smokers ($OR=.90$, $p=.02$, $n=9,825$). The effect on smokers' intentions to quit was of similar size but not significant; however there were many fewer smokers ($OR=1.22$, $p=.27$, $n=952$). **Conclusions:** Traditional media sources, popular websites and Twitter vary together in their anti-tobacco content over time, despite the lack of editorial controls on Twitter and, to some extent, popular websites. Exogenously measured anti-tobacco content predicts reductions in YYA likelihood of initiating smoking. These findings suggest that anti-tobacco media coverage is still impactful in our current complex media environment.

FUNDING: Federal

PA17-2

THE EFFECT OF A NATIONAL SMOKING PREVENTION MEDIA CAMPAIGN ON YOUTH INITIATION TO CIGARETTES

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OBJECTIVE. To assess the relationship between youth's exposure to the Food and Drug Administration's national tobacco public education campaign, *The Real Cost*, and changes in smoking initiation. **METHODS.** A nationally representative cohort study of youth was conducted during November 2013-November 2016, consisting of a baseline survey and four follow-up surveys. We used a discrete time survival analysis model to analyze the risk of smoking initiation as a function of cumulative media exposure by media market (i.e., targeted rating points or TRPS) as well as self-reported exposure to campaign advertising. **RESULTS.** We found that increased levels of advertising were associated with a significant reduction in the odds of reporting smoking initiation at follow-up. Every additional 3,500 TRPs was associated with a 13% decrease in the risk of smoking initiation (adjusted odds ratio [aOR] = 0.87, 95% confidence interval [CI] = 0.81-0.93). Increased levels of self-reported exposure were also associated with



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a significant reduction in the odds of initiation. Those who were exposed to the campaign were 28% less likely to initiate smoking (adjusted odds ratio [aOR] = 0.72, 95% confidence interval [CI] = 0.57-0.91). Based on the results of the TRP model, The Real Cost is associated with over 580,000 U.S. youths aged 11-19 years who did not initiate smoking during February 2014-November 2016 as a result of the campaign. The cost per quality-adjusted life year (QALY) of the campaign was \$963.53. **CONCLUSIONS.** A sustained national tobacco public education campaign can change population-level smoking initiation and prevent tobacco-related harms among youth. Our findings indicate that the campaign was cost-efficient. The cost-savings resulting from The Real Cost represent a large reduction in the financial burden of tobacco to individuals, their families, and society.

FUNDING: Federal

PA17-3

EFFECTS OF PROMOTING FREE CESSATION MEDICATIONS ON QUITLINE CALLS AND CALLER CHARACTERISTICS DURING A NATIONAL ANTISMOKING CAMPAIGN

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SIGNIFICANCE: No study has measured the effect of adding an offer of free cessation medication to a national antismoking media campaign. Understanding this effect could help inform planning of antismoking campaigns. For the first time since CDC launched its *Tips From Former Smokers* campaign (*Tips*®), all televised *Tips* ads, for three weeks in March and April 2017, included a 2-4 second message informing viewers that they could obtain help getting free cessation medications by calling 1-800-QUIT-NOW. This study examines the impact of adding this message to an existing antismoking campaign on quitline call volume, caller characteristics, and callers' motivation to contact the quitline. **METHODS:** We estimated a multivariable model of calls to 1-800-QUIT-NOW from all U.S. states as a function of media market gross rating points (GRPs) for *Tips* ads. The model controlled for possible confounding factors (state quitline promotions, media market characteristics, a linear time trend and state fixed effects). Data from CDC's National Quitline Data Warehouse were used to examine if caller characteristics differed between quitline registrants who called before the promotion and those who called during it. To assess motivations to call the quitline, all callers in 11 states before, during, and after the promotion were invited to complete an additional survey following intake using an interactive voice response system. **RESULTS:** At similar GRP levels, adding the brief offer of medications increased weekly quitline calls by approximately 26.2 calls per area code ($p<.0001$). Compared to those who called the quitline before the promotion, those who called during the promotion were more likely to be non-white, ≥ 45 years old, have \leq high school education, and to have heard about the quitline on TV. The percent of callers citing medications as a motivation to call the quitline also increased during the promotion. **CONCLUSION:** Integrating a brief message into antismoking campaigns with an offer of help accessing free cessation medications may motivate more smokers to call quitlines, especially those who are racial or ethnic minorities, are middle-aged and older, have less education, and see the offer on TV.

FUNDING: Federal

PA17-4

RECALL OF TOBACCO COMMUNICATION CAMPAIGNS: EXAMINING CROSS-CAMPAIGN CUMULATIVE EXPOSURE USING A NATIONAL SAMPLE OF ADOLESCENTS

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Significance: National tobacco control campaigns continue to target at-risk populations with messages to prevent and reduce tobacco product use. This study examined whether advertisements from 2 national campaigns targeting adolescents (i.e., *The Real Cost*, *Fresh Empire*) and 1 campaign targeting adults (i.e., *Tips from Former Smokers*) were reaching adolescents. **Methods:** We analyzed data from a national sample of adolescents aged 13 to 17 years ($n = 975$) surveyed by phone from August 2016 to May 2017. We assessed recall and attitudes toward 5 specific advertisements associated with these campaigns and 3 campaign slogans. Logistic regression models examined whether demographic and smoking-related variables were associated with a) aided recall of the 5 specific campaign advertisements, b) aided recall of the 3 campaign slogans,

and c) post-message negative feelings toward tobacco products. We also examined whether increased exposure to advertisements (i.e., recalling more advertisements) was associated with post-message negative feelings toward tobacco products. **Results:** Almost all (95%) adolescents reported having seen or heard at least 1 of the 5 campaign advertisements. Aided recall of *The Real Cost* and *Tips from Former Smokers* slogans was high (65.5% and 71.6%, respectively), while aided recall of *Fresh Empire* slogan was lower (15.3%) (χ^2 p-value: $p<.001$); however, Black adolescents had higher odds of recalling the *Fresh Empire* ad (aOR: 2.28, 95% CI: 1.39, 3.73) and slogan (aOR: 2.64, 95% CI: 1.06, 6.54) compared to White adolescents. Increased exposure to the advertisements (i.e., recalling more advertisements) was significantly associated with higher odds of reporting negative feelings toward tobacco products in 4 of the 5 models (aORs ranging from 1.34 to 1.61). **Conclusions:** Large-scale national campaigns can have wide reach among both targeted and non-targeted audiences. Cumulative cross-campaign exposure to advertisements may increase impact over and above any single campaign by itself.

FUNDING: Federal

PA17-5

AWARENESS OF AND RECEPΤIVITY TO THE FRESH EMPIRE TOBACCO PUBLIC EDUCATION CAMPAIGN AMONG HIP HOP YOUTH

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INTRODUCTION: In 2015, FDA's Center for Tobacco Products launched *Fresh Empire*, a tobacco public education campaign that targets youth at-risk for smoking who identify with the Hip Hop peer crowd. **OBJECTIVE:** To assess exposure and receptivity to *Fresh Empire*. **METHODS:** The evaluation uses a randomized treatment-control design with 15 campaign-targeted treatment markets and 15 minimal-exposure control markets. We conducted surveys with 12- to 17-year-olds about 6 months (follow-up 1; $N = 2,403$) and 1.5 years after campaign launch (follow-up 2; $N = 2,051$). We also measured exposure using digital and broadcast target rating points (TRPs). We used descriptive and bivariate analyses to explore the proportion of TRPs delivered, treatment-control differences in brand awareness (yes/no) and awareness of video advertisements (maximum frequency of "never" or "rarely" = low, "sometimes" = medium, "often" or "very often" = high), and perceived effectiveness of advertisements (1-5 scale). **RESULTS:** Youth in treatment condition (compared with control) were more likely to be brand aware at follow-up 1 (treatment=41%, control=28%, $p < .01$) and follow-up 2 (treatment=79%, control=60%, $p < .001$). At follow-up 1, youth in treatment condition were more likely to report high awareness (52%) and less likely to report low awareness (32%) of video advertisements than control (high: 40%, low: 42%) ($p < .05$). At follow-up 2, there were no differences in video ad awareness (high: treatment= 51%, control= 42%, $p = .12$; medium: treatment= 18%, control= 20%, $p = .31$; low: treatment= 31%, control= 38%, $p = .20$). Advertisements were rated high in perceived effectiveness with mean scores ranging from 3.93-4.11 at follow-up 1 and 3.75-3.97 at follow-up 2. 80% of digital and 49% of broadcast TRPs were delivered in treatment markets and the remainder in control. **CONCLUSION:** *Fresh Empire* has achieved high campaign awareness and receptivity, with higher brand and video ad awareness in treatment than control markets at follow-up 1, but differences only in brand awareness at follow-up 2. Exposure in control markets underscores the importance of using multiple exposure metrics to assess campaign effects.

FUNDING: Federal

PA17-6

ANTI-TOBACCO CAMPAIGN TARGETING: A RISK FACTOR ANALYSIS OF PATH WAVE 2

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Introduction: Tobacco education and prevention campaigns have had marked success in reducing rates of tobacco use among youth, but disparities continue to exist, leaving low SES, Non-Hispanic white, Hispanics, and LGBT youth at elevated risk for tobacco use. It is therefore critical to assess what groups are being reached through these campaigns. **Methods:** Data for this analysis comes from Wave 2 of the Population Assessment of Tobacco and Health (PATH) Study restricted-use file. We performed a



risk factor analysis to explore the relationship between exposure to three anti-tobacco campaigns (Truth, Tips from Former Smokers, and the Real Cost), and key characteristics related to higher risk of tobacco use using full sample weights and Poisson regression models with robust variance to calculate the adjusted incidence rate ratio (AIRR) to approximate the prevalence ratio. Results: Adjusted models identified increased exposure to tobacco marketing and more time spent on social media as independent factors associated with exposure to all three anti-tobacco campaigns. Youth who were susceptible to cigarettes were also more likely to report exposure to the campaigns (Truth AIRR=1.08; Tips AIRR=1.11; Real Cost AIRR=1.06). Adolescents from families making between \$50,000-\$99,999 a year were also significantly more likely to report exposure compared to those from families making less than \$24,999 a year (Truth AIRR=1.11, Tips AIRR=1.32, Real Cost AIRR=1.18). Queer sexual orientation was associated with increased likelihood of exposure to Truth (AIRR=1.09) and Real Cost (AIRR=1.10), but not Tips (AIRR=1.04). Conclusions: While ample evidence documents the effectiveness of mass media campaigns, it remains important to ensure that high-risk youth are exposed to them and receive the associated benefits. While some high-risk youth are more likely to report exposure, there are priority groups that are not being reached by current efforts, including low SES youth. Future campaigns should consider targeting these groups specifically.

FUNDING: Nonprofit grant funding entity



SRNT Notes



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SRNT Notes



POSTER SESSION 1

POS1-1

CHARACTERIZING BRAINSTEM TO MIDBRAIN CIRCUITRY UNDERLYING NICOTINE REWARD AND AVERSION

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Tobacco use is the leading cause of preventable death in the United States. Nicotine and other addictive drugs are hypothesized to "hijack" the brain's reward pathways. Decades of studies have revealed dopamine (DA) neurons in the ventral tegmental area (VTA) as key players in the circuitry mediating nicotine reward. In addition to reward, nicotine can induce anxiety or aversion but the neural substrates underlying these effects remain unknown. The lateral dorsal tegmentum (LDT) is a brainstem structure required for VTA DA burst firing and nicotine self-administration. The LDT contains glutamatergic, cholinergic, and GABAergic neurons that project to the midbrain, in particular the VTA and interpeduncular nucleus (IPN). We hypothesize that different cell populations in this pathway give rise to different nicotine-related behaviors. To dissect the circuitry in a projection- and cell-specific manner, we employed retrograde tracers, optogenetics, and transgenic mice that allow selective targeting of different LDT cell populations. By using electrophysiology, optogenetics, and behavioral assays, we can study the relationship between nicotine and different LDT cell populations from the cellular to behavioral levels. Acute nicotine exposure increases the AMPAR/NMDAR ratio of glutamatergic inputs from LDT to VTA DA neurons that project to the lateral shell of the nucleus accumbens, indicating nicotine-induced changes in synaptic strength. Selective optogenetic activation of glutamatergic LDT-> midbrain neurons induces reward-related behaviors, while activation of GABAergic LDT-> midbrain neurons induces aversion. Retrograde rabies tracing reveals that LDT VGLUT2 and GAD2 populations receive inputs from different regions of the brain. Electrophysiological evidence of a functional connection between LDT GAD2 cells and the interpeduncular nucleus (IPN) may indicate that this pathway contributes to the aversive effects of nicotine. A detailed investigation of the anatomical and functional properties of the brainstem to midbrain circuit and its upstream inputs may serve as the foundation for development of targeted pharmaceutical treatments to combat nicotine addiction.

FUNDING: Federal; State; Academic Institution

POS1-2

MITOCHONDRIAL DNA CONTENT IN ORAL MUCOSA CELLS FROM AFRICAN AMERICAN AND WHITE SMOKERS

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Mitochondrial DNA content in oral mucosa cells from African-American and White smokers Aleksandra Alcheva, Rebecca J. Kapphahn, Astia Roper-Batker, Joni Jensen, Shannon Cigan, Nicole Thomson, Sharon Murphy, Deborah A. Ferrington, Astia Roper-Batker, Dorothy Hatsukami, Irina Stepanov. Mitochondria are intracellular organelles that serve as the major source of energy in human cells and play a critical role in apoptosis. Mitochondrial DNA (mtDNA) is particularly susceptible to damage induced by genotoxic exposures, in part due to the lack of protective histones and inefficient repair mechanisms. Previous studies have shown that smoking is associated with a decline in mitochondrial function and increase in mtDNA content in oral cells and in the lungs. Studies also report associations between mtDNA content and risk of various cancers. We investigated the mtDNA content in oral cells of African-American (AA) and White (WH) smokers in order to provide insights into the potential role of mtDNA content in the observed higher smoking-related cancer risks in AA smokers than in WH smokers. DNA was isolated from oral mucosa cells of 153 smokers (22 AA 29 WH). MtDNA content was determined by quantitative real-time PCR and expressed as mtDNA to nuclear DNA (nDNA) ratio. A short region of the mtDNA genome located within the Cytochrome b gene (222 bp) was amplified and normalized to the β -globin nuclear gene

(147 bp), used to estimate cell number. The results showed that mtDNA to nDNA ratio had greater variability among the AA smokers than in WH smokers, ranging from 6.7 to 2592.3 and from 9.6 to 418.8, respectively. Mean mtDNA to nDNA ratio was 271.3 ± 565.9 in AA smokers and 127.9 ± 126 in WH smokers; however, the difference did not reach statistical significance ($p=0.09$). Given the highly skewed distribution of the data, natural-log mtDNA was used for regression analysis. After adjustment for race and gender mtDNA content had no association with self-reported cigarettes per day ($p=0.72$), but had a positive association with urinary total nicotine equivalents (a biomarker of smoke exposure, $p=0.03$). Our data suggests that mtDNA in AA smokers may sustain higher levels of damage derived from carcinogenic and oxidative agents present in cigarette smoke, leading to a more dramatic decrease in mitochondrial function and increase in mtDNA copy numbers. The potential utility of using mtDNA copy number and mtDNA modifications (adducts) as biomarkers to identify individuals at high risk for cancer should be further investigated.

FUNDING: Federal; Academic Institution

POS1-3

THE ROLE OF NICOTINIC ACETYLCHOLINE RECEPTOR ALPHA SUBUNITS IN ENERGY BALANCE

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Significance: Nicotine and drugs that target the nicotinic acetylcholine receptor (nAChR) consistently demonstrate weight-reducing effects in rodents. We recently reported a novel potentially important receptor-mediated mechanism by which nicotine lowers body weight (BW). This mechanism involves desensitization of nAChR(s) containing the $\beta 2$ subunit ($\beta 2^*$ nAChR; Hussmann *et al.*, 2014; Dezfuli *et al.*, 2016). Consistent with the role of the $\beta 2^*$ nAChR in BW regulation, we have recently shown that $\beta 2^{+/-}$ male mice have reduced weight gain over time in comparison to littermate controls ($\beta 2^{+/+}$). In contrast, female mice display reduced weight gain only in early adulthood (*unpublished data*). However, the associated alpha (α) subunit that partners with the $\beta 2$ subunit to form the functional nAChR involved in regulation of energy balance and nicotine-induced weight loss has not been established. **Methods:** We used mice with genetic deletions of specific nAChR subunits, i.e., knockout (KO) mice, to test the involvement of the $\alpha 4$ and the accessory $\alpha 5$ subunit of the nAChR in the endogenous regulation of energy balance. We first compared the BW phenotype and food intake (FI) of 7-week-old $\alpha 4$ and $\alpha 5$ KO mice ($\alpha 4^{-/-}$ and $\alpha 5^{-/-}$ respectively) fed a standard diet (SD; 4.5% kcal from fat) to littermate controls ($\alpha 4^{+/+}$ and $\alpha 5^{+/+}$) fed the same diet over 21-weeks. We then tested the hypothesis that the $\alpha 4\beta 2$ nAChR subtype is critical to nicotine-mediated weight loss by measuring BW and FI in obese $\alpha 4^{-/-}$ mice compared to $\alpha 4^{+/+}$ during 8-weeks of chronic nicotine administration (via the drinking water) at a dose of 200 μ g/ml (free base). **Results:** Results from the present studies demonstrate: A) Similar to $\beta 2^{-/-}$ male mice, $\alpha 4^{-/-}$ males fed a SD show reduced weight gain over time in comparison to $\alpha 4^{+/+}$ controls [$F(14,182) = 2.463$, $p<0.01$; $n=5-10$]. B) Female $\alpha 4^{-/-}$ mice do not display decreased weight gain over time. C) Neither $\alpha 5^{-/-}$ males or females have reduced weight gain over time in comparison to $\alpha 5^{+/+}$ controls. The effects of nicotine in the $\alpha 4^{-/-}$ mice compared to $\alpha 4^{+/+}$ mice are currently in progress and will be presented. **Conclusion:** These findings indicate a potentially prominent role for the $\alpha 4\beta 2$ nAChR as an endogenous regulator of BW in the non-obese state with no role for the accessory $\alpha 5$ subunit in energy balance. Furthermore, these studies indicate that the heteromeric nAChR directly responsible or at least critically involved in mediating nicotine's effects on energy balance is the $\alpha 4\beta 2$ nAChR. Overall, these findings highlight the $\alpha 4\beta 2$ nAChR as a potential new drug target site for obesity.

FUNDING: Academic Institution

POS1-4

TOXIC AND CARCINOGENIC CONSTITUENTS IN SMOKELESS TOBACCO PRODUCTS PURCHASED IN AFRICAN COUNTRIES

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Consumption of smokeless tobacco (SLT) products is associated with a range of negative health outcomes, such as addiction, cardiovascular diseases, and cancer. However, major differences in the risk of disease have been reported among SLT users globally, which is mainly due to extensive variability in formulations and chemical composition of SLT products. Data on the variability in toxic and carcinogenic constituents across



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different SLT product types and brands can assist in establishing effective regulatory policies and preventive strategies. In this study, we analyzed SLT products that were purchased in five African countries: Mauritania, Nigeria, South Africa, Uganda, and Zambia. A total of 54 samples representing different varieties of manufactured and hand-made SLT products were analyzed. Moisture content, pH, total and unprotonated nicotine, 5 tobacco-specific *N*-nitrosamines (TSNA), 10 polycyclic aromatic hydrocarbons (PAH), 5 heavy metals, nitrate and nitrite were analyzed by validated methods. Total nicotine ranged from 1.6 to 20.5 mg/g wet weight with moisture content ranging from 6.6 to 57.6%. Unprotonated nicotine contributed to 5.3-99.6% of total nicotine. Total TSNA ranged from 1.6 to 100.7 µg/g wet weight with the ranges for NNN and NNK being 0.5-32.5 µg/g and 0.04-9.79 µg/g, respectively. Total PAH ranged from 65.2 to 569.1 ng/g wet weight with phenanthrene and pyrene as major contributors and benzo[a]pyrene ranging from below the limit of detection (LOD) to 3.1 ng/g. Amounts of 5 toxic metals were: arsenic, LOD-2.9 µg/g; cadmium, 0.1-2.1 µg/g; chromium, 0.2-7.8 µg/g; nickel, 1.1-5.9 µg/g and lead, 0.1-11.4 µg/g (all wet weight). Levels of nitrite and nitrate varied more than 800- and 20-fold, respectively, across the products. In general, substantial variations in the levels of toxicants and carcinogens were observed among both manufactured and hand-made SLT products based on the product type and composition, and the country where these products were made. Our results highlight the critical need for SLT products surveillance in African countries, to better understand the exposures and cancer risks in users of these products.

FUNDING: Federal

POS1-5

ANALYSES OF NICOTINE AND TOBACCO-SPECIFIC NITROSAMINES IN SPENT FILTERS FROM MACHINE-SMOKED CIGARETTES: EFFECT OF SMOKING INTENSITY AND FILTER VENTILATION

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While biomarkers of exposure are crucial for the measurements of tobacco constituent intake in smokers, biological sample collection may be invasive and analytical procedures for their measurements are labor-intensive. Analysis of chemical constituents in spent cigarette filters has been employed by some researchers as a proxy for smoke intake and toxicant exposures. For such approach to be useful in tobacco product regulation, it is important to understand how levels of constituents in filters are related to the constituent yields in cigarette smoke and how they are influenced by smoking intensity and filter ventilation. Our goal was to analyze nicotine and two carcinogenic tobacco-specific *N*-nitrosamines NNN and NNK in spent filters of machine-smoked cigarettes, and evaluate their relationship with the smoking intensity, constituent yields in the smoke, and filter ventilation. A total of 114 cigarette varieties representing 11 major U.S. cigarette brands were smoked using three smoking regimens [ISO, Massachusetts and Canadian Intense (CI)]. Constituents in 1-cm filter sections and in cigarette smoke were analyzed by mass-spectrometry-based methods. Filter ventilation was measured by a KC-3 apparatus (Borgwaldt). The levels of nicotine, NNN, and NNK in spent filters increased with the increasing smoking intensity: under ISO conditions these levels were 0.24±0.08 mg/filter, 23±9 ng/filter and 22±9 ng/filter, respectively, whereas under CI regimen levels were 0.56±0.16 mg/filter, 52±20 ng/filter and 32±12 ng/filter, respectively. Nicotine levels in filters correlated with smoke yields under ISO, but not CI. When expressed per mg of nicotine, NNN and NNK levels in filters correlated with the respective yields in the smoke for all intensities. Filter ventilation in the tested brands ranged from 1 to 72%. There were substantial differences in the relationships between filter ventilation and constituent levels in spent filters which were affected by smoking intensity. These complex interactions and the implications for the use of filter constituent levels as proxies for smoking intensity and constituent exposures in smokers will be discussed.

FUNDING: Federal

POS1-6

NICOTINE AND EPIGENETIC TRANSGENERATIONAL RISK OF ABDOMINAL AORTIC ANEURYSM

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Significance: Cigarette smoking is a risk factor for abdominal aortic aneurysm (AAA), leading to accelerated growth and rate of fatal rupture. Numerous studies suggest a significant portion of the risk for AAA resulting directly from nicotine exposure. It has been recently appreciated that exposure to tobacco smoke and nicotine can lead to epigenetic alterations, which can be transmitted in a transgenerational fashion in animal model and humans. Cigarette smoke is among the strongest environmental modulators of DNA methylation. Prenatal tobacco smoke exposure not only alters DNA methylation in human placenta, but also in offspring (F1), resulting in persistent changes into adulthood. This work explores the effects of parental nicotine exposure on the offspring's risk for experimental AAA. **Methods:** Apo E-/- mice, derived from parents (F0) exposed to subdermal nicotine or saline infusion, underwent subdermal Angiotensin II (AngII) infusion to induce abdominal aneurysms. During 28 days of follow up, aneurysm growth was tracked via ultrasound. Subgroups underwent *ex-vivo* pressure myograph assessment of the abdominal aorta. **Results:** We find that parental nicotine exposure augments experimental AAA formation. Maternal nicotine exposure prior to conception (vs. saline) led to larger, and faster-growing AAA in male F1 mice. Additionally, maternal nicotine exposure resulted in higher overall F1 aneurysm incidence and fatal rupture-rates (vs. paternal or saline). Effects in female F1 mice were less pronounced. In *ex vivo* aortic myography in male F1 mice after maternal F0 nicotine exposure showed decreased distensibility compared with paternal nicotine or saline groups. These findings indicate that maternal nicotine exposure leads to transgenerational effects on aortic stiffening in male offspring, a process highly involved in AAA formation. We also show that subdermal nicotine infusion in adult, male C57BL6 mice increases aortic stiffness, and therefore conclude that nicotine not only increases aortic stiffness in male mice, but that maternal nicotine exposure can pass on this risk to males in the next generation. We are currently processing tissues harvested from F0 and F1 animals for assessment of pro-AAA gene/protein expression and evaluation of DNA methylation at various loci. **Conclusion:** In conclusion, we show that parental nicotine exposure can augment experimental AAA growth, particularly in male offspring, accompanied by an increase in aortic stiffness. This work is supported by TRDRP (26IP-0041) and DFG (MU4309/1-1)

FUNDING: Federal; State

POS1-8

COMPARISON OF THE ADDICTIVE POTENTIAL OF CIGARETTE, LITTLE CIGAR, E-CIGARETTE, AND WATERPIPE TOBACCO SMOKE CONDENSATE IN A RAT SELF-ADMINISTRATION MODEL

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In addition to nicotine, the pharmacological effects of tobacco products are mediated by non-nicotine constituents, which may alter the reinforcing effects of nicotine, or serve as reinforcers on their own. Results from past rodent research using intravenous (IV) self-administration procedures suggest that several non-nicotine tobacco constituents may play a role in addiction. The objective of this study was to evaluate the reinforcing effects of aqueous solutions of aerosol condensate from e-cigarettes and tobacco smoke condensate from cigarettes, little cigars, and waterpipe tobacco in a rat self-administration procedure. Four groups of adult male Sprague-Dawley rats were trained to self-administer nicotine (30 µg/kg/infusion) on a fixed ratio 5 (FR5) schedule of reinforcement. Following nicotine dose-effect assessment (1, 7.5, 15, and 30 µg/kg/infusion), rats were given access to a smoke or aerosol condensate solution derived from their assigned tobacco product (cigarette, little cigar, e-cigarette, or waterpipe tobacco) on an FR5 schedule of reinforcement. Responding was maintained by smoke/aerosol condensate containing 1, 7.5, 15, and 30 µg/kg/infusion nicotine, with the ratio of nicotine:non-nicotine constituents held constant across doses for each tobacco product. Within groups, responding was compared between the nicotine alone condition and the nicotine plus smoke/aerosol condensate condition. Comparison of dose-effect curves revealed that cigarette, little cigar, and e-cigarette smoke/aerosol condensates produced an apparent leftward shift in the nicotine dose-effect curve, suggesting that smoke/aerosol condensate increased the reinforcing potency of nicotine. Waterpipe tobacco smoke condensate produced an apparent rightward shift in the dose-effect curve, suggesting that smoke condensate decreased the reinforcing



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potency of nicotine. Results indicate that non-nicotine constituents (e.g., minor tobacco alkaloids, flavorants) in tobacco products affect responding maintained by IV administration of aqueous solutions derived from these products. Progressive ratio schedules of reinforcement will be used to evaluate the reinforcer efficacy of these solutions.

FUNDING: Federal

POS1-9

LEVELS OF TOBACCO-SPECIFIC NITROSAMINES AND NICOTINE IN SOME LOWER-COST CIGARETTE BRANDS

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Tobacco remains one of the major risk factors for a number of chronic diseases, including cancer, lung and cardiovascular diseases. Raising cigarette prices through tobacco taxation is one of the most effective tobacco control measures leading to reductions in cigarette use. However, another consequence of such measure is shifting to lower-cost cigarette brands, especially among smokers with low socioeconomic status (SES). Little information is available on the yields of harmful constituents in lower-cost cigarettes. We analyzed nicotine and the tobacco-specific nitrosamines NNN and NNK in three low cost brands: Pyramid, Winner, and Timeless Time. Different varieties (red, gold, silver, blue, menthol, etc.) of each brand were included in the analyses, and each variety was analyzed in triplicate, to a total of 71 individual samples. Cigarettes were smoked on a single-port smoking machine (Borgwaldt) using two smoking regimens (FTC and Canadian intense). The constituents were analyzed by liquid chromatography-tandem mass-spectrometry. The sum of NNN and NNK in the smoke of all tested cigarettes ranged from 108 to 930 ng/cigarette, and nicotine ranged from 0.57 to 2.8 mg/cigarette under the Canadian intense regimen. When expressed per milligram nicotine, NNN levels in smoke varied 20-fold and NNK varied 40-fold across all varieties tested. Levels of these constituents in tobacco filler correlated with the levels in smoke ($R = 0.90$, $p <0.001$ for NNN and $R = 0.85$, $p <0.001$ for NNK under Canadian intense conditions), indicating that tobacco blending and processing methods are responsible for the variations observed in cigarette smoke. Together, our results show that levels of important harmful constituents may vary grammatically across low-cost cigarette brands, with some containing significantly higher levels of carcinogenic nitrosamines than the majority of popular commercial brands. This study underscores the vulnerability of low-SES population to harmful effects of smoking and the importance of establishing lower limits for harmful and potentially harmful constituents in tobacco products by the Food and Drug Administration.

FUNDING: Federal

POS1-10

CHARACTERISTICS OF E-CIGARETTE USE IN A SAMPLE OF ALASKA NATIVE ADULTS IN NORTHERN ALASKA

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Tobacco use greatly increases the risk of cardiovascular disease (CVD), many types of cancer, lung disease and premature death. Alaska Native (AN) people have disproportionately higher smoking prevalence than the general population, with reports of 50% of AN men and 33% of AN women smoking cigarettes. State data indicate e-cigarette (ecig) use among adults in Alaska increased from 1% to 7% from 2010 to 2014. The current study aimed to characterize ecig use among AN people of the Norton Sound Region of Alaska who have been enrolling in the Healing and Empowering Alaskan Lives toward Healthy Hearts (HEALTHH) study since June 2015. HEALTHH is a secondary prevention telemedicine-delivered, two-group randomized trial that is testing interventions for tobacco use and other CVD risk behaviors for adult smokers with hypertension or hyperlipidemia. Intention to quit smoking is not required for study participation. Of the 301 HEALTHH participants, 91 (30%) reported at baseline having ever used ecigs; 4% reported daily ecig use. Ever ecig use was more common among men (38%) than women (22%), $p < .001$. Ever ecig users were younger (age $M=38$, $SD=12$) than never-ecig users (age $M=50$, $SD=13$), $p < .001$. Ecig users did not differ from never-ecig users on desire or stage of change for quitting smoking. Ecig use was unrelated to having had a heart event, lung disease or cancer diagnosis. The most commonly reported brands of ecigs used were: Njoy and Blu. Among the full sample, the most frequent channels for hearing about ecigs were TV (59%), friends (34%), and in store promotions (11%). In a remote region of Northern Alaska, largely accessible only by air travel, ever ecig use was reported by a third of the sample and was more common among men and younger

people. Daily ecig use was rare. In contrast to studies in other population groups, ecig use among our sample of AN adults was not associated with a greater motivation to quit combustible cigarettes.

FUNDING: Federal

POS1-11

A NOVEL APPROACH TO THE ASSESSMENT OF ELECTRONIC CIGARETTE TOPOGRAPHY CHARACTERISTICS

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The use of electronic nicotine delivery systems (ENDS) has increased dramatically over the last decade. However, during this same period of time, there has been little empirical evidence to describe how consumers use these new products. One reason for this scarcity of data is that techniques and approaches used to collect topography (puff) characteristics have yet to catch up with the changes in format and function of new ENDS products. We have developed a new approach that will assess ENDS topography use characteristics in both controlled (in-clinic) and naturalistic (ambulatory) environments. The Product Use and Behavior (PUB) instrument is positioned between the power unit and cartridge of an ENDS product and acts as a sentinel, recording the periods of product activation over a continuous period of use without impacting how the consumer interacts with the ENDS product. This new approach provides data on puff duration, inter-puff interval, total number of puffs, battery characteristics (voltage/current), as well as how these characteristics vary across use sessions in the form of cumulative use patterns over time. The analysis of the voluminous amount of data generated by the PUB instrument requires novel approaches to evaluation of time-series data in an unbiased manner. Additionally, data captured by the PUB instrument can also be used to estimate mouth level exposure (eMLE) per puff and over product use periods. The PUB instrument produces data that will provide insights into how consumers interact with, and use, ENDS products.

FUNDING: Tobacco Industry

POS1-12

FREE RADICALS, CARBONYLS AND NICOTINE FROM THE NIDA STANDARDIZED RESEARCH ELECTRONIC CIGARETTE

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Introduction: E-cigarettes (e-cigs) are a diverse and continuously evolving group of products with four generations currently in the market. The National Institute on Drug Abuse (NIDA) standardized research e-cigarette (SREC) is intended to provide researchers with a consistent e-cig device with known characteristics. Thus, we conducted laboratory-based characterizations of oxidants and nicotine in aerosols produced from SREC and other breath-activated, commercially available e-cigs (Blu and Vuse). We hypothesized that oxidant and nicotine production will be significantly affected in all devices by changes in puffing parameters. **Methods:** All e-cigs were machine vaped and the aerosols generated were examined for nicotine, carbonyls, and free-radicals while varying the puff-volumes and puff-durations to reflect typical human usage. The data were normalized on a per puff, per gram aerosol, and per milligram nicotine basis.

Results: We found that aerosol production generally increased with increasing puff-duration and puff-volume in all e-cigs tested. Increased puff-duration and puff-volume increased nicotine delivery for Blu and Vuse, but not the SREC. We report, for the first time, high levels of reactive free-radicals in aerosols from all e-cigs tested. Formaldehyde, acetaldehyde, acetone, and propionaldehyde were detected in the aerosols of all tested e-cigs. **Conclusions:** Carbonyl and free radical production is affected by puff-duration and puff volume. Overall, SREC was more efficient at aerosol and nicotine production than both Blu and Vuse. In terms of carbonyl and free radical levels, SREC delivered lower or similar levels to both other devices. **Implications:** This is the first study that provides data on the oxidants and nicotine produced from the SREC compared to other similar devices, and under different puffing regimens. These data will be informative for future human topography and biomarker studies.

FUNDING: Federal; Academic Institution



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POS1-13

SECONDHAND TOBACCO SMOKE INDUCES INHIBITION OF IMMUNE FUNCTIONS AND DNA DAMAGE OF ALVEOLAR MACROPHAGE IN MICE

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Significance: Cigarette tobacco smoke is consisted from main-stream tobacco smoke (MTS) and secondhand tobacco smoke (STS). STS is released into the atmosphere, and may impact lung health in non-smoker. STS is inhaled into the lung by respiration and affect to alveolar macrophage (AM). AM is playing an important role of immune system in the lung. However, the effect of STS on AM is not yet fully demonstrated compared with MTS. In this study, we investigated the effect of STS on DNA damage and immune functions in AM. **Methods:** Mice were exposed to STS of 20 cigarettes/day during 10 days by using STS exposure auto-machine. After STS exposure, AM were obtained by bronchoalveolar lavage (BAL). AM was analyzed by SEM and TEM. TLRs expressions, phagocytic activity and reactive oxygen species (ROS) generation of AM were determined by FACS. Expressions of cytokines mRNA of AM were measured by RT-PCR. DNA damage of AM was evaluated by comet assay. **Results:** The number of AM was significantly ($p<0.02$) increased in STS exposed mice. The cell size and intra-cellular structure of AM were changed by STS. Phagocytic activity of AM was significantly ($p<0.05$) inhibited by STS. Expressions of CD11b, TLR-2, TLR-4 and CD14 on AM were significantly ($p<0.05$) inhibited by STS. ROS generations of AM were significantly ($p<0.05$) increased by STS exposure. Expression of TNF- α mRNA in AM was significantly ($p<0.02$) inhibited by STS. Tail moment and length of AM as indicator of DNA damage were significantly ($p<0.05$) increased by STS. **Discussion:** STS exposure caused the change of cell size and intracellular structure in AM. STS induced DNA damage in AM by ROS generation. The phagocytic activity, expressions of CD11b, TLR-2, TLR-4, CD14 and TNF- α mRNA in AM were decreased by STS. STS indicated toxicity for DNA of AM and inhibition of these immunological functions in AM were mediated by DNA damage. **Conclusion:** These results suggest that inhibition of immune functions of AM by toxicity of STS may be associated with risk of lung infection or development of pulmonary disease.

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POS1-14

EFFECTS OF AN E-CIGARETTE AEROSOL EXTRACT ON CONDITIONED TASTE AVERSION IN ADOLESCENT RATS

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Significance. Development of preclinical methodology for evaluating the relative abuse liability of electronic cigarettes (ECs) in adolescents is urgently needed to inform FDA regulation of these products. We previously reported reduced aversive effects of EC liquids containing nicotine and a range of non-nicotine constituents compared to nicotine alone in adult rats as measured using intracranial self-stimulation (ICSS). The goal of this study was to compare the aversive effects of nicotine alone and EC aerosol extracts in adolescent rats as measured using conditioned taste aversion (CTA). This assay involves a shorter training protocol than ICSS and can be conducted during the brief adolescent period in rodents. We used EC aerosol extracts rather than EC refill liquids because they more accurately simulate EC use in humans via aerosol exposure. **Methods and Results.** In Experiment 1, nicotine alone (1.0 or 1.5 mg/kg, s.c.) produced robust CTA in adolescent rats, thereby establishing a model to study the effects of EC extracts. At a nicotine dose of 1.0 mg/kg, CTA to Vuse Menthol EC extract, but not Aroma E-Juice EC extract, was consistently attenuated compared to nicotine alone during repeated CTA tests (Experiment 2a). At a nicotine dose of 0.5 mg/kg, CTA to Vuse Menthol EC extract did not differ from nicotine alone during the first CTA test, but extinguished more rapidly across repeated tests (Experiment 2b). Chemical analyses of EC extracts indicated that they contained several minor alkaloids (e.g., nornicotine, anabasine), while levels of the MAO inhibitors harmine and norharmane (β -carbolines) were either very low (Aroma E-Juice EC extract) or not detectable (Vuse Menthol EC extract). **Conclusions.** These data indicate that non-nicotine constituents in Vuse Menthol EC extract attenuate nicotine's aversive effects in adolescents, consistent with effects of EC liquids in adults. These models may be useful for anticipating the relative abuse liability of ECs in adolescents, as well as for modeling FDA-mandated changes in product standards for nicotine or other constituents in ECs.

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POS1-15

CARBONYL COMPOUNDS MEASUREMENTS FROM A SUB-OHM ELECTRONIC CIGARETTE WITH TEMPERATURE CONTROL FUNCTIONALITY

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Electronic cigarettes (ECIGs) use a battery-powered heater coil to heat and aerosolize a liquid containing propylene glycol (PG), vegetable glycerin (VG), nicotine, and other additives. Carbonyl compound species are commonly found in the ECIG aerosols. CCs are well-known thermal degradation products of PG and VG and are thought to be major causative agents in lung disease among smokers. Literature reports on CC yields from ECIGs show that increasing device power results in an increase in CC production, likely due to the higher temperatures attained at higher power. Some advanced ECIG models allow the user to select temperature during puffing. TCDs (temperature control devices) are perceived as a "safe vape" on social media platforms. To date, there are no published data addressing temperature measurements and CCs emissions from TCDs. In this study, CC emissions from a popular TCD model (SMOK TF-N2) filled with analytical grade PG were measured in triplicates at the following temperatures: 215, 275 and 315 C. The tested temperature levels fall within the manufacturer's recommendation range (215-315 C). CCs were trapped on 1p-DNPH coated silica cartridges and quantified by HPLC. For each temperature level, average CC yields were calculated. For the temperature settings studied, total CCs yield ranged from 176(93)-2,571(1,855) μ g/15puffs. Increasing temperature resulted in an increase in CC yields. Even when TCDs are used within the temperature recommendation range of the manufacturer, TCDs may deliver high levels of CCs, similar to combustible cigarette levels.

FUNDING: Federal

POS1-16

FREE RADICAL, CARBONYL, AND NICOTINE LEVELS PRODUCED BY JUUL ELECTRONIC CIGARETTES

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Significance: Free radicals and carbonyls produced by electronic cigarettes (e-cigs) have the potential to inflict oxidative stress. Recently, Juul e-cigs have risen drastically in popularity; however, there is little data on nicotine and carbonyl yields and no data on free radical production from this new e-cig design. **Methods:** Aerosol generated from four different Juul flavors was analyzed for carbonyls, nicotine, and free radicals. The e-liquids were analyzed for propylene glycol (PG) and glycerol (GLY) concentrations. To determine the effects of e-liquid on oxidant production, Juul pods were refilled with nicotine-free 30:70 or 60:40 PG:GLY with or without citral. **Results:** No significant differences were found in nicotine ($164 \pm 41 \mu$ g/puff), free radical ($5.85 \pm 1.20 \text{ pmol/puff}$), formaldehyde ($0.20 \pm 0.10 \mu\text{g/puff}$), and acetone ($0.20 \pm 0.05 \mu\text{g/puff}$) levels between flavors. The PG:GLY ratio in e-liquids was ~30:70 across all flavors with GLY being slightly higher in tobacco and mint flavors. In general, when Juul e-liquids were replaced with nicotine-free 60:40 PG:GLY, oxidant production increased up to 190% and, with addition of citral, increased even further. **Conclusions:** Juul devices produce free radicals and carbonyls, albeit, at levels substantially lower than those observed in other e-cig products, an effect only partially due to a low PG:GLY ratio. Nicotine delivery by these devices was as high as or higher than the levels previously reported from cigarettes. These findings suggest that oxidative stress/damage resulting from Juul use may be lower than that from cigarettes or other e-cig devices; however, the high nicotine levels are suggestive of a greater addiction potential.

FUNDING: Federal

POS1-17

PREDICTION OF ANALYTE YIELDS, MUTAGENICITY, AND CYTOTOXICITY OF MAINSTREAM TOBACCO SMOKE FROM TOBACCO BLENDS

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The purpose of this study was to determine if analyte yields, mutagenicity, and *in-vitro* cytotoxicity of two blended experimental cigarettes containing multiple types of tobacco



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could be predicted from the response of experimental cigarettes containing a single tobacco type represented within each blended experimental cigarette. Select mainstream tobacco smoke (MS) analytes were collected using the International Organization for Standardization puff regimen and measured. Spontaneous mutant frequency was determined using a mouse lymphoma assay. The number of revertant colonies was determined via the *Salmonella* reverse mutation assay. Cytotoxicity (1/EC₅₀) of gas vapor phase (GVP) and total particulate matter (TPM) from MS was determined using the neutral red uptake assay. Under the assumption of linear blending, the predicted result for a tobacco blend is based on the weighted average of the responses of the experimental cigarettes containing the corresponding single types of tobacco that constitute the blend. Accurate predictions were considered to be those with values $\pm 10\%$ of measured value. Accurate Predictions for 60-82% of selected mainstream analytes were made for Blend 1 experimental cigarettes (35.41% Bright: 22.96% Burley: 14.63% Oriental: 27% Reconstituted Leaf Domestic Bright) and Blend 2 experimental cigarettes (35.41% Bright: 22.96% Burley: 14.63% Oriental: 27% Expanded Tobacco). Accurate predictions for spontaneous mutation frequency were made for Blends 1 and 2 experimental cigarettes. The number of revertant colonies was not consistently predicted with accuracy for Blend 1 or 2 experimental cigarettes. However, 1/EC₅₀ could be accurately predicted for GVP in Blend 1 and 2 experimental cigarettes, but TPM could only be accurately predicted for Blend 2 experimental cigarettes. In conclusion, predictions via linear blending were not sufficient to replace measurement of analyte yields, mutagenicity or cytotoxicity. However, linear blending may serve as an additional screening tool when toxicological and mutagenic responses of experimental or blended tobacco cigarettes of known tobacco composition must be evaluated.

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POS1-18

BENEFITS OF SMOKING CESSATION THERAPY DURING TREATMENT OF ALCOHOL ADDICTION

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Significance Considering the negative health effects associated with smoking and consumption of excessive amount of alcohol, special attention is required to the vast population of addicts who use these stimulants simultaneously. The synergistic effect of a simultaneous use of nicotine and alcohol leads to an increased risk of many diseases such as cardiovascular and metabolic disease and cancer. The introduction of anti-tobacco therapy during alcohol withdrawal treatment would significantly reduce the risk of such diseases in addicts. The aim of the study was to diagnose the tobacco addiction syndrome, readiness and motivation to quit smoking, and assess the nicotine withdrawal syndrome during alcohol withdrawal therapy. Additionally, the change in the nicotine metabolism ratio (NMR) as a prognostic factor of cigarette consumption was also assessed. **Methods** The study included 128 men aged 44.7 ± 7.6 years (range 30-60 years), patients of the Addiction Therapy Center in Parzymiechy, Poland. The number of cigarettes smoked daily were 17.7 ± 7.5 . The patients were under medical care for 7 weeks on an average. At three-week intervals, the patients completed the tobacco dependence test (Fagerstrom Test for Nicotine Dependence, FTND), the Minnesota Nicotine Withdrawal Scale (MNWS) test and the motivation / readiness to quit smoking test (Schneider). In the same time intervals, urine samples were for cotinine and trans-3'-hydroxycotinine analysis. **Results** Mean FTND score significantly decreases after three weeks by 12.4% (6.51 v. 5.70, p < 0.0001) and remains at this level until the end of therapy. The Schneider test significantly increases at the end of therapy by 10.4% (7.05 v. 7.78, p < 0.0001). In the MNWS test, the average of points at the end of therapy is reduced by 10.1% (32.9 v. 29.3, p < 0.001). NMR decreased significantly by 28.6% (2.76 versus 1.97, p=0.005) and after another three weeks by 4.7% to 1.84% (ns). **Conclusion** During alcohol withdrawal therapy, the pharmacological dependence on nicotine and withdrawal symptoms decreased. The therapy also led to increase in the motivation and willingness to quit smoking as the reduction of nicotine metabolism rate is expected to nicotine's lower demand for the body. These results suggest, that the patients addicted to both alcohol and nicotine need to be provided access to behavioral therapy and pharmacotherapy of nicotine addiction. **Funding** The grant N404 145539 from the Ministry of Science and Higher Education of Poland and KNW-1-054/K/7/0 by Medical University of Silesia, Katowice, Poland

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POS1-19

INVESTIGATING MENTHOL AS A STIMULUS FOR MODULATORY CONTROL OF CONDITIONED RESPONDING

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Significance: Menthol is a widely used additive in cigarettes that modulates somatosensory perception, nicotine metabolism, dopaminergic neurotransmission, and the addictive potential of tobacco products. Drug self-administration research in rats has shown that menthol enhances nicotine reinforcement. Taken together, these findings suggest that peripherally injected menthol may have stimulus effects that can acquire modulatory control of conditioned responding. Accordingly, we investigated whether menthol could serve as a positive feature that occasioned when a discrete conditioned stimulus (CS, cue-lights) was paired with an unconditioned stimulus (US, sucrose). **Methods:** Male and female Sprague-Dawley rats (n=10 per sex) received intermixed menthol (0.0183 or 5 mg/kg) and vehicle (50% DMSO:H2O, v/v) sessions injected intraperitoneally before chamber placement. Sessions consisted of eight 15-sec CS trials across 20 min. On menthol sessions, each CS presentation was followed by 4-sec access to sucrose provided in the dipper receptacle. On vehicle sessions, the CS presentations occurred, but sucrose was withheld. Thus, menthol set the occasion upon which the light CS was reinforced. Dipper entries were transformed into a difference score, measuring CS-specific goal tracking. Training lasted for 16 menthol and 16 vehicle sessions. **Results:** Difference scores were not significantly different between menthol sessions and vehicle sessions during the first CS trial at either dose, indicating that menthol was not serving as an occasion setter using a protocol that is effective for many compounds (e.g., nicotine, methamphetamine, chlordiazepoxide). After the 32 training sessions, rats receiving 0.0183 mg/kg menthol were shifted to 15 mg/kg menthol. Rats receiving 5 mg/kg continued at this dose. Again, difference scores on menthol sessions did not differ from vehicle sessions. **Conclusions:** Combined, these findings suggest that menthol at doses that alter nicotine self-administration does not serve as a feature positive occasion setter.

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POS1-20

NICOTINE DISCRIMINATION IN RATS: REVERSAL LEARNING AND VARENICLINE SUBSTITUTION

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Intro: The interoceptive stimulus effects of nicotine can come to control appetitive-reward seeking. Specifically, in the drug discriminated goal tracking (DGT) task, nicotine that has been differentially paired with sucrose will come to control increased rates of goal-tracking (i.e., head entries into a dipper receptacle). Here, we investigated reversal learning of the trained discrimination as well as substitution of varenicline (Chantix[®]) when training was continued or reversed. **Methods:** Nicotine (0.4 mg base/kg) was administered SC to rats prior to placement in a conditioning chamber in which sucrose was intermittently available in the dipper well; on interspersed saline sessions sucrose was withheld. Similar to past work, after repeated pairings, nicotine acquired control over goal-tracking. During the second phase, rats were split into four groups. The first group maintained the acquisition training conditions with nicotine as the stimulus paired with sucrose (NIC+). The second group maintained the drug-reinforcer pairing but varenicline (1 mg salt/kg), replaced nicotine as the stimulus paired with access to sucrose (VAR+). The third group had the nicotine-reinforcer relation reversed such that sucrose was available on saline sessions, and withheld on nicotine sessions (NIC-). The fourth group was similar to NIC- training except varenicline now signaled the absence of sucrose (VAR-). **Results:** Rats in NIC+ and VAR+ groups maintained high levels of dipper entries on drug versus saline sessions, indicating varenicline fully substitutes for the nicotine stimulus when the drug stimulus was continually paired with sucrose. The NIC- and VAR- groups eventually learned the reversed discrimination, though it was tenuous. Notably, the VAR- group was slower to show reversal and responding was more variable than NIC-. This pattern differs from NIC+ versus VAR+ and suggests that the 1 mg/kg varenicline stimulus is not the same as 0.4 mg/kg nicotine stimulus when substitution testing requires new learning.

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POS1-21

NEXT GENERATION PRODUCTS INDUCE LOWER BIOLOGICAL ACTIVITY THAN COMBUSTED CIGARETTES. A COMPARISON OF AEROSOL CHEMISTRY AND IN VITRO TOXICITY

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Tobacco smoking has long been recognised as a major cause of disease. While public health bodies recommend complete cessation as the best action smokers can take to improve their health, some organisations begin to recognise the harm reduction potential of alternative products to smokers who are unwilling or unable to quit. There are many next generation products (NGPs) commercially available aiming to provide an alternative to smoking, with a significant reduction in harm. The study objective was to compare the chemical composition and *in vitro* toxicological activity of different NGP aerosols with conventional cigarette smoke. Products investigated were the Kentucky reference cigarette (3R4F), a tobacco heating product (THP), a hybrid product (HYB) and a *myblu*™ vapour product (1.6% [w/w] nicotine; tobacco flavour). The smoke/aerosols were generated using the Health Canada Intense smoking regime for 3R4F and THP (55mL/2s/30s) and the CORESTA Recommended Method N°81 (55mL/3s/30s; square wave puff profile) for HYB and *myblu*™. The collected whole smoke and aerosols were tested under the CORESTA regulatory *in vitro* toxicology assays: neutral red uptake (BEAS-2B) for cytotoxicity, Ames (TA98, TA100) for mutagenicity and *in vitro* micronucleus assay (V79) for genotoxicity. Chemical analysis of all the NGP aerosols tested revealed substantial reductions in aerosol constituents when compared with conventional cigarette smoke. For example, the WHO 9 priority toxicants were below the level of detection in *myblu*™ aerosol corresponding to a >99% reduction compared to 3R4F. All NGP aerosols demonstrated marked cytotoxicity reductions compared to cigarette smoke on a per puff basis. 3R4F smoke was highly mutagenic in the Ames test and induced significant genotoxicity after 1 puff. THP aerosol produced a significant response in TA100 only, and induced genotoxicity after 24 puffs. In contrast, neither HYB nor *myblu*™ aerosols were mutagenic or genotoxic (up to 100 puffs) under the test conditions. The data shows clear differences between 3R4F cigarette and NGP emissions and *in vitro* toxicity. NGPs should be considered to have the potential to reduce smoking-related disease risks.

FUNDING: E-cigarette/Alternative nicotine products Industry; Tobacco Industry

POS1-22

DOSE RESPONSE OF ACUTE VERSUS CHRONIC EFFECTS OF WATERPIPE SMOKE ON CARDIAC PHYSIOLOGY

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Significance: Waterpipe smoking has become increasingly popular in recent years, however little is known about the health effects on the cardiac system associated with long-term waterpipe smoking. **Methods:** To investigate the effects of waterpipe smoke (WPS) on cardiovascular disease, we exposed hyperlipidemic, apolipoprotein E deficient (ApoE^{-/-}) male and female C57BL/6 mice to either WPS or filtered air as a control for 2 hours per day, 4 days per week for 5 months in a nose-only exposure system (n=5). Cardiac physiology was assessed by collecting electrocardiograph (ECG) data using implanted radiotelemetry devices, and the ECG data was further analyzed to measure heart rate variability (HRV). Variations in the WPS generation system allowed a dose-response analysis to changes in the concentration of the WPS. Heart rate (HR), as well as time and frequency domain measures of HRV showed an initial acclimation period of 3 to 5 weeks where both control and WPS exposed animals followed similar trends in HR and HRV changes. **Results:** Following this acute period, the effect of WPS became apparent with decreases in HR of 15-20% decline from baseline measures, whereas control animals showed only a 5 % decline. HRV as measured by standard deviation of normal R-R intervals (SDNN), root mean squared of successive differences (RMSSD), and High-Frequency (HF) HRV increased in male animals exposed to WPS as compared to controls. Female mice exposed to WPS showed no HRV change compared to controls. Throughout the acute and chronic phases of the long-term exposure, the exposure-induced effects on HRV correlate with the concentration of WPS in the exposure system. 45% of the variance in HR can be attributed to the concentration of WPS. The dose of WPS contributes to 43% of the variance seen in total HRV, SDNN. HRV measures which represent autonomic nervous system, RMSSD and HF HRV, both increase significantly after WPS exposure and dose contributes to approximately 30%

of the change seen. **Conclusions:** These data indicate that the dose of WPS inhaled during a long-term exposure strongly affects the changes seen in cardiac physiology as measured by HRV in hyperlipidemic mice.

FUNDING: Federal

POS1-23

SHORT TERM VARIABILITY OF HPHCs IN MACHINE MADE CIGARS COMPARED TO CIGARETTES

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In May 2016, the U.S. Food and Drug Administration (FDA) issued a final rule to deem cigars to be subject to the Federal Food, Drug, and Cosmetic Act (the FD&C Act), as amended by the Family Smoking Prevention and Tobacco Control Act (Tobacco Control Act). As part of this regulation, the FDA will require manufacturers to report the quantities of Harmful and Potentially Harmful Constituents (HPHCs) in cigar filler and smoke. The diversity of the cigar product category adds challenges to the measurement of HPHCs. CORESTA has developed recommended methods for the measurement of nicotine and CO in cigars; however, methods for the other HPHCs have not been developed. The consensus HPHC methods for cigarettes, with defined repeatability and reproducibility (r&R) values, have not been shown to be fit-for-purpose for the analysis of cigars. Using our validated analytical methods, we demonstrate that the CORESTA, ISO and Health Canada smoking regimes exhibit similar levels of smoke yield variability for machine made cigars. We also show that machine made cigars have significantly more resistance to draw (RTD) and weight variability than cigarettes thus resulting in much greater smoke yield variability. We demonstrate that the short-term variability for FDA's abbreviated list of HPHCs in cigar smoke is roughly twice that of cigarettes. The HPHCs in cigar filler show less variability than smoke HPHCs and may be useful for comparative purposes.

FUNDING: Tobacco Industry

POS1-24

IMPACT OF MENTHOL ON ORAL NICOTINE CONSUMPTION IN FEMALE AND MALE SPRAGUE DAWLEY RATS

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Significance: One of the most preferable flavors in oral nicotine delivery systems is menthol which masks the harshness of tobacco. However, possible interactions between oral menthol and nicotine on intake and preference remain unclear. Therefore, we aimed to determine the impact of menthol on oral nicotine consumption. **Methods:** Adult Sprague Dawley female and male rats (n=8 per group) were given a choice of water or drug solution by using two-bottle free choice paradigm for two weeks: vehicle (5% ethanol), nicotine (20 mg/l), menthol (1 g/l) and mentholated nicotine groups. At the end of the study, plasma nicotine levels were determined. **Results:** When rats were given a choice of nicotine or water, nicotine intake was similar between female and male rats. Menthol addition to nicotine solution significantly increased nicotine intake and preference in male but not female rats without a considerable effect on total fluid intake and body weight change in either sex. The average nicotine intake in male rats was 0.5 ± 0.05 and 1.4 ± 0.12 mg/kg/day for nicotine and menthol-nicotine combination ($p<0.05$), respectively. The average nicotine intake in female rats was 0.6 ± 0.05 and 0.6 ± 0.03 mg/kg/day for nicotine and menthol-nicotine combination ($p>0.05$), respectively. Plasma nicotine levels were not significantly different between the groups in either male (nicotine group: 20.8 ± 4.9 , mentholated nicotine group: 31.9 ± 3.2 ng/ml) or female (nicotine group: 24.0 ± 3.3 , mentholated nicotine group: 17.8 ± 2.9 ng/ml) rats ($p>0.05$). **Conclusions:** Menthol increases oral nicotine consumption in male, but not female, rats. This study may provide data on the co-use of menthol and nicotine in the smokeless tobacco, particularly oral dissolvable tobacco products.

FUNDING: Federal; Academic Institution

**POS1-25****PREDICTING THE ONSET OF HIGH-ALDEHYDE EMISSIONS FROM ELECTRONIC CIGARETTES: A FILM BOILING FRAMEWORK**

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Electronic cigarettes (ECIGs) use a battery-powered heater coil to heat and vaporize a nicotine-containing liquid. ECIGs have been shown to emit toxic carbonyl compounds (CCs), sometimes at levels exceeding combustible cigarettes. High CC emissions are commonly attributed to "dry puffs" which occur when the ECIG runs dry and the temperature rises. However, we have observed high CC emissions even when the heater coil was unambiguously well-saturated with liquid. In this study we investigated an alternative hypothesis for high CC production: film boiling. Film boiling occurs when a thin vapor film forms around a submerged heated surface. When this happens, thermal energy is trapped beneath the film, and the temperature of the surface rises suddenly and drastically. Film boiling occurs when the thermal power input to the surface exceeds a threshold known as the critical heat flux (CHF, W/m^2). CHF can be predicted from theory and can be used to calculate the critical power, $P^*(W)$. P^* may provide a convenient indicator of the power at which a given ECIG device will begin to spike in CC emissions, even when the system is wet. We measured P^* for 35 kinds of ECIG heating coil wires that were submerged in a solution of propylene glycol (PG) and compared measurements to theoretical predictions. We found that calculated and observed P^* were correlated ($R^2=0.65$, $p<0.0001$). We then measured CC emissions and liquid consumption as a function of power for three types of ECIGs that varied by geometry and coil wire material of construction. P^* was computed for each of the ECIG devices. We found that the increase in CC emissions rose drastically (by 10-fold) when the theoretical P^* threshold computed for each device was exceeded. Importantly, P^* was crossed at powers well within the manufacturer's recommended operating range. The data indicate that theoretical P^* can be used to predict the power above which a given ECIG device will emit high CC levels. The data also provide evidence for an alternative pathway to high CC emissions, one which does not require the heating coil to be dry.

FUNDING: Federal

POS1-26**IMPACT OF NICOTINE DOSE MANIPULATIONS ON PAVLOVIAN CONDITIONED APPROACH IN RATS**

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Nicotine is a weak primary reinforcer but produces robust reinforcement enhancing effects. Nicotine increases responding for non-nicotine reinforcers and increases approach to cues that predict non-nicotine rewards. We hypothesized that these effects of nicotine would be dose-dependent; reducing nicotine dose should reduce approach to reward predictive cues. To test this hypothesis, we investigated the effects of nicotine in a Pavlovian Conditioned Approach (PCA) paradigm. Rats were randomly assigned to one of two groups [NIC (0.4 mg/kg base) or SAL, $n=5/group$]; each group received a subcutaneous injection of their assigned solution 15 min before each of 19 sessions. In each session rats were placed in an operant box and received 15 pairings of a 15 s conditioned stimulus (CS; lever extension and cue light illumination) followed by presentation of the unconditioned stimulus (US; 0.1 ml of 20% sucrose). Sign-tracking (approach to the CS) was defined as lever contacts and presses, whereas goal-tracking (approach to the US) was defined as receptacle entries during the CS. After approach behavior stabilized, we investigated the effects of additional nicotine doses (0, 0.1, and 0.8 mg/kg, base) in the NIC group, the SAL group served as a control throughout the study. During acquisition, sign-tracking was significantly higher in the NIC group relative to the SAL group. The NIC group maintained increased sign-tracking behavior across every nicotine dose, including 0 mg/kg. The findings show that nicotine changes the incentive value of the CS and suggest that nicotine produces a persistent change in the topography of the conditioned response which could indicate long-lasting changes in reward-seeking behavior.

FUNDING: State; Academic Institution

POS1-28**THE EFFECTS OF SHORT AND LONG TERM ADMINISTRATION OF THE MINOR TOBACCO ALKALOIDS NORNICOTINE AND ANATABINE ON ENERGY BALANCE IN MALE AND FEMALE RATS**

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Significance: Nicotine is the primary component in tobacco products responsible for their effects on body weight. Yet previous research indicates that minor tobacco alkaloids (MTAs), found in low levels in tobacco products, reduce food intake in rodents, which could lead to changes in body weight. Their lower addictive potential relative to nicotine makes them potential candidates for obesity pharmacotherapy. We hypothesized that MTA administration would prevent weight gain through reductions in food intake. **Methods:** To test this, we administered saline, nicotine (NIC; 0.5 mg/kg) and 3 minor tobacco alkaloids (nornicotine - NOR: 6.0 mg/kg; anatabine - ANAT: 3.0 mg/kg; anabasine - ANAB: 3.0 mg/kg) to male rats housed in indirect calorimetry chambers for seven consecutive days (i.p.; $n = 10/group$). Standard laboratory chow and water were available ad libitum. **Results:** All drugs reduced weight gain and food intake relative to saline. Faster and significantly greater delays in weight gain and reductions in fat mass were seen with NOR and ANAT, while NIC and ANAB prevented additional weight and fat gain. All drugs, except ANAT, increased physical activity. There was a trend for increases in energy expenditure for all drugs tested, although this failed to reach significance. Based on their ability to promote the greatest weight loss, NOR and ANAT were further evaluated in a new set of male and female rats ($n = 5/group$). NOR, ANAT, or saline were administered (i.p.) daily for 4 weeks, and food intake, physical activity and energy expenditure were measured. Males were most sensitive to MTA effects on weight gain and food intake, compared to females, as there was only a short-term effect of ANAT on food intake, and no change in body weight in females. Despite this finding, females were more sensitive to ANAT- and NOR-mediated increases in SPA, whereas, compared to ANAT, NOR produced greater increases in SPA in males. Both MTAs reduced fat mass gain in males and females. **Conclusions:** These results suggest that ANA and NOR are promising therapeutic targets for obesity in males and require further investigation of their efficacy in females and in models of obesity.

FUNDING: Federal; Academic Institution

POS1-29**FROM FIELD TO STORES: EXPLORING CUMULATIVE EXPOSURES TO TOBACCO POLICIES IN U.S. TOBACCO PRODUCING COMMUNITIES**

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Significance: The US remains the world's 4th largest tobacco producer, including 7 states in 2017. Populations involved in tobacco production (e.g., migrant farmers) are uniquely vulnerable to tobacco health risks associated with agricultural tobacco production (e.g. green tobacco sickness (GTS), heat stress, and pesticide exposure) and consequences of state and local tobacco control policies. This study describes the cumulative tobacco policy environment for populations involved in tobacco production. **Methods:** We used data from the National Agricultural Statistics Service to identify major tobacco producing counties between 2016-2017 and their production volume. Data from Truth Initiative, our tobacco control partners, occupational health databases, and web searches were used to identify state and county tobacco control policies and relevant occupational safety regulations for tobacco agriculture. 2018 County Health Ranking data were used to explore comparisons in occupational risk and tobacco control policies between predominately tobacco growing counties and non-tobacco growing counties. **Results:** We identified 125 major tobacco producing counties across 7 states. Four states preempt smoke-free ordinances at the local level, while 2 have smoke-free workplace laws. Smoke-free restaurants/bars was the most common non-tax policy affecting counties ($n=41$). In the two most predominant tobacco producing states (NC and KY), 42.7% of tobacco growing counties had a smoke-free restaurant/bar policy compared to 51.9% of non-tobacco growing counties. No tobacco growing counties in NC or KY had a smoke-free multi-unit housing policy, compared to 6.1% of non-tobacco growing counties. Few other counties ($n=8$) had additional policies, including smoke-free workplace, dining/ bar patios, parks, or public transit waiting area. Federal pesticide regulations are set by the US EPA and administered by states. While no specific heat stress or GTS standards exist in these states, federal or state programs retain important discretionary authority.



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Conclusions: Overall, tobacco control policies are limited in tobacco growing areas. Health campaigns focusing on both tobacco control and occupational risks may benefit workers and their families.

FUNDING: Nonprofit grant funding entity

POS1-30

SMOKE-FREE LAWS AND DISPARITIES IN SMOKING AMONG YOUTH, 2000-2015

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SIGNIFICANCE: Little is known about how tobacco control policies intersect with socio-demographic patterns of youth smoking. This study explores differential associations between smoke-free law coverage and youth smoking by parental education, race/ethnicity, gender, and intention to attend college. **METHODS:** Using nationally representative, cross-sectional data from the 2000-2015 Monitoring the Future (MTF) study, we examined the relationship between smoke-free law coverage and the probability of smoking in the last 30 days among 8th (n=178,789), 10th (n=182,718), and 12th graders (n=71,342). Smoke-free law coverage was measured as the percent of the population in a respondent's county covered by smoke-free laws passed at the city, county, or state level. We created separate variables for smoke-free laws in workplaces and hospitality venues (i.e., restaurants or bars). Logistic regression models with two-way interactions were used to assess whether the relationship between smoke-free laws and smoking participation varied according to parental education, race/ethnicity, gender, and (for 12th graders) whether the respondent probably/definitely will (vs. probably/definitely won't) pursue a four-year college degree. We tested the significance of interactions on the additive scale using average marginal effects. **RESULTS:** For 8th grade students, workplace laws were associated with the greatest reduction in the probability of smoking participation among Hispanics, compared to other racial/ethnic groups, and among males, compared to females. For 10th grade students, hospitality smoke-free laws were associated with a greater reduction in smoking among females compared to males. For students in grade 12, the relationship between each type of smoke-free law and smoking was modified by parental education level, with the greatest reduction in smoking among students with the highest parental education (college or above). There were no significant interactions between smoke-free laws and college intention. **CONCLUSION:** Smoke-free laws are associated with youth smoking participation, but these relationships sometimes differ by race/ethnicity, parental education, and gender.

FUNDING: Federal

POS1-33

CONSIDERATION OF HEALTH DISPARITIES IN THE CONTEXT OF TOBACCO 21 POLICIES

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Tobacco initiation typically begins during adolescence but varies by race/ethnicity and tobacco product type (e.g., cigarettes, cigars, smokeless tobacco, e-cigarettes). Raising the minimum legal age to purchase to 21 decreases access and would likely prevent or delay tobacco initiation. There has been a rapid diffusion of Tobacco 21 policies in the last few years. As of September 2018, six states and more than 340 localities adopted Tobacco 21 laws. Increased attention to the potential for health disparities is warranted given that early adopters of health policies are often localities with the lowest risk of chronic disease, and differences in adoption could exacerbate health disparities. The extent to which Tobacco 21 laws will be effective at addressing tobacco health disparities may depend on where such laws are adopted and how they are implemented. Nascent data suggest that localities that have Tobacco 21 policies may be less racially and ethnically diverse. This presentation will provide an overview of key factors that can influence the impact of Tobacco 21 laws on tobacco use health disparities. These include but are not limited to: the diversity of tobacco products; differential rates of initiation by race/ethnicity; differential rates of initiation by tobacco product type; and historical patterns of underage tobacco sales by demographics. Additionally, this presentation will give consideration to the variability in Tobacco 21 laws with respect to prohibited conduct, culpable parties, ID check requirements, fines, and license suspension/

revocation. The presentation will conclude with a public policy framework to address a critical gap in the evidence base via a focus on racial/ethnic groups in the context of a diverse tobacco environment.

FUNDING: Federal

POS1-34

TOBACCO TREATMENT SPECIALIST TRAINING FOR TOBACCO EDUCATION AND CONTROL PROFESSIONALS

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Background: The Certified Tobacco Treatment Specialist (CTTS) credential is the most widely recognized title for professionals who work toward the reduction of tobacco use. Candidates who wish to obtain the CTTS credential must complete a TTS program, pass a standardized exam, and complete 240 hours of clinical tobacco treatment services. In contrast to this clinical emphasis, many of the major impacts on tobacco use have been brought about through tobacco use education, public outreach, policy, and regulatory change. Interestingly, professionals who provide services in tobacco use education or control often obtain training through a TTS program, but typically do not receive the CTTS credential due to the requirement of completing clinical hours. The Duke-UNC Tobacco Treatment Specialist Training Program was designed to address this challenge, and provides substantive training in the reduction of tobacco use from all three perspectives - clinical, education and control. **Method:** We report outcomes from a study designed to assess the need for TTS curriculum targeted to tobacco use education and control professionals. A survey was administered to Duke-UNC TTS Training Program participants from 2016-2018 to assess their professional degree, job description, scope of work, work environment, and population treated. **Results:** Survey results included 173 TTS course participants. Of these participants, 14.45% reported that their primary tobacco-related work was tobacco control and/or education. An additional 6.36% were involved with both clinical and tobacco control and/or education. Among those in education and control, 44.44% have a Master's Degree or higher, 30.56% work as health educators, 16.67% work within educational institutions, and 13.89% work in hospitals. **Discussion:** In this sample, roughly a fifth (20.81%) of TTS participants were found to be involved in education or tobacco control services. TTS training programs should consider embracing the training of tobacco education and control professionals and should consider modifying the CTTS curriculum and credentialing requirements to better support these important contributors in the field.

FUNDING: Other

POS1-35

YOUTH SUSCEPTIBILITY TO ELECTRONIC CIGARETTES AND TOBACCO CIGARETTES AFTER EXPOSURE TO ELECTRONIC CIGARETTE ADVERTISEMENTS

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Significance: Electronic e-cigarette (EC) advertisements (ads) are minimally regulated and may impact the likelihood of tobacco use among youth. This study assessed how EC ads impact susceptibility to EC use and cigarette smoking (CS) among a racially diverse youth sample differing in tobacco use history in order to assess needs for policy and prevention.

Methods: A convenience sample of past month CS (n=672) and nonsmoking (NS) tobacco-susceptible youth (n=686) aged 13-18 years living in Virginia (US) completed an in-person survey and were randomized to a control ad condition (bottled water) or one of three static (e.g., print/online banner) EC ad conditions differing in thematic content: "general," "flavor and taste," and "people and youth". Youth viewed three condition-specific ads and then answered items regarding susceptibility to EC and CS (Pierce et al., 1995). Following standard scoring, individuals were coded as either susceptible/not susceptible to EC and CS. Logistic regression models predicting EC and CS susceptibility within CS and NS were used to test the influence of EC ad condition controlling for demographics and past month EC use. **Results:** Overall, the sample was primarily Black/African American (A-A; 60%) with 52% female (no significant differences by CS status). Exposure to a randomized EC ad condition was not significantly associated with EC and CS susceptibility in either CS or NS. Past month EC use was positively associated with EC and CS sus-



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ceptibility in CS and NS ($p < 0.05$). Among CS, identifying as White was negatively associated with EC and CS susceptibility relative to Black/A-A. Among NS, identifying as White or Hispanic was positively associated with EC susceptibility relative to Black/A-A. Older age was positively associated with EC susceptibility only among CS. **Conclusions:** While acute EC ad exposure did not affect EC/CS susceptibility indices in CS and NS, findings reinforce previous work regarding the influence of previous EC use and highlight novel differences in demographic associations by CS status. Findings warrant further examination by race/ethnicity to identify risk and protective factors for EC and CS susceptibility.

FUNDING: Federal; State

POS1-36

"I WANT TO QUIT ON MY OWN TIME": PERCEPTIONS OF SMOKE FREE HOUSING POLICY AND BARRIERS TO COMPLIANCE AMONG LOW-INCOME HOUSING RESIDENTS

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SIGNIFICANCE: Under a federal mandate, all HUD-funded housing authorities have been required to implement smoke-free housing (SFH) policies starting July 31, 2018. However, little is known about factors affecting HUD-mandated SFH policy compliance. This study aimed to assess perceptions of HUD-mandated SFH and potential barriers to compliance among low-income housing residents in Norfolk, VA. **METHODS:** Residents were recruited through flyers and community events. A Community Advisory Board reviewed all recruitment materials and assisted with question development. We conducted five focus groups with nonsmoking and smoking low-income housing residents (n=36). All focus groups followed a semi-structured format and were conducted in residents' communities. Questions explored awareness of and attitudes toward SFH policy, SFH compliance, and preferences for smoking cessation. Data analysis used a grounded theory approach. **RESULTS:** Attitudes toward SFH policy differed between smokers and non-smokers. Almost all smokers reported at least some non-compliance, with a majority describing how SFH simply drove them to smoke inside where they could not be seen. Smokers discussed themes related to the unfairness of SFH implementation/enforcement and lack of readiness to quit. Preoccupation with stressors and concern for safety emerged as major barriers to SFH compliance; expansion of housing benefit was identified as a potential facilitator. Nonsmokers were more supportive of SFH, but also discussed how smokers deserved accommodations (e.g., a designated smoking area on the property where safety could be improved). **CONCLUSIONS:** Noncompliance was common, and several barriers limiting compliance were identified, including limited safe outdoor smoking areas. Housing Authorities should consider practical strategies to resolve compliance barriers, while maintaining a sense of fairness to all residents (e.g., by ensuring consistent enforcement, especially within the same property).

FUNDING: Federal

POS1-37

THE TRUTH ABOUT TOBACCO INDUSTRY PRACTICES AT THE POINT OF SALE

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Significance: Tobacco companies make extensive use of the retail environment to reach both current and future customers by advertising and promoting their products and normalizing the presence of tobacco products in everyday life. **Methods:** This study consisted of a search of literature on point of sale policies in the United States. These policies were restricted to tobacco retailer licensing and density, price discounting, and in-store promotion and placement. **Results:** The largest U.S. cigarette and smokeless tobacco manufacturers spent over \$8.9 billion in 2016 on advertising and promotional expenditures in the retail environment, including advertisements posted at the retail location, price discounts, promotional allowances, coupons, and sampling. The advertising and promotional efforts of tobacco companies in the retail environment contribute to the initiation and progression of tobacco use among young people. Tobacco retailers are also often more heavily populated in areas with a greater number of minority and low-income populations. Tobacco companies use a variety of methods in the retail environment, including: reducing the prices of their products to circumvent higher taxes by dropping wholesale prices and employing tactics such as couponing, multipack discounts (e.g. buy-two-get-one-free or buy-two-for-one deals) and price discounts (e.g., \$2.50

off one pack); promoting products in the retail environment by using displays and advertisements and providing retailers with incentives for advertising their products; and paying retailers to strategically place tobacco products front-and-center in retail environments which are easy-to-see for customers, often around the checkout counter.

Conclusion: Regulation of point of sale tobacco marketing practices are not as widespread or commonly employed as taxation or clean indoor air laws; however, evidence suggests they are potentially powerful and underutilized policy options.

POS1-38

YOUNG ADULTS' PERCEIVED EFFECTIVENESS OF DRAFT PICTORIAL E-CIGARETTE WARNINGS

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Significance: Research shows that pictorial warning labels for cigarettes are more effective than text-only warnings and preliminary work suggests that pictorial warnings could also be considered for e-cigarettes. Pictorial warnings may be important for maximizing their effectiveness among young people, and enhancing the salience of the single nicotine addiction warning required for e-cigarettes to date in the United States. This study collected pilot data about the perceived effectiveness of draft e-cigarette pictorial warnings. **Methods:** Participants were 876 young adults (ages 18-29) recruited through Amazon MTurk who completed an online e-cigarette survey in 2018. Participants viewed and ranked five versions of the same e-cigarette nicotine addiction warning message — four pictorial and one text-only — on their perceived: noticeability, likelihood of capturing young people's attention, memorability, relevance to the addiction warning text and overall effectiveness in warning people about e-cigarette risks. For each outcome, presentation of the five warning versions was randomized. Pictorials included symbolic images of risk and addiction, and of priority audiences for the warning (i.e., youth). **Results:** For all outcomes, pictorial warnings were ranked higher than the text-only warning, and the warning using a yellow triangle caution symbol was ranked highest for all outcomes ($p < .001$). The text-only warning was ranked as the least likely to be effective for all four outcomes in which it was assessed ($p < .001$). Trends were similar for current e-cigarette users and non-users. **Conclusions:** Future research should assess perceptions and the appropriateness of pictorial imagery for e-cigarette warnings and test their efficacy against text-only warnings experimentally.

FUNDING: Federal

POS1-39

THE RELATIONSHIP BETWEEN SELF-REPORTED EXPOSURE TO MARLBORO ADVERTISING AND SMOKING SUSCEPTIBILITY AMONG SOUTHEAST ASIAN ADOLESCENTS

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Significance: The tobacco industry aggressively infiltrates new markets (e.g., women and youth) through pro-tobacco advertising. For instance, Philip Morris International's brand Marlboro has been releasing new products and ads as part of their global re-branding campaign, Architecture 2.0, in both the Philippines and Indonesia. This study explored the relationship between self-reported exposure to Marlboro advertising and youth smoking susceptibility in these two countries. **Method:** A secondary data analysis was conducted on two cross-sectional samples of non-smoking Southeast Asian adolescents (n=505 Filipinos and 674 Indonesians), ages 13-17 years, residing in Metro Manila (May-June 2016) and Jakarta (July 2017). Smoking susceptibility to cigarettes was defined by 2 survey items asking if they would 1) smoke an offered cigarette from a best friend, and 2) smoke a cigarette in the next year. Youth who answered "definitely not" to both were considered not susceptible, whereas those who responded otherwise were considered susceptible. An index of self-reported exposure to Marlboro advertising outlets was determined by summing six items asking whether youth saw Marlboro marketing recently in six outlet types. Multivariable logistic regression adjusted for age, gender, and smoking history to explore the association between exposure to Marlboro advertising and youth smoking susceptibility, stratified by country residence. **Results:** Greater number of outlets of Marlboro exposure was not associated with smoking susceptibility among youth in Manila (Odds ratio (OR)=1.04, $p=0.47$) and Jakarta (OR=0.95, $p=0.37$). Females had higher odds of susceptibility in Jakarta (OR=2.20; $p<0.01$) but not in Manila. **Conclusion:** Indonesian female youth had significantly higher odds of being susceptible to smoking compared to Indonesian male youth. Self-reported number of outlets of exposure is not necessarily a good measure of amount and/or frequency of



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exposure. Longitudinal studies can monitor associations between better measures of exposure to cigarette marketing and cigarette susceptibility and use, to track changes in progression along the use continuum due to marketing.

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POS1-40

SMOKE FREE AND TOBACCO FREE COLLEGE CAMPUSES IN THE UNITED STATES

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Objective: To describe the number and proportion of university systems with 100% smoke-free and 100% tobacco-free protections across the U.S., and by state. **Methods:** Postsecondary education and 100% smoke-free and tobacco-free campus protections data were integrated to calculate the number and percent of: 1) smoke-free and tobacco-free accredited, degree-granting institutions and 2) students and staff protected by campus policies and state laws. **Results:** 823 accredited, degree-granting institutions in the U.S. (16.7%) have either 100% smoke-free or 100% tobacco-free protections, representing 1,816 individual campuses, sites, and schools. An estimated 14.9 million college students (26.9%) and 8.9 million faculty and staff (25.4%) are protected by 100% smoke-free or 100% tobacco-free campus policies and state laws. Only 3 states and 2 territories have 100% smoke-free or 100% tobacco-free protections in over half of their university systems. **Conclusions:** As of 2017, just 16.7% of accredited, degree-granting institutions in the U.S. had 100% smoke-free or 100% tobacco-free protections. Despite progress, more efforts can ensure that students and staff benefit from comprehensive 100% smoke-free and 100% tobacco-free protections at U.S. colleges and universities.

FUNDING: Federal

POS1-41

CIGARS ARE THE COMBUSTIBLE TOBACCO PRODUCT WE SHOULD NOT OVERLOOK

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Significance: For the first time, current use of cigars by high school students (7.7%) in the United States has surpassed current cigarette use (7.6%), according to the 2017 National Youth Tobacco Survey. The Food and Drug Administration only began regulating cigars after issued the final rule on deeming tobacco products to include cigars in May 2016. Since cigars have only been regulated recently, an updated review of the science is necessary for policymakers to better understand the issues surrounding these products.

Methods: This study consisted of a systematic review via a PubMed search of all scientific literature on cigars published after the 1998 National Cancer Institute's Tobacco Control Monograph 9, Cigars: Health Effects and Trends.

Results: Cigar consumption and prevalence has increased since 2000 and could be undermining progress made in reducing cigarette prevalence. Further, prevalence of little cigar and cigarillo use is likely underestimated due to misreporting in surveys. Consumers believe cigar smoking to be less harmful and more socially acceptable than cigarette smoking. Cigar smokers are likely to experiment or be current users of other tobacco products and marijuana. Cigars are the most heavily flavored market of tobacco products and flavored cigar use is especially high among youth and young adults. Tobacco industry advertising and promotional activities of cigar products cause youth and young adults to start smoking. Moreover, the federal cigar tax disparity allows cigar manufacturers to manipulate the weight of their products and avoid regulation.

Conclusion: While the prevalence of cigarette use has decreased in the United States, the tobacco control community and the Food and Drug Administration should be concerned about cigar use, especially among youth, and work on policies to address the use of these products, including addressing flavors in cigar products.

POS1-42

OVERVIEW OF SALES RESTRICTIONS ON FLAVORED TOBACCO PRODUCTS IN THE U.S.

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Significance: In 2009, U.S. federal law banned flavors (exempting menthol) in cigarettes, however other flavored tobacco products are still allowed. In response, localities have enacted laws to restrict the sale of such products. This study examines variations of local flavored tobacco sales restrictions in the U.S. and compares other tobacco control policies that are present in states with a flavored tobacco sales restriction. **Methods:** Reviewing news articles, social media, and updates from tobacco control partners we identified U.S. jurisdictions that have enacted flavored tobacco sales restrictions, as of July 31, 2018. We examined each ordinance and coded for time of enactment, menthol flavor and product inclusions, buffer zone restrictions (i.e. around schools, parks, playgrounds), and retailer exemptions. Coding was reviewed by policy and legal experts. We linked 100% smoke-free laws and excise tax policies in states identified with flavor restrictions. **Results:** We identified 140 localities across 7 states that enacted a flavored tobacco sales restriction between June 29, 2007 and July 31, 2018. The majority (64.9%) of policies were enacted between 2016 and 2018. Sixteen policies (11.4%) applied to menthol flavors (including cigarettes); 3 (2.1%) applied to menthol flavors (excluding cigarettes). Four (2.9%) established sales restrictions within buffer zones. Additionally, 117 (83.6%) exempted adult-only retailers or retailers with a percentage of tobacco revenue; 111 (79.3%) exempted smoking bars or e-cigarette establishments; 4 (2.9%) exempted premium cigars; and 2 (1.4%) exempted e-cigarettes. In states with at least one local flavor policy, the average excise tax is higher (\$3.14) than in the rest of the U.S. (\$1.50). The 7 states identified also all have 100% smoke-free laws in non-hospitality workplaces, restaurants, and bars. **Conclusion:** Local tobacco flavor restrictions across the U.S. have accelerated in recent years. Areas with stronger tobacco control policies are enacting flavor restrictions. Surveillance of differences in the structure of policies is essential to inform research and identify differences in access to flavored tobacco products.

FUNDING: Nonprofit grant funding entity

POS1-43

EQUITY IN THE REACH OF POLICIES RESTRICTING FLAVORED TOBACCO PRODUCT SALES

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Flavored cigarettes (except menthol) were banned at the US federal level in 2009, but other flavored tobacco products are still permitted. Thus, local municipalities have passed sales restrictions on flavored tobacco products. A critical goal is to protect youth from tobacco use. Youth and young adults, women, African Americans, Hispanics, and those of low SES disproportionately use flavored tobacco products. Thus, flavor restrictions may also reduce disparities among other vulnerable groups. This study assessed the extent to which flavor restrictions equitably reached these vulnerable subgroups in relation to their proportion of the population ('reach equity'). We identified 139 US jurisdictions (city, town, county or state) with restrictions on the sale of flavored tobacco products as of July 31, 2018. We linked jurisdictions with demographic characteristics from the American Community Survey including race/ethnicity, gender, age, and household poverty. We calculated each groups' representation within the population protected by flavor bans. We used Reach Ratios (ReRas) to assess reach equity. We separately calculated ReRas and 95% confidence intervals among the entire population and among youth under 18, defined as the proportion of the population covered by flavor policies from each subgroup divided by the proportion of the US population in that subgroup. A ReRa of 1.0 indicates equitable representation, while a ReRa > 1.0 indicates greater reach of flavor restrictions in each subgroup. These jurisdictions cover 5.9% of the US population across 7 US states. Among the total covered population, ReRas for young adults (18-24), women, African Americans, Hispanics, Asians and those of other races, and those below the federal poverty limit were above 1.0. ReRas were similar among



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the youth population (under 18) but had proportionate reach to females. Current US flavor policies have equitable or greater reach to vulnerable groups at greatest risk of flavored tobacco use, thus supporting the potential equity effects of these policies.

FUNDING: Nonprofit grant funding entity

POS1-44

ESTIMATING CHANGES IN DEMAND DUE TO BANNING FLAVORS IN TOBACCO: RESULTS FROM AN EXPERIMENTAL AUCTION AMONG MENTHOL CIGARETTE SMOKERS

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In 2009, "characterizing" flavors for cigarettes (exempting menthol) were banned in the US. Menthol cigarette (MC) use has been linked to initiation, dependence, and reduced cessation. Local jurisdictions have enacted various menthol/flavored tobacco policies, including restricting sales on (1) all menthol/flavored products, (2) menthol/flavored combustible products (exempting e-cigarettes), and (3) flavored products exempting menthol/mint flavor. Estimating demand for potential product substitutes among MC smokers is critical to evaluating the potential public health impact of such policy options. This pilot study used the Becker-DeGroot-Marschak (BDM) experimental auction method to determine likely behavioral responses to flavored tobacco restrictions among adult MC smokers in Washington, DC (n=29). To estimate demand for alternative products, our approach elicited bids for menthol, non-menthol, and flavored cigarettes, little cigars, e-cigarettes, and nicotine (NRT) gum (10 products). We examined overall differences in mean bid prices for MCs vs. each alternative product using paired t-tests and differences by quit intention. MC smokers had significantly greater demand for MCs than for menthol capsule cigarettes, non-menthol cigarettes, and all cigar products, but equivalent demand for flavored, menthol, and non-flavored e-cigarettes and NRT gum. Participants who intended to quit had significantly lower demand for all combustible products and NRT (n=16) than for MCs. Among those with no intention to quit (n=14), demand was significantly lower for non-menthol cigarettes and cigars, but equivalent demand for other products, compared with MC. MC smokers appear to have demand for e-cigarettes (flavored, menthol, and non-flavored ('tobacco flavor')) and NRT compared with MCs suggesting that these smokers may move to lower harm products or quit if MCs were unavailable – if e-cigarettes are an available option. However, MC smokers without intention to quit may find flavored combustible products appealing, suggesting that policies restricting cigars may be critical to reducing risk for these smokers.

FUNDING: Federal

POS1-45

SIMILAR SOFTENING ACROSS DIFFERENT RACIAL AND ETHNIC GROUPS OF SMOKERS IN CALIFORNIA AS SMOKING PREVALENCE FALLS

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Significance: Smoking prevalence differs among different racial/ethnic groups. As prevalence falls it is important to understand the characteristics of continuing smokers and to reach them with policies and interventions. Our previous research found that as smoking prevalence fell in the U.S., remaining smokers made more quit attempts and smoked fewer cigarettes per day (CPD), indicating so-called softening. We examine California, a state with a highly diverse population, to assess whether there is differential softening among remaining smokers in different racial/ethnic groups, including Asian subgroups. **Methods:** We used the California Tobacco Survey (1990-2008, a particularly active tobacco control time; N: 145,466; current smokers: 46,195). We ran logistic and linear regressions for smoking prevalence, CPD, quit attempts and time to first cigarette (30 min) as a function of race/ethnicity (non-Hispanic White, Hispanic, African American, Japanese, Chinese, Filipino, Korean, other Asian/Pacific Islander, American Indian/Alaska Native) controlling for other demographics. **Results:** Overall prevalence fell from 21.1% in 1990 to 12.3% in 2008 (p<0.01), showing similar declining trends across all racial/ethnic groups (p=0.54), albeit from different baseline prevalence levels. In terms of softening indicators the overall proportion with at least one quit attempt in the past 12 months increased from 46.2% to 59.3% by a factor of 1.28 per decade (95%CI=1.20, 1.36, p<0.01) in the unadjusted and by 1.25 (95%CI=1.17, 1.34, p<0.01) in the adjusted models. CPD declined from 16.9 to 10.9, -3.43 CPD per decade (95%CI=-3.77, -3.09,

p<0.01) in the unadjusted and -2.96 (95%CI=-3.24, -2.67, p<0.01) in the adjusted model. There were no significant changes in the time to first cigarette. Interactions of race/ethnicity and time show similar trends among all subgroups except Hispanics whose CPD remained stable rather than declining. **Conclusion:** Although from different baseline levels, tobacco control policies have benefitted all subgroups of California smokers who exhibited similar softening as prevalence fell. Interventions are still needed to reduce the baseline differences.

FUNDING: Federal; State

POS1-46

THE EFFECTS OF NICOTINE METABOLISM ON OUTCOMES AMONG SMOKERS ENROLLED IN A RANDOMIZED CLINICAL TRIAL OF REDUCED NICOTINE-CONTENT CIGARETTES

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Significance: As the Food and Drug Administration considers limiting nicotine in cigarettes to make them minimally addictive, it will be important to understand how individual differences influence responses to nicotine reduction. This secondary analysis asks whether rate of nicotine metabolism affected smoking behavior, subjective ratings and compliance among smokers using reduced nicotine-content cigarettes.

Methods: A large, randomized clinical trial comparing the effects of cigarettes differing in nicotine content found that smokers assigned to cigarettes with 2.4mg nicotine or less per gram of tobacco smoked fewer cigarettes per day than those assigned to their usual brand or 15.8mg nicotine after six weeks. For this analysis, the low nicotine-content conditions that yielded similar results in the trial were collapsed into one very low nicotine content (VLNC) group to maximize statistical power. Based on salivary nicotine metabolite ratio (NMR), VLNC participants were categorized into normal (NMR > 0.22, n = 241) vs. slow metabolizers (NMR ≤ 0.22, n = 227). Outcomes were then compared between these two groups.

Results: Among VLNC users, normal metabolizers reported greater withdrawal than slow metabolizers during the first week of post-randomization cigarette use (p < 0.001). However, all other outcomes did not significantly differ between fast and slow metabolizers, including cigarettes smoked per day, urinary total nicotine equivalents, total puff volume, dependence scores, subjective product ratings, the proportion of non-compliant participants and the average percent of non-study cigarettes smoked. Further analyses of outcomes among the fastest nicotine metabolizers and analyses using NMR as a continuous variable are ongoing.

Conclusions: These findings suggest capping nicotine at levels less than or equal to 2.4mg/g tobacco in cigarettes may decrease smoking regardless of individual variation in nicotine metabolism. However, smokers who more rapidly metabolize nicotine may experience greater initial withdrawal.

FUNDING: Federal

POS1-47

CIGAR SALES IN CANADA: IMPACT OF THE 2015 AMENDMENT TO THE TOBACCO ACT

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SIGNIFICANCE: In 2009, Health Canada implemented its first restrictions on flavoured cigars to prevent inducements to tobacco use by youth. At that time, the *Tobacco Act* was amended to limit the sale of confectionary-flavoured cigars to those weighing more than 1.4 grams or cigars without a filter. Cigar sales declined by 30% in the two years following the amendment. After 2009, however, certain cigars (those over the 1.4 gram weight limit, or cigars without filters) were introduced that contained the same flavours targeted by the 2009 intervention. By 2014, these reformulated, flavoured cigars comprised 66% of the cigar market in Canada. In response, Health Canada strengthened its restrictions on the use of flavours in cigars to further protect youth from the dangers of smoking initiation. Specifically, in 2015 the prohibition on additives to cigars was expanded to include cigars with tipping paper, cigars that have an non-spiral outer wrapper and all cigars weighing less than 6 grams. Alcohol flavours (port, rum, wine and whisky) were exempted from the regulation. **OBJECTIVES:** 1) Review the impacts of the 2015 federal fla-



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vour restrictions on the cigar market in Canada. 2) Understand the product strategies the tobacco industry used to respond to the restrictions. **METHODS:** Under Health Canada's *Tobacco Reporting Regulations*, tobacco manufacturers and importers are required to report brand-level sales volume. We analysed data on cigars sales in Canada to evaluate how sales of cigars were impacted in the year following the 2015 federal flavour regulations. **RESULTS:** In the year following the 2015 restrictions, total cigar sales declined by 13%. Sales of flavoured cigars declined by 41% while sales of unflavoured cigars increased by 29%. Despite the decrease in flavoured cigar sales, sales of alcohol flavoured cigars more than doubled, from 44 million units to 91 million units. **CONCLUSION:** The 2015 federal restrictions on flavours in cigars may have contributed to an overall decrease in cigar sales. However, the increase in sales of alcohol flavoured cigars appears to indicate that a substitution effect occurred between prohibited flavours and exempted flavours. Given the policy intent of the 2015 intervention, smoking population surveys in Canada should be monitored to determine if the increased popularity of alcohol flavoured cigars has impacted youth use of these products. Additionally, other jurisdictions may want to consider the product substitution effects observed in Canada when designing their own restrictions on flavoured tobacco.

FUNDING: Federal

POS1-48

IMPLEMENTING A TOBACCO CESSATION PROGRAM THAT INTEGRATES TECHNOLOGY- AND CLINICIAN-DELIVERED ASSESSMENT AND INTERVENTION IN AN URBAN CANCER CENTER: PROCESSES, CHALLENGES, AND LESSONS LEARNED

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The University of Chicago Comprehensive Cancer Center was awarded a NCI Moonshot Supplement to develop and implement a tobacco cessation program from the ground up. Given the urban cancer center environment and institutional challenges, we designed a program that optimizes reach and tailoring by integrating technology- and clinician-delivered assessment and intervention. Specifically, the program is centrally supported by TelASK® Quit Manager, a cloud-based system that interfaces with the Electronic Medical Record (EMR) and manages all aspects of the tobacco cessation program. A new part-time hire, a Tobacco Treatment Specialist (TTS), will be the liaison between patients and providers, oversee the referral process, provide front-line tobacco cessation support in the cancer clinics, and oversee implementation and patient follow-up with TelASK®. In this presentation, we review our step-by-step process of implementing early stages of the program, and describe challenges and lessons learned on strategies for successful implementation. First, we review the numerous steps of integrating an outside technology vendor (TelASK®) with the EMR (EPIC) including creating an IT work order, completing a security risk assessment, consulting legal and compliance departments, executing a Business Associate Agreement, creating data extraction rules, and pilot-testing the data extraction process in a mock-live environment. Second, we review the process of identifying and hiring a TTS to integrate the cancer clinic work flow in a manner that supports sustainability and acceptability within a financially risk-averse urban cancer center environment. Many lessons were learned and challenges addressed in terms of buy-in and support from leadership; becoming familiar with IT/business resources, processes, and technical terminology; making adjustments to planning timetables and budget allocation; and gaining confidence in outreach and hiring of a qualified TTS. Specific strategies for successful implementation of our emerging program will be described in an effort to share lessons learned and support similar tobacco cessation program development initiatives at other cancer centers.

FUNDING: Federal

POS1-49

SYSTEMS CHANGES, REGISTRIES, AND IMPLEMENTATION PROTOCOLS FOR TREATING TOBACCO IN CANCER CARE (SCRIPTT-CC)

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Consistent tobacco use screening and referral to cessation services are recommended as best practices within clinical cancer care. However, provider barriers to implementing tobacco use screening and treatment may reduce the likelihood that patients receive

recommended cessation services. We describe barriers to tobacco use screening and treatment among providers, and protocols developed to enhance screening and treatment at 1 urban and 2 rural cancer centers. Interviews and site visits identified barriers to routine screening and treatment including: tobacco status not displaying in a visible location in the EMR to prompt provider intervention; low regard for treatment importance; lack of knowledge of counseling/medications; low confidence for treating; bias toward shaming/advice rather than evidence based care; no dedicated staff/champions; no means to document intervention or generate reports for quality improvement. Screening rates were high but medical assistants (MAs) often carried over tobacco use status without assessing it at each encounter. To enhance screening, we piloted a protocol for MAs to better screen and proactively notify providers which patients smoke. To enhance treatment, 10 providers attended Tobacco Treatment Specialist (TTS) training. We modified the EMR to create smartlists of treatment options to prompt intervention, facilitate documentation, and generate data for reports; displayed tobacco use status under vital signs; simplified cessation medication preference lists to facilitate order entry; and created workbench lists of smokers with upcoming cancer treatment appointments to enable TTSs to identify smokers and offer care. We are presently working with oncology navigators to develop a workflow to identify smokers and refer for treatment prior to initiating cancer care. We worked with our cancer registry to develop and implement two new measures of counseling and medications that will systematically be collected by registrars, on an ongoing basis, on all patients who use tobacco. Sustainability is sought by integrating treatment into clinic workflows and tapping external treatment resources such as quitlines and text messaging.

FUNDING: Federal

POS1-50

RESPONSES TO CIGARETTE PRICE DISCOUNTING AMONG YOUNG ADULT SMOKERS: A DISCRETE CHOICE EXPERIMENT

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Background: Previous observational studies have found positive associations between exposure to price promotions at the point of sale and smoking behaviors. However, experimental studies to test the association were lacking. **Methods:** We conducted discrete choices experiments with a US online sample of young adult smokers (aged 18-29). Participants were given various scenarios situated at a point of sale. Original prices of different cigarette price tiers (high/middle/low) and quantity (pack/carton), and alternative tobacco option (e-cigarettes/loose tobacco/chew) were shown in each scenario, while discount prices (10% or 20% off) were shown for different cigarette tiers/quantity. Participants were asked what they would choose to purchase from the available options, including to not purchase anything. Generalized linear regression models were used to control for choice clustering by participants and stratified by education level (high school or less/some college/college graduate). **Results:** Price promotions for high and middle tiers cigarette cartons were not associated with increased odds of choosing to purchase cigarettes. However, 20% off low tier cigarette cartons was associated with increase odds of choosing to purchase cigarettes among young adult smoker with high school (AOR=1.94, 95% CI=1.37-2.73) and some college (AOR=1.67, 95% CI=1.20, 2.30) education. 20% off high tier cigarette packs were associated with increased odds of choosing to purchase cigarettes among young adult smokers with some college (AOR=1.40, 95% CI=1.03-1.92) and college education (AOR=1.52, 95% CI=1.08-2.14). Additionally, 10% and 20% off middle tier cigarette packs were associated with increase odds of choosing to purchase cigarettes among young adult smokers with high school and some college education ($p<0.05$), while similar promotions for low tier cigarette packs were associated with increase odds of choosing to purchase cigarettes among high school and college educated young adult smokers ($p<0.05$). **Conclusions:** Price promotions at middle and low tier cigarettes differentially increase intention to purchase cigarettes among lower education young adult smokers.

FUNDING: Federal



POS1-51

ENDS PRODUCT PREFERENCES AMONG ADULT SMOKERS: A DISCRETE CHOICE EXPERIMENT

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Background: The use of electronic nicotine delivery systems (ENDS) has been growing markedly. Although the US Food and Drug Administration (FDA) acknowledges the potentials of ENDS to be less harmful than combustible cigarettes (i.e., products on a continuum of risk), conclusive evidence is lacking on whether adult smokers who use ENDS would completely switch to ENDS or quit altogether. **Method:** This study uses a discrete choice experiment (DCE) to examine product preferences among a national sample of adult smokers (N=1,154) recruited online who were also using ENDS or did not rule out using ENDS in the future. The DCE evaluates five ENDS attributes: whether ENDS are less harmful to health than cigarettes (relative harm); ENDS' effect for helping people quit; nicotine strength; flavor; and price. Participants were asked to choose their preferred product among their own cigarettes, two alternative hypothetical ENDS products, and not choosing any. ENDS preferences were analyzed using a variety of models that impose different assumptions on the error structures, including multinomial, nested, and mixed (random parameter) logit analyses. **Results:** We found that adult smokers prefer ENDS that are less harmful to health than cigarettes, effective in helping people to quit, and have a lower refill price, and dislike products that are of a menthol flavor, not effective in helping quitting, and high liquid nicotine strength. Specifically, the marginal willingness to pay (WTP) is \$4.1 for a vape pen that is less harmful to health than cigarettes, \$3.0 for a vape pen with unknown effectiveness in helping quitting, \$4.7 for a vape pen that is effective in helping cessation, \$2.3 for a tobacco flavor over a menthol flavor, \$4.3 for a tobacco flavor over other flavors, and \$0.5 for a lower nicotine strength. **Conclusions:** Flavors, prices, effectiveness in helping quit, and nicotine strength influence smokers' preferences for ENDS. Policies regulating these features may play a significant role in altering smokers' ENDS preference, and thereby impacting their tobacco use behaviors.

FUNDING: Federal

POS1-53

SUBSTITUTABILITY OF ELECTRONIC AND HEAT-NOT-BURN CIGARETTES AS A FUNCTION OF ELECTRONIC CIGARETTE TAXES AND SUBSIDIES: INTERNATIONAL EXPERIMENTAL TOBACCO MARKETPLACE STUDY

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Background: The Experimental Tobacco Marketplace (ETM) provides an experimental method to estimate, prior to implementation, the effects of new policies or new products on purchasing patterns across various available products in a complex tobacco marketplace. The current study used the ETM to test the influence of taxation and subsidization of electronic cigarettes (ECs) on the substitutability of ECs and heat-not-burn cigarettes (HNB) in exclusive smokers, exclusive vapers, and dual users. **Method:** Participants (N=561) from the United States, England, and Canada completed the ETM online as part of the 2018 International Tobacco Control (ITC) Four Country Smoking and Vaping Wave 1 Survey (4CV2). Participants were instructed to make hypothetical weekly purchases, with access to an account balance consistent with weekly expenditure on cigarettes/ECs. A picture, description, and price was displayed for all products. Prices varied for cigarettes (1/2x, 1x, 2x, 4x, 8x market price) and e-liquid (1/4x, 1/2x, 1x, 2x, 4x market price), counterbalanced across participants. HNB, nicotine replacement therapies (NRTs: gum/lozenge) and smokeless tobacco (snus, dip) were available at a constant price across all purchase decisions. **Results:** Cigarette demand was unaltered by EC taxation/subsidization. EC substitutability increased with EC subsidization and decreased with EC taxation among exclusive smokers and dual users. A similar pattern was found for EC intensity (peak use) among exclusive vapers. There was negligible demand for HNB, NRTs, and smokeless tobacco, with the exception of increased HNB substitutability in exclusive smokers as a function of EC taxation. **Conclusions:** The ETM offers a method to predict how consumers might respond to policies that alter the price of ECs. Findings suggest EC taxation will dampen EC substitutability and limit

harm minimization associated with switching, whereas EC subsidization will promote transitions away from smoking. We demonstrated limited consumer appeal for HNB across three countries.

FUNDING: Federal; Nonprofit grant funding entity

POS1-54

DEMAND AND APPEAL FOR FLAVORED VS UNFLAVORED LITTLE CIGARS/CIGARILLOS IN YOUNG ADULTS: A BEHAVIORAL ECONOMIC APPROACH TO INFORM POLICY

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Background: Past 30-day cigar use among young adults (YAs) is nearly 2 to 4 times higher than youth and older adults, respectively. Data from 2017 show that nearly half of past 30-day YA cigar users report use of a flavored cigar. FDA has recently requested information about cigars and flavored tobacco products to inform new regulatory efforts. Behavioral economic tasks provide a way of quantifying appeal for a tobacco product in response to different policy scenarios. The purchase task is one behavioral economic paradigm that assesses the impact of price on self-reported consumption and individual differences in demand (i.e., appeal) at these increasing prices. This study examined the main and interactive effects of little cigar/cigarillo (LCC) use behavior and susceptibility to use on appeal for flavored vs unflavored LCCs using a purchase task. **Method:** 202 young adult (18-30) tobacco users and non-users recruited via Amazon Mechanical Turk were randomized to view a package of a grape- or tobacco-flavored LCC. Following randomization, participants were asked to report how many LCCs they would buy and smoke at increasing prices. Indices of demand included: intensity (consumption when free), breakpoint (first price with no consumption), *omax* (maximum expenditure), and *pmax* (price associated with maximum expenditure). **Results:** There were significant interactions of condition and past year LCC use on breakpoint and *omax* (*p*'s < .01). Respondents who viewed flavored LCCs and reported past year LCC use had the highest breakpoint and the highest maximum expenditure (consumption x price) relative to any other condition. There was a significant main effect of condition on *pmax*. Specifically, those randomized to view the flavored vs unflavored LCC were willing to consume LCCs at a higher price point. **Conclusions:** YAs showed greater willingness to pay for flavored LCCs compared to non-flavored LCCs, suggesting greater appeal of these products. Regulatory efforts restricting flavors in cigars may reduce appeal in young adults, with greatest effect on existing LCC users.

FUNDING: Nonprofit grant funding entity

POS1-55

DUAL USE VERSUS EXCLUSIVE E-CIGARETTE USE: HOW KNOWLEDGE, PERCEPTIONS, AND BELIEFS INFLUENCE VAPING INITIATION

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Background: While quitting the use of tobacco and related products is the best option for health, for cigarette smokers, switching to exclusive use of e-cigarettes (and not dual use of cigarettes and e-cigarettes) is less harmful than cigarette smoking. It is important to gain insight into the initiation process of exclusive e-cigarette use versus dual use. This comparison provides policy makers with opportunities to target different types of users. This study examined behavioral determinants associated with both tobacco and e-cigarette use. Determinants were assessed for differences between user groups among adults (>18 years) and adolescents (13-17 years). **Methods:** A cross-sectional survey (n=731) among 61 exclusive current e-cigarette users, 122 current dual users, 407 non-users, and 141 current smokers was conducted in the Netherlands. The questionnaire assessed demographics, tobacco and e-cigarette behavior, knowledge, attitudes, social ties, risk perceptions, intention, self-efficacy, and deliberation. We used structural equation modelling to evaluate how behavioral determinants influence initiation of e-cigarette use and dual use. **Results:** Health benefits was the most frequently reported reason for e-cigarette use. A low socio-economic status was associated with ever use of e-cigarettes, and older participants were less likely to have tried e-cigarettes. Participants knew more about tobacco cigarettes than e-cigarettes. Furthermore, non-users perceived the social environment to be more negative towards e-cigarette and tobacco



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use. Compared to e-cigarette users, non-users and smokers perceived e-cigarettes as more harmful. Smokers were significantly more likely to have an intention to start vaping than non-users. Finally, e-cigarette users reported to have made a deliberate choice to switch from tobacco use to e-cigarette use. Conclusion We found distinct differences in determinants for initiation of e-cigarette use and dual use. With these differences, policy makers are able to target specific characteristics of e-cigarette use initiation to prevent use among non-users and prevent dual use.

FUNDING: Nonprofit grant funding entity

POS1-56

EFFECTS OF USER PUFF TOPOGRAPHY AND DEVICE CHARACTERISTICS ON ELECTRONIC CIGARETTE TOXICANT EMISSIONS

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Significance: Some electronic cigarettes (ECIGs) users attain tobacco cigarette-like plasma nicotine concentrations, while others do not. Some ECIGs generate very high levels of carcinogenic carbonyl compounds (CCs), while others do not. Understanding the factors that influence ECIG nicotine and CC emissions is relevant to regulation. These factors may include user puff topography, liquid composition and ECIG design features. This study addresses how these factors can influence ECIG nicotine and CCs generation. **Methods:** ECIG aerosols were generated with a digital puffing machine from 20 different ECIG devices, including above- and sub-ohm devices, at powers ranging from 1-200W, 1-8sec puff durations, 1-10L/min flow rate, 0/100 to 100/0 propylene glycol/vegetable glycerin ratios and 0-75mg/mL nicotine concentration. Nicotine yield (particle phase) was determined by GC/MS, and CCs (gas phase) were trapped on DNPH-coated silica cartridges and analyzed using HPLC. Results are reported per mg of liquid consumed. **Results:** We found that nicotine yield ranged between 0-0.06mg/mg of liquid consumed. Total CCs ranged from 0-70µg/mg. Increasing nicotine concentration resulted in an increase in nicotine emissions per liquid consumption. Puff duration and power increased liquid consumption but not nicotine yield per liquid consumed. CC emissions were strongly correlated to power intensity (W/m², power/ECIG heating filament surface area). For one unit of nicotine, sub-Ohm devices were found to emit higher CCs than above-Ohm devices. **Conclusion:** Depending on conditions such as puff topography, electrical features and product design, ECIGs can generate far less or far more nicotine and CCs than a single cigarette in 15 puffs. No single user topography, liquid composition, or device characteristic determines nicotine and other toxicant emissions; rather, emissions are determined by combinations of variables.

FUNDING: Federal

POS1-57

HOW CHEMICAL QUANTITIES ARE CONVEYED AFFECTS PERCEIVED RISK OF CIGARETTE BRANDS AND INTEREST IN SWITCHING BRANDS

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Significance: The US government is required to publicly display the quantities of harmful chemicals in cigarette brands. We sought to test formats for presenting chemical quantity information that would not lead to incorrect beliefs that brands vary in risk of health problems. **Methods:** We recruited a convenience sample of US adults (n=609) and a probability sample of US adolescents and adults (n=1,440). An online experiment randomized participants to view one of 5 formats (control, presence/absence, point estimate, range, visual risk indicator). Participants then answered questions about which, if any, brand was more likely to lead to health problems, and whether the information would lead them to switching brands if they smoked. **Results:** Showing one cigarette brand with 3 more harmful chemicals than another brand resulted in more people perceiving the brand as more harmful as compared to control (64.6% vs 1.1%, p<.01). Likewise, in other experimental conditions, participants were more likely (64.2-75.2%) to say that the brands differed in harm as compared to control (0.7-1.1%, all p<.01). Participants in the experimental conditions were also more likely to say they would switch to the brand with lower quantities of chemicals (68.8-77.4%) as compared to control (7.7%, all p<.01). Belief that one brand was safer than the other mediated the relationship between format and interest in switching. **Conclusion:** Each of the formats tested were

interpreted by most people as indicating a meaningful difference in risk. Until research indicates substantive differences in risk between brands, quantity information by brand is likely to be misleading.

FUNDING: Federal

POS1-58

MULTIOMICS SYSTEMS TOXICOLOGY INHALATION CESSATION STUDY IN APOE KNOCKOUT MICE TO INVESTIGATE RESPIRATORY AND CARDIOVASCULAR EXPOSURE EFFECTS OF A POTENTIAL AND A CANDIDATE MODIFIED RISK TOBACCO PRODUCT COMPARED WITH CONVENTIONAL CIGARETTES

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Significance. Cigarette smoke (CS) causes adverse health effects, including respiratory disease (chronic obstructive pulmonary disease), cardiovascular disease, and cancer. To reduce the risk of smokers developing smoking-related diseases, Philip Morris International is developing modified risk tobacco products (MRTP). **Methods.** Within a systems toxicology study, we integrated multi-omics measurements (mRNA/miRNA transcriptomics, proteomics, metabolomics, and lipidomics) with classical endpoints to assess the effects in ApoE^{-/-} mice of six months of exposure to CS or to aerosols from one potential and one candidate MRTP (the Carbon-Heated Tobacco Product [CHTP] 1.2 and Tobacco Heating System [THS] 2.2, respectively)—both leveraging the heat-not-burn principle—at matched nicotine concentrations (28 microgram/L). The impact of cessation or switching to CHTP 1.2 after three months of CS exposure was also evaluated. Multi-omics data analysis was supported by identification of multivariate latent factors and their interpretation in the context of biological networks. **Results.** Exposure to CS caused adverse effects on the lungs, including lung inflammation, and on the cardiovascular system, with aortic plaque formation. In contrast, exposure to the potential MRTP aerosols did not induce lung inflammation or enhance plaque development. Cessation or switching to CHTP 1.2 reversed lung inflammation and halted progression of aortic plaques. Multi-omics results further supported apical endpoints and provided insights into the underlying molecular mechanisms triggered by CS exposure, including oxidative stress, immune-regulatory metabolites, and lipid alterations. **Conclusion.** In this study, exposure to the potential MRTP aerosols had minimal adverse respiratory and cardiovascular effects. Cessation or switching to CHTP 1.2 delayed the progression of CS-induced atherosclerotic and lung emphysematous changes. This work exemplifies how multi-omics approaches can be leveraged effectively within a systems toxicology study.

FUNDING: Tobacco Industry

POS1-59

A SYSTEMS TOXICOLOGY ASSESSMENT OF REPEATED EXPOSURE OF HUMAN ORGANOTYPIC GINGIVAL CULTURES TO SWEDISH SNUS EXTRACTS AND TOTAL PARTICULATE MATTER FROM CIGARETTE SMOKE

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Significance: In Sweden, where snus use exceeds smoking among men, relatively low rates of major smoking-related diseases have been recorded. However, currently published studies lack a clear consensus on the effects of snus use on oral health, mainly due to confounding factors in epidemiological data, such as lack of account for the variability of product chemistry and use patterns. In line with the aims of tobacco harm reduction strategies, the effect of snus use should be investigated in comparison with that of cigarette smoking. The present study aimed to determine the biological impact of snus extracts from CORESTA and Swedish Match, in comparison with total particulate matter (TPM) from 3R4F reference cigarette smoke, by a systems toxicology approach. **Methods:** Two doses of snus extracts and TPM, diluted in phosphate-buffered saline and



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with matched nicotine concentrations, were applied to the apical side of human gingival organotypic epithelial cultures repeatedly for 72 hours. An additional higher concentration of the snus extracts was included to reflect nicotine levels observed in the saliva of snus users. **Results:** Gingival tissue morphology and medium levels of inflammatory mediators indicated a mild, transient effect of snus extract exposure compared with overt tissue injury elicited by TPM. Network enrichment analysis using the profiles of differentially expressed genes and causal biological network models demonstrated a lower impact of the snus extracts on the biological processes captured in the network models, particularly the xenobiotic metabolism response network, compared with that exerted by TPM. An integrative analysis of the mRNA and miRNA expression profiles was performed, providing novel exposure markers and suggesting potential roles for the miRNA involved in biological alterations. **Conclusions:** These data indicate that exposure to snus extract, even at considerably higher nicotine concentrations, has less impact on the gingival epithelium than cigarette smoke exposure. Although this study did not fully account for the repeated exposure occurring in snus users, it supports the harm reduction potential of snus in the context of oral health.

FUNDING: Tobacco Industry

POS1-60

SMOKE-FREE RULES IN HOMES AND CARS: A FOCUS ON ADOLESCENT SMOKING AND SECONDHAND SMOKE EXPOSURE

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The majority of Minnesota smokers implement home-only smoke-free rules, and comprehensive smoke-free rules (i.e., in homes and cars) are not common. Comprehensive smoke-free rules are also less common among low-socioeconomic status (SES) populations, and having child in the home predicts smoke-free homes but not smoke-free cars. Secondhand smoke (SHS) exposure remains high among all U.S. children, and nearly all tobacco users begin tobacco use during adolescence; yet tobacco use and SHS exposure are higher among youth who live with a smoker. This study addresses the dearth of population-based research on how comprehensive household smoke-free rules relate to tobacco use and SHS exposure among adolescents. Data came from the 2014 Minnesota Youth Tobacco Survey—a representative sample of Minnesota youth. We examined youth who lived with a smoker (N= 1,287). Measures included household smoke-free rules (no rules, partial rules—home or car, but not both—, and comprehensive rules), lifetime and 30-day cigarette use, 30-day cigarette and other product use, and SHS exposure in past 7 days in the home and car. We used descriptive statistics, weighted multivariate logistic regression, and weighted zero-inflated Poisson and zero-inflated negative binomial regressions. Compared to comprehensive rules, partial and no smoke-free rules were significantly and positively related to lifetime cigarette use (respectively, AOR=1.80, 95% CI=1.24, 2.61; AOR=2.87, 95% CI=1.93, 4.25), and 30-day cigarette use (respectively, AOR=2.20, 95% CI=1.21, 4.02; and AOR=2.45, 95% CI=1.34, 4.50). No smoke-free rules significantly predicted using cigarettes and other tobacco products compared to comprehensive rules. Based on descriptive and regression results, SHS exposure rates in both the home and car were significantly lower among youth whose household implemented comprehensive smoke-free rules. Comprehensive smoke-free rules protect youth from the harms of caregiver tobacco use. Relative to both partial and no smoke-free rules, comprehensive smoke-free rules have a marked impact on tobacco use and SHS exposure among youth who live with a smoker.

FUNDING: Federal

POS1-61

INCOME DISPARITIES IN SMOKING CESSATION AND THE DIFFUSION OF SMOKE-FREE HOMES AMONG U.S. SMOKERS: RESULTS FROM TWO LONGITUDINAL SURVEYS

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Significance: Lower rates of successful quitting among low-income populations in the United States may be from slower dissemination of smoke-free homes, a predictor of cessation. We explored the role of smoke-free homes in cessation behavior across income levels. Methods: Current smokers who were ≥ 18 years and who participated in the longitudinal 2002-2003 (n=2801) or 2010-2011 (n=2723) Tobacco Use Supplements

to the Current Population Survey were included in this study. We categorized income as multiples of the federal poverty level (FPL) ($<300\%$ FPL versus $\geq 300\%$ FPL). We examined the association of smoke-free homes with 1+day quit attempts and 30+ days abstinence at 1-year follow-up. We then conducted a mediation analysis to examine the extent that smoke-free homes contributed to income disparities in 30+ days abstinence. Results: Between the two surveys, heavy smoking (≥ 1 pack/day) declined by 17%, and smoking prevalence declined by 15% among those with higher-incomes ($\geq 300\%$ FPL). Although similar in 2002, the prevalence of smoke-free homes was 33% lower among individuals living $<300\%$ FPL than those living $\geq 300\%$ FPL. Although the quit attempt rate was similar, the 30+ days abstinence rate was higher in the 2010-11 cohort than in 2002-3 cohort (20.6% versus 15.5%, $p<0.008$). Whereas smoking ≥ 1 pack/day was associated with lower odds of 30+ days abstinence (Adjusted odds ratio [AOR] 0.7; 95% CI 0.5-0.9), having a higher income (AOR 1.9, 95% CI 1.4-2.6) and a smoke-free home (AOR 1.6, 95% CI 1.2-2.1) were associated with greater odds of 30+days abstinence. Differential changes in smoke-free homes across income groups between the two surveys contributed to 36% (95% CI 35.7-36.3) of the observed income disparity in 30+ days abstinence. Conclusions: Increasing the diffusion of smoke-free homes among low-income populations may attenuate at least a third of the income disparities in smoking cessation, highlighting the need for interventions to increase adoption of smoke-free homes among low-income households.

FUNDING: Federal; State

POS1-62

BRIDGING THE DIVIDE BETWEEN SMOKE-FREE HOMES AND CESSATION: DISPARITIES IN SECONDHAND SMOKE EXPOSURE, SMOKE-FREE HOMES, AND SMOKING CESSATION IN THE UNITED STATES

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Significance: Policies prohibiting smoking in indoor public places and workplaces have increased. However, many US nonsmokers remain exposed to secondhand smoke (SHS) in private settings, including homes. In addition to reducing SHS, research suggests increasing smoke-free homes among low-income smokers may reduce disparities in cessation. We assessed US trends and disparities in SHS exposure, smoke-free homes, and smoking cessation. Methods: SHS exposure was assessed using serum cotinine among US nonsmokers aged 3+ years from the National Health and Nutrition Examination Survey during 1988/1991–2013/2014. Smoke-free home rules were assessed using data among US adults aged 18+ years from the Tobacco Use Supplement to the Current Population Survey during 1992/1993–2014/2015. Recent cessation (former smokers who last smoked 6–12 months ago) was assessed using data among US adults aged 18+ years from the National Health Interview Survey during 2000–2015. National trends were assessed overall and by select groups. Results: SHS exposure among US nonsmokers declined from 87.5% in 1988/1991 to 25.2% in 2013/2014 ($p<0.05$). During 2013/2014, exposure was greatest among nonsmokers living with someone who smoked in the home (73.0%), non-Hispanic blacks (50.3%), those living in poverty (47.9%) or rental housing (38.6%), children aged 3–11 (37.9%), and those with less than high school education (30.7%). US households with a smoke-free rule increased from 43.0% in 1992/1993 to 86.5% in 2014/2015 ($p<0.05$). During 2014/2015, 9 in 10 households with no smokers had a smoke-free rule compared to 5 in 10 households with a smoker. Recent cessation increased from 5.7% in 2000 to 7.4% in 2015 ($p<0.05$). In 2015, recent cessation declined with increasing education, and was higher among those with private health insurance (9.4%) than those who were uninsured (5.2%) or on Medicaid (5.9%). Conclusions: In the US, SHS exposure has declined while smoke-free home rules and cessation have increased. However, disparities exist, particularly among lower socioeconomic groups. Opportunities exist to expand smoke-free homes, particularly among smokers, to reduce SHS and promote cessation.

FUNDING: Federal

POS1-63

INTERFACIAL DYNAMICS OF THE MODEL PULMONARY SURFACTANT IN THE PRESENCE OF GLYCEROL/PROPYLENE GLYCOL MIXTURES

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This communication presents a physicochemically-based analysis of direct interactions between the basic components of e-liquids (i.e., glycerol (GL) and propylene glycol (PG) that form the aerosol in electronic nicotine delivery systems (ENDS)) and the model pulmonary surfactant: MPS (Survanta). Experimental studies were done using dynamic drop tensiometer (PAT-1M, Sinterface, Germany) in simulated conditions of the respiration, i.e., during periodic breathing-like variations of the MPS air/liquid interface at the physiological temperature. Influence of GL, PG and GL/PG mixtures (20-80%) on the interfacial dynamics of the MPS system was studied at a wide concentration range of these ingredients simulating different doses of inhaled e-cigarette aerosols deposited in the pulmonary region. Estimates of the average e-liquid concentration were calculated based on a deposition model for orally inhaled aerosols. MPS dynamics was assessed on the basis of surface rheological parameters, which quantitatively describe the response of the active air/liquid (pulmonary) interface to the mechanical deformations (expansion and contraction) during breathing. The results show that GL, PG and their mixtures induce evident alterations of the original MPS properties (e.g., a decrease in the surface tension amplitude, surface elasticity and surface viscosity) only at very high concentration levels, which exceed by more than 100-fold the average concentration expected after a typical vaping session. It is also demonstrated that the overall effect of PG is stronger than that of GL. The influence of e-liquid constituents on the pulmonary surfactant is discussed on the basis of their adsorption and desorption at the air/liquid region during oscillatory variations of the interfacial area. Discussed physicochemical phenomena may be related to certain changes in the pulmonary surfactant function *in vivo*. Therefore, the findings from the presented studies should be included into the safety assessment of inhaled ENDS-vapor, also in case of nicotine-free products.

FUNDING: Tobacco Industry

POS1-64

KEY ISSUES GOVERNING NICOTINE AND TOXICANTS EMISSIONS FROM ELECTRONIC CIGARETTES - AN OVERVIEW

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Electronic cigarettes (ECIGs) are an increasingly popular, highly diverse, class of tobacco products that expose users to nicotine and sometimes undesired harmful toxicants, such as carbonyl compounds (CCs). ECIG design has proliferated through the years. Today, ECIG products are tending towards two main categories: sub-Ohm devices (SODs) and pod-systems. SODs use large heating coils with high power and low nicotine concentrations. Pod-systems use low power with high nicotine concentrations. In this review, we explore the implications of these divergent approaches on nicotine yield, total particulate matter (TPM), and CCs. We consolidated TPM, nicotine, and CCs emissions measurements from several studies conducted in our lab using the same measurement techniques. Assisted by a previously validated physics-based computer model, the data was analyzed to draw general lessons about the overlapping effects of power, device design variables, and liquid nicotine concentration on nicotine and non-nicotine toxicant emissions. The data analyzed represent a range of conditions and devices as different from one another as the pod and the SOD. We found that nicotine concentration in the aerosol typically equals that in the liquid. Thus, for a given liquid concentration, more liquid consumed by a device translates to proportionally greater nicotine emitted. Furthermore, liquid consumption (and TPM) is directly proportional to power input. As a result, a given user can obtain the same amount of nicotine by trading off power for nicotine concentration. CCs emissions per unit liquid consumed are approximately constant across power and device, provided that a power intensity (W/m^2) threshold is not exceeded. As a result, lower power devices using high nicotine liquids emit lower CCs per unit nicotine emitted. A critical power intensity threshold exists across which CC emissions per unit TPM rise drastically with power; this threshold is well-predicted using film-boiling theory and is a function of ECIG device geometry. As a result, two different devices operating at the same power using the same liquid can have very different CC emissions. ECIGs can be thought of as chemical processors in which the CC and nicotine output is proportional to the liquid throughput, which in turn is proportional to power input. Provided that the critical power intensity is not exceeded, obtaining a given nicotine yield using a low power device with a high nicotine concentration like JUUL results in lower CC emissions than a high-power device with a low nicotine liquid like SODs.

FUNDING: Federal

POS1-65

PRIOR NICOTINE AND ALCOHOL ADMINISTRATION ALTERS THE REWARDING ACTION OF ACUTE AMPHETAMINE IN YOUNG BUT NOT ADULT MICE

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Significance: Nicotine use during adolescent period leads to the use of alcohol and other addictive drugs later in life. In the present study, we examined if nicotine and then alcohol administration compared to saline would alter the rewarding action of acute amphetamine. **Method:** Adolescent and adult male and female mice were tested for preconditioning place preference in the CPP paradigm on day 1, then received conditioning with nicotine (0.25 mg/kg, s.c.) or saline (twice daily for 3 days) and then tested for postconditioning place preference on day 5. Mice were then left undisturbed for 3 days and then conditioned again with nicotine for 3 more days and tested again for CPP. Mice were then conditioned with ethanol (2 g/kg) instead of nicotine twice, as described for nicotine, and tested for CPP at the end of each conditioning period. Mice conditioned with saline were conditioned with saline throughout to serve as the control groups. Finally, all mice received a single amphetamine/saline or saline/amphetamine (3 mg/kg) conditioning once a day and then tested for CPP 24 h after the last conditioning. On each test day, mice were placed in the central neutral chamber of the CPP apparatus and allowed to explore the three chambers for 15 min. The amount of time that mice spent in each chamber was recorded. Mice were then euthanized, brains removed and nucleus accumbens was processed for protein expression using western blot analyses.

Results: Adolescent mice conditioned with saline throughout and then amphetamine showed greater CPP than their respective adult mice. On the other hand, adolescent mice pretreated with nicotine and alcohol exhibited blunted CPP after conditioning with amphetamine. There were changes in the expression of dopamine transporter in adult mice pretreated with nicotine and alcohol compared to adolescent mice. **Conclusion:** The current results suggest that the rewarding action of acute amphetamine is greater in adolescent than adult mice. While prior nicotine and alcohol conditioning failed to alter the rewarding action of amphetamine in adult mice, this treatment blunted the rewarding action of acute amphetamine in adolescent male and female mice. Western blot data suggested that these differences were related to changes in the expression of dopamine transporter.

FUNDING: State

POS1-67

SMOKING CESSATION INTERVENTIONS WITH POTENTIAL FOR USE IN LUNG CANCER SCREENING: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background: Current guidelines recommend delivery of smoking cessation interventions to individuals at high-risk of lung cancer attending lung screening. However, there are limited direct data on cessation intervention efficacy in screening programs. We conducted a systematic review and meta-analysis of interventions with potential for use in this setting. **Methods:** We searched Medline, PubMed and Embase to identify randomized controlled trials of cessation interventions from the US, Europe, and Australia published from 2010-2018. We included trials with participants ages 50+ and non-light smokers. We excluded trials with <100 participants, primarily younger or light smokers, and institutional populations. The primary outcome was self-reported or biochemically verified 7-day point prevalence abstinence at 6 months. Two investigators independently reviewed and abstracted studies using a structured tool. Random effects models were used to estimate pooled effect sizes by intervention category. Assessment of publication bias was performed using Egger's test. **Results:** We identified 3814 potentially eligible studies. The final eligible sample included 99 trials testing 137 interventions among 111,259 individuals (range 103-16,430 participants per study): pharmacotherapy (n=51), provider-based (n=3), web-based (n=30), in-person counseling (n=31), telephone counseling (n=14), and other (n=8). Use of pharmacotherapy (odds ratio OR= 1.40, 95% CI=1.26-1.55), provider-based (OR=5.48, CI=1.13-26.54), electronic-web based (OR=1.20, CI=1.10-1.32), in-person counseling (OR=1.36, CI=1.19-1.55) all increased the odds of abstinence; and telephone counseling (OR= 1.18, 95% CI=0.99-1.39) tended to increase abstinence. There was suggestion of some publication bias in certain categories. **Conclusions:** Several categories of interventions appear to be effective in increasing cessation rates among individuals that may be eligible for lung cancer



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screening. Decisions about which strategies to implement should consider pending results of trials specific to lung screening settings and populations, feasibility, costs, and impact on population mortality.

FUNDING: Federal

POS1-68

A SIMPLE AND ACCURATE RELATIVE SCALE TO CHARACTERIZE E-LIQUIDS FOR FREE BASE NICOTINE YIELD

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Introduction: Based on the Pankow theory and studies by tobacco companies, free base nicotine is responsible for impact or harshness of the aerosol due to nicotine's rapid absorption. Therefore, it is important to characterize e-liquids for their free base nicotine yield which might determine the acceptance of the product. Currently, there are three methods to measure free base nicotine content in e-liquids. These methods, based on the physical properties of nicotine, are Liquid Liquid Extraction (LLE), NMR chemical shift, and Dilution based on the Henderson Hasselbalch (HH) theory. To compare these methods, they should be tested in controlled experiments. The goal of our study was to compare these three methodologies for their accuracy, limitations, and ultimately provide a standardized approach. **Methods:** The study was performed using five e-liquid flavors. LLE was carried out using toluene or hexane. An NMR experiment was replicated as per Duell et al. We extended our approach based on the HH theory to measure protonated nicotine (NiH^+) using potentiometric titration (PT) as change in potential per addition of titrant containing counter ions to NiH^+ . **Results:** Application of toluene or hexane extractions resulted in flavor dependent inaccuracies (5 to 30% difference from HH equation). Accuracy of the PT method was confirmed by calculating pKa of pyrrolidine group of nicotine as 8.17 ± 0.12 at $18.5^\circ\text{C} \pm 1$, close to the value reported by Gonzalez et al. Further, we measured NiH^+ in the five flavors of e-liquids (10X diluted in HPLC water). Accuracy between the results by HH equation and by PT was found to be $\leq 2.0\%$ for all five samples (n=3). NMR offered an alternative scale that was found to be precise (0.02 to 2.69 %RSD depending on flavor). **Conclusions:** The extraction technique was found to be limited by solvent interactions with flavors. NMR technique, although promising, is yet to be fully tested. On the other hand, the PT approach provides an alternative scale to characterize e-liquids for free base nicotine yield. Based on results, the PT method based on HH theory with fixed dilution and pH measurement is reproducible, accurate and feasible. **Funding:** LK is supported by the National Institute on Drug Abuse of the National Institutes of Health under Award Number 2U54DA036105 and the Center for Tobacco Products of the U.S. Food and Drug Administration. The content is solely the responsibility of the authors and does not necessarily represent the views of the NIH or the FDA.

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POS1-69

COMPARING THE REWARD VALUE OF CIGARETTES AND FOOD DURING TOBACCO ABSTINENCE AND NONABSTINENCE

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Significance: Some addiction theories propose that nicotine dependence is characterized by an imbalance between motivation for cigarettes compared to nondrug primary rewards, such as food. This imbalance is thought to become increasingly polarized during abstinence, which motivates smoking. The present study evaluated motivation for cigarettes and food during abstinence and nonabstinence in heavy smokers using the Choice-Behavior-Under-Cued-Conditions (CBUCC) procedure to examine cue-specific reactions to cigarettes and food. **Methods:** Fifty daily, dependent cigarette smokers underwent two study sessions using the CBUCC procedure under nonabstinent and overnight abstinent conditions. During the CBUCC procedure, participants were presented with cigarettes, food, or water across multiple trials. On each trial, participants rated their craving for both tobacco and food and indicated the amount of money they would spend to access the cue. The amount spent directly determined the probability that the cue could be accessed and sampled on each trial. Multiple variables were collected from CBUCC to evaluate motivational factors and drug use behaviors such as reward value, craving, seeking, choice time, and consumption. **Results:** As an index of reward value, participants spent significantly more money to access cigarettes than food or water, and spent significantly more for food relative to water, regardless of abstinence status. Abstinence significantly increased the reward value of cigarettes but did not

significantly affect the reward value of food or water. Participants also demonstrated clear cue-specific craving for cigarettes and food, although craving was overall higher for cigarettes than for food. **Conclusions:** This study indicated that motivation for cigarettes was generally greater than motivation for food. Overnight abstinence selectively increased motivation for cigarettes but had little impact on motivation for food. This suggests that, during abstinence, heavy smokers do not reallocate motivational resources from nondrug rewards towards cigarettes; rather, motivational processes for food remain constant from nonabstinent to abstinent sessions.

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POS1-70

US SMOKERS' QUALITATIVE PERCEPTIONS AND QUESTIONS ABOUT VERY LOW NICOTINE CIGARETTES

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Significance: The US FDA's new approach for tobacco regulation includes considering a very low nicotine content (VLNC) standard for cigarettes. We investigated what smokers understand about this potential policy to learn about their questions and concerns. **Methods:** We conducted an online qualitative survey of 78 adult US smokers using a national convenience sample. The survey introduced participants to the potential VLNC policy. Eleven open-ended questions addressed topics including how participants would describe VLNC cigarettes to a friend, how they thought VLNC cigarettes would compare to current cigarettes, and how a VLNC policy may impact their interest in quitting smoking. The survey also asked what questions participants had about VLNC cigarettes. We coded results using ATLAS.ti and conducted a thematic content analysis, extracting key themes and representative quotations. **Results:** Many participants understood the concept of VLNC cigarettes and that they would be less addictive ("like decaf coffee"), but some misinterpreted the policy ("would be safer to smoke") or were skeptical ("a scam to get you to smoke more cigarettes"). Smokers believed these cigarettes may be less satisfying, less calming, may taste worse, and may be priced differently than current cigarettes. A few said they would likely end up smoking more cigarettes. Smokers said these cigarettes would be "pointless" and a "waste of money" but some supported the policy as a way to help them quit smoking. A few said it was unfair for the government to force them to quit. The most common questions were around possible changes in the health consequences, cost, or taste of the cigarettes. A few asked why this policy was being considered, and others wanted to know what chemicals would be put in the place of the nicotine. Some smokers had concerns about whether smokers would be helped with their withdrawal symptoms and "nic fits." **Conclusions:** Many smokers understood VLNC cigarettes would be less addictive. However, some people were skeptical or misinterpreted the health risks of VLNC cigarettes. Some smokers wanted additional support for quitting. These findings suggest that before a national VLNC policy is implemented research could inform the development and implementation of a communications campaign to address public concerns, correct misperceptions, and reduce unintended consequences.

FUNDING: Federal

POS1-71

DEEP LEARNING STRATEGIES FOR ANALYSIS OF STEM CELL MICROSCOPY VIDEOS

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Significance: Stem cells are a widely used in-vitro model of early embryogenesis and differentiation for developmental toxicology. Dynamic behavioral responses, observed using time-lapse optical microscopy, provide key insights into cell health/status via morphology/phenotypic expression. Data complexity is subject to the existence of dynamically changing heterogeneous stem cell colonies in culture (e.g. pluripotent precursors, progenitors/intermediates, and derivatives) as well as general image variation, and unpredictability of experimental outcomes. Video Bioinformatics software based in computer vision, image processing and pattern recognition overcomes the reliability and efficiency issues of human-aided by-hand



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analysis. Furthermore, machine learning and artificial intelligence (deep learning, DL) programs have repeatedly achieved unparalleled robustness and accuracy for a variety of complex tasks including image classification and endpoint prediction. **Methods:** This work focuses on modeling time-lapse microscopy videos using a subset of DL algorithms called Generative Adversarial Networks (GAN), and is applied to the analysis and quantification of microscopy videos from developmental toxicology studies. A minimal biological dataset is supplemented with synthetically generated video data using GAN and used to train a custom DL network. **Results:** A variety of network configurations are highlighted to showcase the effects of hyper-parameters and algorithm design on classification performance with supplemented datasets. Statistical analysis of generated video quality is performed using a structural similarity metric. The morphological and behavioral effects of Formaldehyde and Acetaldehyde on human embryonic stem cells are observed and modeled using GAN and compared with real images to determine biological relevance of the generated dataset. **Conclusions:** In addition to directly accomplishing the given task, this work serves to indirectly unveil pitfalls of current experimental and algorithm techniques, and illuminate strategies for their symbiotic design and implementation of deep learning algorithms for developmental toxicology experiments.

FUNDING: State

POS1-72

RECRUITING SMOKERS FOR FMRI RESEARCH: ANALYSIS OF YIELD AND COSTS BY RECRUITMENT CHANNEL

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Recruiting smokers for fMRI research can be challenging. Tracking the yield and costs of different recruitment channels can help direct staff time, prioritize spending and inform future studies. For an fMRI study of adult daily smokers, we faced recruitment challenges of having >10 exclusion criteria and requiring two on-campus visits for a total of 3 hours. Study incentives were \$100, a printed image of one's brain and paid parking. Recruitment channels were posted flyers; emails to support groups, listservs and research registries; and ads/postings in the campus newspaper, campus research website (Sona), Craigslist, Quora, Google and on social media sites (Facebook, Reddit, Nextdoor). Recruitment materials linked to the study's web-based screener, which asked how they heard about the study. We analyzed yield and cost by recruitment channel. Over 8 months' time, 1292 participants have been screened, with the top recruitment channels being Facebook (53.5%), Sona (15.1%), Craigslist (8.9%) and word of mouth (7.8%). Of 1048 ineligible, biggest reasons for exclusion were smoking < 5 cigarettes per day (44.6%) and body mass index outside the target range (30.9%). The cost per screened individual was highest for the campus newspaper (\$27.86), followed by Reddit (\$9.65), Google Ads (\$8.97), flyers (\$8.93) and Facebook (\$6.35). Quora cost \$37.10 with no yield. Craigslist, listservs, registries, Nextdoor, Sona and word of mouth were free. Among the 40 participants completing the study, the best recruitment channels were Facebook (n=17, 42.5%), word of mouth (n=7, 17.5%) and Sona (n=4, 10.0%). The costs have averaged \$4.31 per screened individual and \$139.32 per study completer. Staff time was most intensive for posting flyers. Policy restrictions on tobacco-related ads stalled online recruitment campaigns. Yet, Facebook, with its wide reach and targeting criteria, still yielded the most participants for a relatively small investment. Supplementing with free channels helped to keep overall campaign costs down. In developing a recruitment plan and budget, using Facebook supplemented with free recruitment channels provided the greatest yield at the most reasonable cost.

FUNDING: Federal

POS1-73

MENTHOL INHIBITS UGT2B10 CATALYZED DETOXIFICATION OF THE POTENT TOBACCO CARCINOGEN, NNAL

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Significance: Menthol may be added to tobacco products as either naturally occurring L-menthol or synthesized racemic DL-menthol and is excreted as a menthol glucuronide (MG). The most potent tobacco carcinogen is 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK). NNK is extensively metabolized to enantiomers [(R) or (S)] of the equally carcinogenic chiral 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL). Both (R)- and (S)-NNAL have been shown to be carcinogenic. Detoxification of (R)- and (S)-NNAL

through glucuronidation on NNAL's pyridine ring nitrogen (NNAL-N-gluc) is primarily mediated by UGT2B10. Menthol has been shown to inhibit NNAL-N-gluc formation in human liver microsomes (HLM). The goal of the present study was to elucidate the impact of menthol on NNAL-N-gluc formation *in vivo*. **Method:** *In vitro* inhibition assays using HLM or microsomes from UGT2B10 over-expressing HEK293 cells were performed with racemic (R/S)-NNAL as substrate with each menthol enantiomer added separately as inhibitor. *In vivo* data were gathered from analysis of MG, NNAL, and NNAL metabolites from 50 menthol smokers and 50 non-menthol smokers. Samples were obtained from the Southern Community Cohort Study. **Results:** Both L- and D-menthol enantiomers were inhibitors of UGT2B10 *in vitro* with IC₅₀ values of 236 and 202 μM, respectively. *In vivo* D-MG levels, when present, were far below the levels of L-MG observed in smokers of both menthol or non-menthol cigarettes, with D-MG comprising an average of 1.3% of total MG. Urinary L-MG was detectable in 98 subjects and levels were not significantly different between menthol and non-menthol smokers ($p=0.50$). When stratified by teriles of urinary MG levels, NNAL-N-gluc levels were highest in smokers with the lowest MG levels, with NNAL-N-gluc levels inversely associated with MG levels in smokers. **Conclusion:** These data suggest that menthol inhibits a major detoxification pathway of the tobacco carcinogen, NNK. The relatively high levels of urinary menthol in smokers of both menthol and non-menthol cigarettes raise the possibility that menthol branding may not be the best approach to studying the impact of menthol as a tobacco additive.

FUNDING: Academic Institution

POS1-74

NICOTINE-INDUCED ENHANCEMENT OF PERIPHERAL ATTENTION IN RATS

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Whilst the beneficial effects of nicotine on sustained and selective attention have been widely reported, an aspect often overlooked is peripheral (or distributed) attention, which involves attentional coordination and control. The aims of this research was firstly to develop a peripheral attention task for rats, which would facilitate the detection of exogenous and endogenous aspects of peripheral attention. Secondly, to evaluate the effects of a wide range of nicotine doses on measures of task performance. Rats ($n = 12$) were trained in a covert orienting task and tested using predictive (80% valid, 20% invalid) and non-predictive (50% valid, 50% invalid) peripheral cues. However, under these conditions, the endogenous aspect of peripheral attention was not detected. Therefore, nicotine (0.05-0.8 mg/kg, s.c.) was tested under non-predictive cueing (exogenous) in which nicotine was observed to decrease reaction times and reduce reaction times to invalidly cued targets. Response accuracy also increased with increasing dose, characterised by dose-dependent reductions in incorrect responses. A small dose of nicotine (0.1 mg/kg) significantly decreased omission errors. The results suggest that nicotine can enhance the dis-engagement and re-orienting of peripheral attention, with decreases in the number of errors. Thus, this task provides a sensitive rodent model for the attention-enhancing effects of nicotine and other cholinergic compounds.

FUNDING: Academic Institution

POS1-75

ASSOCIATIONS BETWEEN JUUL INFORMATION SOURCES AND PRODUCT USE AND PERCEPTIONS

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Background: JUUL e-cigarettes has gained >60% of the US 2018 retail market share among branded e-cigarette companies. However, the information sources through which JUUL users learned about the product are not known. This study examined associations between information sources about JUUL and JUUL use and perceptions. **Methods:** We assessed the sources of awareness about JUUL through 2 cross-sectional surveys of US adults (Survey 1: 502 18-24 year-olds; Survey 2: 803 adult smokers). Participants identified the sources through which they learned about JUUL (social media, friends and family, etc.). Primary outcomes were ever and past-30 day use of JUUL and perceptions of JUUL compared to VUSE (e.g., which product would be less harmful, taste better, etc.). **Results:** Among Survey 1 participants, 9.4% had ever used JUUL and 6.8% had used in the past 30 days. Learning about JUUL through word-of-mouth (aRRR=3.9) and JUUL's online accounts (aRRR=3.9) was associated with past-30 day JUUL use.



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Learning through JUUL's online accounts (aRRR=3.9) or JUUL sponsored events (aRRR=3.5) was associated with ever use. Individuals who learned of JUUL through JUUL advertising (online accounts, outdoor ads, online ads) were more likely to have positive perceptions of JUUL (perceive the product to be more fun, less harmful, less addictive, taste better; aORs range from 2.2-5.1). Among Survey 2 participants, 8.1% had ever used JUUL and 9.9% had used in the past 30 days. Learning about JUUL through print ads was associated with past 30-day use (aRRR=7.1) and learning through JUUL sponsored events was associated with ever use (aRRR=5.3). Learning about JUUL through the news was negatively associated with past 30-day use (aRRR=0.2). Individuals who learned of JUUL through internet ads were more likely to perceive JUUL as more fun (aOR=2.0) and better tasting (aOR=2.0), while individuals who learned of JUUL through print ads perceived JUUL to be better for quitting smoking (aOR=2.0) and less harmful (aOR=2.4). Conclusions: Learning about JUUL through JUUL-sponsored messaging is associated with JUUL use and positive JUUL perceptions. Implications for policy and practice will be discussed.

FUNDING: Federal; Academic Institution

POS1-76

ANALYTICAL AND TOXICOLOGICAL ASSESSMENT OF JUUL ELECTRONIC CIGARETTES PRODUCTS

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Introduction: JUUL EC products have become very accessible and popular among middle school and high school students. The purposes of this study were to: (1) identify and quantify flavor chemicals in JUUL EC Pod juice flavors purchased online and in stores and (2) determine if these products are cytotoxic using invitro models. **Method:** Eight JUUL pod flavors were analyzed using GCMS to identify and quantify flavor chemicals in pod juice and aerosols made at variable flow rates. BEAS-2B cells were exposed to fluids and aerosols for 24 hrs and cytotoxicity was determined using methyl tetrazolium (MTT), and neutral red assays. **Results:** 58 flavor chemicals were identified in all the products with three flavors (menthol, ethyl maltol, and vanillin) being detected at concentrations > 1mg/ml. Duplicate pods had very similar flavor chemicals compositions. Transfer efficiency of total flavor chemicals in the pod juice into aerosols was generally > 75%. Nicotine concentrations generally exceeded 50 mg/ml. Both cytotoxicity assays generally revealed very similar patterns of response with the most cytotoxicity revealed at 3% and 10% for cells treated with fluids. At lower concentrations, toxicity is observed with the only the MTT assay for 3 of 8 flavors. Very slight levels of LDH leakage into extracellular medium was observed after treatment with aerosols. The toxicity of the aerosols in MTT and neutral red assays was observed between 0.4% - 3% when compared to the fluids. **Conclusion:** Fluids and aerosols from JUUL products are cytotoxic and affects cell survival. These data provide new and useful information for users and regulatory agencies on the chemical composition of JUUL products and their potential to cause harm to users.

FUNDING: Federal; Academic Institution

POS1-77

JUUL AWARENESS, TRIAL, AND USE AMONG MISSISSIPPI UNDERGRADUATE STUDENTS

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Significance: JUUL e-cigarettes can rapidly deliver nicotine to the brain, are not complicated to maintain and use, and can be used discreetly. These features may be attractive to adult cigarette smokers looking for a product to replace cigarettes, but may also attract non-smoking youth and young adults. JUUL has changed the e-cigarette landscape in a short span of time, yet little is known about JUUL use among young adults. The current study assessed awareness and nicotine perceptions of JUUL, and the prevalence of trial and frequency of use of JUUL among undergraduate students at three Mississippi universities. We also examined misclassification issues in survey assessment of e-cigarette and JUUL use. **Methods:** A random sample of undergraduate students completed a web-based survey on the Qualtrics platform. Respondents were asked about e-cigarette trial and then about JUUL awareness, trial, and use. **Results:** Most students had seen or heard of the JUUL (69.5%), and about half of those who had heard of the JUUL were aware that one JUUL pod has an equivalent amount of nicotine to a pack of cigarettes (59.4%). More than a third of students reporting have tried JUULs

(37.1%); and more than half of trial users reported either daily or past week JUUL use (55.6%), another 20.5% reported past 30-day use - but not in the past week, and the remaining quarter had not used a JUUL in the past 30 days (23.9%). Males, smokers, and students in the Greek system were more likely to report daily or past week JUUL use than others, $p < .05$. On a measurement note, 9.9% of students who reported JUUL trial did not report e-cigarette trial. Females (18.9%) were more likely than males (4.1%) and non-smokers (15.5%) were more likely than some day smokers (3.3%) and daily smokers (0.0%) to misclassify JUULs as not being e-cigarettes, $p < .05$. **Conclusion:** Awareness and trial of JUUL are high among undergraduate students in Mississippi. Moreover, most trial users report past 30-day use, in contrast to many previous studies finding that most trial use is discontinued. Daily/weekly use among more than 4 of ten non-smokers who tried JUUL raises concerns about nicotine addiction among non-smokers. Universities and policy makers need to be aware of JUUL use among undergraduates, particularly those who are non-smokers.

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POS1-78

ADOLESCENTS' AWARENESS OF THE NICOTINE STRENGTH AND E-CIGARETTE STATUS OF JUUL E-CIGARETTES

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Significance: JUUL e-cigarettes, which are popular among youth, resemble USB flash drives and use disposable pods containing a high concentration of nicotine salt (5% by weight or 59mg/ml) and flavors (e.g., mint, mango). Although JUUL packaging lists the nicotine concentration of its pods as 5%, it is unknown how youth interpret this information. Thus, we first examined adolescents' perceptions of the nicotine strength of JUULs when no information was provided, and, subsequently, when informed that JUULs contain 5% nicotine. Furthermore, the use of the term "JUULing" instead of "vaping" raises concerns about whether youth even view JUULs as e-cigarettes. Thus, we also evaluated whether adolescents view JUULs as e-cigarettes. **Methods:** A computerized survey was administered in 2 Connecticut high schools in May-June 2018 (N=1960). Participants described JUULs' nicotine strength, first when no information about nicotine concentration was provided (accompanied by a picture of a JUUL), and, second, when informed that JUULs contain 5% nicotine (accompanied by a picture of JUUL's packaging with the nicotine content highlighted). Participants reported whether they believe JUULs are e-cigarettes. **Results:** The sample comprised 56.0% never JUUL users, 12.7% experimenters (lifetime use but no past month use), and 31.2% past-30-day users. Most students underestimated JUULs' nicotine strength, with a greater percentage underestimating strength when they were informed that JUULs contain 5% nicotine (no info: 74.5%; 5% nicotine: 82.9%). Only 55% of adolescents believed that JUULs are e-cigarettes. **Conclusions:** Most adolescents, including current users, were unaware of JUUL's high nicotine strength, raising concerns about inadvertent exposure to nicotine and risk for developing dependence. These findings suggest that efforts to establish comprehensible definitions of nicotine levels, label products accordingly, and educate youth about the negative consequences of nicotine exposure are needed. Additionally, 45% of adolescents did not consider JUULs to be e-cigarettes or were unsure, suggesting that further efforts are needed to help clarify for youth what products constitute e-cigarettes.

FUNDING: Federal

POS1-79

YOUTH E-CIGARETTE PURCHASE LOCATION FINDINGS FROM THE INTERNATIONAL TOBACCO CONTROL POLICY EVALUATION

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Background: Electronic cigarettes (ECs) EC may represent a method of nicotine delivery that could be advantageous for smoking cessation, but also could be harmful if non-smokers, especially youth use them as a gateway into smoking. This study examines how differences in regulations regarding EC sales in different countries influence where and the types of ECs purchased by youth who report use of EC. **Design/Methods:** Data are from Wave 1 of the ITC Tobacco and E-cigarette Youth Survey (2017), a web-based



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cohort survey of 12064 16- to 19-year-olds recruited from a commercial panel in CA (n=4,008), EN (n=4,086) and the US (n=43970). At the time of this survey, Canada (CA) prohibited the retail sale of ECs containing nicotine, while no such restrictions existed in England (EN) and the United States (US), although all three countries had laws prohibiting sales to minors. Participants were asked about their use of EC and whether they had purchased an EC in the last 12 months. Those who reported purchasing and EC were asked where they had purchased with three response options: 1) online, 2) specialty EC stores (i.e., vape shop), or 3) other retail establishment. In addition, analyses explore how different user characteristics (i.e., dual use vs exclusive VNP use, frequency of smoking and vaping), demographic factors (i.e., age, gender), and EC product features (i.e., product type) correlate with purchase location in each country. Results: In all three countries, among respondents who reported having used an EC (18.3%, 28.1% and 24.4% in Canada, the US and England respectively) in the past 12 months, most did not report purchasing an EC in the last 12 months. Only 37%, 47%, and 32% of those users (in Canada, the US and England respectively) reported having actually purchased an EC in the past year. In all three countries the majority of respondents reported purchasing their ECs at a vape shop. Purchasing location was unaffected by reaching the legal age to purchase in each country. However, reporting purchasing of an EC was more common in those who were current EC users (i.e., past 30 day users) and in current smokers. Conclusions: Most 16-19 year olds who report having used and EC in the last 12 months have obtained their EC from a social source not a commercial source. Among those who had purchased an EC in the past year, vape shops were by far the most commonly reported commercial source. It does not appear that regulatory differences in where ECs can be sold between CA, US and EN have impacted where ECs are purchased by youth.

FUNDING: Federal; Academic Institution

POS1-80

PREVALENCE AND PREDICTORS OF JUUL USE AMONG A NATIONAL SAMPLE OF YOUTH AND YOUNG ADULTS

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Significance: Rates of electronic nicotine delivery system (ENDS) use among young people have exceeded that of cigarettes. The novel ENDS, JUUL, was released in 2015 and has since dominated the ENDS market. The objective of this study was to estimate the prevalence of JUUL use and identify demographic and psychosocial predictors of use among youth and young adults in the U.S. **Methods:** A national, probability-based sample of youth and young adults was recruited via address-based sampling. Additional subsamples were recruited from an existing, probability-based, online panel. The resulting sample included N=14,379 participants ages 15-34 years. Online surveys assessed JUUL use, tobacco use, ENDS harm perceptions, sensation seeking, and demographic characteristics. Data were collected in February - May 2018. Chi-square analyses assessed differences in rates of JUUL use by demographic and psychosocial characteristics. Logistic regression models identified significant predictors of ever and current JUUL use. **Results:** Overall, 6.0% reported ever JUUL use, and 3.3% reported current use. Rates were highest among those ages 18-21 years, with 11.2% reporting ever JUUL use and 7.7% reporting current use. JUUL use was also common among youth ages 15-17, with 9.5% reporting ever use and 6.1% reporting current use. Among current users ages 15-17, 55.8% reported use on 3 or more days in the past month, and over one-quarter reported use on 10 to 30 days. Significant correlates of use included younger age, white non-Hispanic race/ethnicity, greater financial comfort, perceptions of ENDS as less harmful than cigarettes, household ENDS use, high sensation seeking, and current combustible tobacco use. **Conclusion:** JUUL use was significantly higher among young people, with those under 21 having significantly higher odds of ever and current use. Frequency of use patterns suggest youth may not be experimenting with the device but using it regularly. Given the reportedly high nicotine content of JUUL, there is concern over the potential for addiction among young people. Findings suggest strong regulatory actions are needed to prevent youth uptake.

FUNDING: Nonprofit grant funding entity

POS1-81

COMPARISON OF NICOTINE DELIVERY AND SUBJECT EFFECT PROFILE OF JUUL, IQOS, AND COMBUSTIBLE CIGARETTES

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Background: "Pod mods" are a new style of electronic cigarette (ECIG) that have become increasingly popular among youth and young adults. Pod mods are small, portable ECIGs that are loaded with small prefilled tanks or "pods". JUUL is a name brand pod mod that has become one of the most popular ECIGs on the market. "Heat-not-burn" products heat tobacco electronically to produce an aerosol. IQOS is a heat-not-burn product available in several countries. While these products are often advertised for combustible cigarette smokers, little empirical research has been done on these products in smokers. **Methods:** In this study, six participants (5 men) who were regular cigarette smokers with little ECIG and no IQOS or JUUL experience completed a within-subject study that used standard human laboratory methods to investigate nicotine delivery, physiological response, and subjective effects after 10 puffs (30s interpuff interval) from JUUL, IQOS, or own brand combustible cigarettes (as a control condition). **Results:** Results indicate that, after a 10-puff bout, JUUL delivers, on average, 7.1 ng/ml nicotine and IQOS delivers, on average, 15.8 ng/ml nicotine, compared to 22.5 ng/ml for own brand combustible cigarettes. JUUL and IQOS did not differ from own brand combustible cigarettes on heart rate increases after product use. Participants' tobacco abstinence symptoms decreased in all three conditions after product use. On average, participants rated their own brand cigarettes as more satisfying, pleasant, and better tasting than JUUL and IQOS. **Discussion:** JUUL and IQOS deliver physiologically active doses of nicotine and suppress withdrawal in cigarette smokers naive to JUUL and IQOS. Nicotine delivery likely contributes to these products' potential as a smoking alternative and also potential for abuse among non-smokers, especially youth.

FUNDING: Federal

POS1-82

JUUL PRODUCTS FOR SALE ON CRAIGSLIST.COM: AN EXPLORATORY STUDY

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SIGNIFICANCE: E-cigarettes have become popular with adolescents and young adults. One particular e-cigarette brand, JUUL, has gained the majority (72%) of the market. Although there is evidence of JUUL products being sold online through E-bay, the extent to which JUUL products are being sold through the popular resale website Craigslist remains unknown. As such, the objective of this study was to explore the extent of sales regarding JUUL products through Craigslist. **METHODS:** From June 25th through July 12th of 2018, the "for sale" posts were searched using the term "JUUL" in each major US city that was generated by Craigslist for each state (including Washington DC). In order to focus the study on sales posted by individuals, postings provided by tobacco stores were excluded from the analysis. Duplicate postings from the same individual were excluded. Each posting was analyzed for the type of JUUL product being sold (devices, chargers, pods), the price of the product(s), and if the seller specified an age requirement to purchase the product(s). The prices from the postings were then compared to the prices provided by the official JUUL website. **RESULTS:** During the timeframe of this study, there were a total of 260 posts on Craigslist for a variety of JUUL products. The most common products for sale included: a combination of device(s) and charger(s) (46%); a combination of device(s), charger(s), and pod(s) (41%); or just pods (12%). A total of 184 posts (71%) advertised products that were priced below that of the official JUUL website. Only 14 posts (5%) from individuals specified they would check identification for age requirements to purchase the products. **CONCLUSION:** Our findings suggest the presence of a JUUL product market on Craigslist, which may have implications for youth. Although FDA has taken some action to address brick-and-mortar retail establishments and online retailers, stricter regulation of electronic products, like JUUL, is necessary to address resales to minors and issues of potential tampering of products. Additional studies are warranted to investigate markets on other resale sites, such as OfferUp or letgo.

FUNDING: Unfunded



POS1-83

JUUL PERCEIVED DRUG EFFECTS AND PREFERENCES BETWEEN EMERGING YOUNG AND OLDER ADULTS

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Significance: JUUL, a small, rechargeable, closed-system e-cigarette has recently become a market leader, with growing popularity among emerging and young adults. However, little is known about their attitudes toward the product, reasons for use, perceived drug effects, dependence, and patterns of use. The present study examined these among emerging adults (EA: 18-24 years), young adults (YA: 25-29 years), and older adults (OA: 30+).

Methods: Participants were ($N=949$) adult ever JUUL users, who completed online surveys via Amazon Mechanical Turk. Questionnaires examined current JUUL use, preferences, and perceptions. For analyses, age groups were divided into EA, YA, and OA. **Results:** Frequency of JUUL use differed by age groups, with EAs having the greatest percentage of nondaily users (37%) and OAs with the greatest percentage of experimenters (69%). There were no significant differences in the percentages of daily users between age groups (10.3% of EAs, 11.3% of YAs, 10% of OAs). EA (54%) and YAs (52.8%) had a greater preference for fruity/sweet flavors (e.g., Mango, Fruit Medley, Crème Brûlée) compared to OAs and OAs reported greater preference for traditional flavors (e.g., Cool Mint and Virginia Tobacco; 59.3%; $p=.003$) compared to EA (46%) and YAs (47.2%). Compared to OAs, EAs reported greater dizziness ($p=.003$), lightheadedness ($p=.001$), nausea ($p<.001$), coughing/choking ($p=.006$), rush/buzz ($p=.001$), and difficulty inhaling ($p<.001$) when using JUUL. EAs also reported greater perceived rush/buzz ($p=.02$) than YAs. No differences between groups were observed in JUUL dependence and reasons for first use. **Discussion:** In this sample, EAs reported greater non-daily use and experiencing greater positive and negative drug effects from JUUL use compared to YA and OAs. EA and YAs also reported greater preference for fruity/dessert flavors, while OAs preferred more traditional tobacco flavors. EAs may experience and use the JUUL differently than YAs and OAs, therefore preventive efforts should be tailored specifically to this age range.

FUNDING: Federal; State

POS1-84

UNDERAGEJUUL > LESSONS FROM SOCIAL MEDIA ON YOUTH ACCESS TO JUUL

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Significance: From 07-09-2017 until 01-07-2018 (when it was banned), a subreddit social media venue called UnderageJuul was used to discuss topics related to use of the electronic nicotine delivery system (ENDS) product called Juul. Because Juul has become the most used ENDS product in the U.S., and youth use of Juul has become a significant public health concern, the analysis of content in the UnderageJuul subReddit can provide a valuable insight into approaches used by those not legally able to obtain Juul. **Methods:** Even though the subReddit was blocked, our team was able to retrieve discussion content on UnderageJuul users. During the 6 months this subReddit existed, there were 717 threads, 2935 comments, and 844 unique users. Only a small percentage of UnderageJuul users reported their age (5%). **Results:** Mango, mint, and cucumber flavors were the most popular flavors reported, and about half (46.1%) of those using the UnderageJuul subReddit also participated in the subreddit "JUUL" - which is still used. By examining purchase requests and completed transactions in detail, we observed that there were 7 approaches that these users used to buy JUUL: (1) use of another person's identification/credit card to purchase product ($n=15$), (2) websites that did not require proof of age ($n=8$), other online vendors or Reddit users ($n=197$), meeting face-to-face ($n=51$), replacement codes ($n=30$), purchase of age-verified Juul account from someone else ($n=8$), sharing information on stores that did not verify age ($n=27$). **Conclusions:** Despite the great concern about adolescent Juul use, a small number of people used UnderageJuul, and an even smaller number used it to circumvent laws on underage use of Juul. However, discussions by those who did discuss access are informative and relevant to the regulatory process. The most common methods involved online or on-ground stores that did not age verify, or Reddit users who helped another person

obtain Juul. The banning of UnderageJuul did not prevent continued discussions on accessing Juul, which now occurs on the "Juul" subreddit and other venues. Additional content analyses will be provided.

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POS1-85

#JUUL ON INSTAGRAM: FLAVORS AND CARTOONS

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Purpose: The increasing popularity of the JUUL electronic nicotine delivery system (ENDS) among youth poses several potential public health concerns. Social media can help researchers better understand what types of JUUL-related content adolescents are being exposed to. This study sought to examine JUUL-related images and characterize associated conversations posted on the social media platform Instagram. **Methods:** We collected 25,428 unique Instagram posts that included #JUUL in the image caption from June 2018 to July 2018. The data also included the comments that corresponded to each image. A random sample ($n=3000$) were selected for analysis by coders. Each coder assessed the type (activity/product/advertisement/text/other) and appeal (discrete/cost/flavors/ease of use/harm reduction/cartoons) of images that were posted, and the patterns of conversations about each image. **Results:** The most frequent classification of JUUL-related images showed an ENDS device or product (64%), followed by images of an activity (16%), such as someone JUULing. About 28% of the images displayed different flavors and 10% included cartoons. Coders also found 21% of the captions mentioned flavors and 15% talked about cost (e.g., low cost). About 50% of the conversations discussing the images tended to consider JUUL positively, 48% were neutral or expressed both positive and negative sentiment, and 2% were negative. User comments and responses focused on flavors, cost, and harm reduction. **Conclusions:** Images of JUUL posted on Instagram—through use of the hashtag #JUUL—include many pictures of flavored ENDS products. Cartoons were used as part of marketing messages or on images of packages. Conversations about these images tend to discuss JUUL positively. These results can be used to inform future regulatory activities to reduce appeals such as flavors and cartoons that may resonate with teens.

FUNDING: Federal

POS1-86

EXAMINING DIFFERENCES AMONG YOUNG ADULT JUUL/VAPE POD USERS AND USERS OF ALL OTHER FORMS OF ELECTRONIC NICOTINE DELIVERY SYSTEMS

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Significance: JUUL is an Electronic Nicotine Delivery System (ENDS) product that was introduced in the US in 2015, and whose popularity has since grown tremendously. Subsequently, similar JUUL-style (i.e. vape pod) ENDS products have also emerged on the market. Estimates from 2018 indicate that JUUL holds more than half of the US market share for ENDS. Data from the Truth Initiative indicate that 25% of young adults do not consider use of JUUL as use of ENDS, but rather as "JUULing," suggesting the need for specific examination of current ENDS users of JUUL/vape pod. We examined differences in socio-demographics, other substance and tobacco product use, personality characteristics, and depressive symptoms between young adult current JUUL/vape pod users and ENDS users of all other types (e.g. cig-a-likes, vape pens, mods, etc.). **Methods:** Participants were 510 current/past 30-day ENDS users, 18-29 years old (M age=24.2, SD=2.36), who were drawn from a larger cohort of 5,482 Texas college students who participated in Marketing and Promotions across Colleges in Texas (M-PACT) project in spring 2018. Almost 24% ($n=120$) of current ENDS users identified as JUUL/vape pod users. **Results:** Chi squares and T-tests indicate that compared to current users of other ENDS products, JUUL/vape pod users were significantly more likely to be younger between the ages of 18-24 ($p=.000$), more likely to be male ($p=.002$), more likely to identify as White ($p=.033$), more likely to binge drink in the past 2 weeks ($p=.003$), and report higher sensation seeking ($p=.005$). **Conclusion:** Findings indicate a need to include JUUL/vape pod as part of comprehensive tobacco prevention efforts on college campuses, given that almost a quarter of the present study participants



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reported using JUUL/vape pod. Tobacco control efforts on college campuses targeting JUUL/vape pod use could also address high risk behaviors such as binge drinking and sensation seeking among this population. Research on the long-term effects of using JUUL is warranted given that JUUL contains higher nicotine levels compared to other ENDS, which is concerning from a public health perspective.

FUNDING: Federal

POS1-87

TRENDS IN JUUL USE AMONG YOUTH AND YOUNG ADULTS FROM 2017 THROUGH 2018

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Despite the dramatically decreasing use of combustible cigarettes, rates of electronic nicotine delivery system (ENDS) use among young people are rising. The most popular ENDS product, JUUL, was released in 2015 and has since rapidly dominated the ENDS market. This study examines JUUL use and harm perceptions among youth and young adults over a one-year period (July 2017-July 2018) of rising JUUL sales. Data was collected from a continuous tracking survey of young adults aged 15-21, with daily surveys conducted among 140 participants/week. Both ever-use and past 30-day use of JUUL increased dramatically over 12 months, particularly among younger users, coinciding with the rise of JUUL in the marketplace. Ever-use among all age groups increased nearly eight-fold, from 1.6% in July 2017 to 12.2% in July 2018, and from 2.4% to 15.2% among users aged 15-17. This directly correlates with Nielsen data showing the total dollar share of ENDS sales for JUUL tripling from 2017-2018 (24% to 72%). Use was more common among youth from the Eastern U.S. (17% ever use) than the South (9.7% ever use). Ever-use grew across all racial groups, but more White youth consistently reported ever using a JUUL than Black or Hispanic youth. By July 2018, across all age groups, more than half (54%) of participants had used JUUL at least once in the past 30 days. Harm perceptions also shifted, with participants first reporting JUUL as more harmful or as harmful as cigarettes (July 2017: 21%). By July 2018, more than one-third (33%) believed JUUL to be less harmful than cigarettes. Women were more likely than men to believe that JUUL was less harmful than cigarettes, and this belief nearly doubled among women across the survey period. Younger participants also shifted their view of JUUL across the period, with the percent of 15-17 year-olds who believed JUUL to be less harmful nearly doubling. By July 2018, nearly 40% of participants aged 15-17 perceived JUUL to be less harmful than cigarettes. This study uniquely demonstrates the explosive growth of JUUL, defined by both ever use and percent market share and how its perceptions have changed significantly over a one-year period.

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POS1-88

YOUNG ADULTS' KNOWLEDGE, RISK PERCEPTIONS, AND USE OF JUUL

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Significance JUUL is marketed to adult smokers as a “satisfying alternative” to smoking cigarettes. Use continues to rise in the US, accounting for almost half of the current e-cigarette market. The public health community is concerned JUUL may introduce young people to nicotine, lead to cigarette smoking, and prevent smokers from completely quitting combustibles. **Methods** In spring 2018, we conducted an online survey of a cohort of young adults recruited in 2010 from 11 Southeast colleges. We assessed JUUL awareness, knowledge of nicotine content, risk perceptions relative to cigarettes, and frequency and quantity of use. We examined associations between use, relative risk perceptions, cigarette smoking status, sex, and SES. **Results** The sample (n=1927) was 52.1% female, 84.5% white, mean age 25.2 (SD=0.5). Over a third (34.9%) were aware of JUUL, and 17.8% of those aware knew a JUUL pod contains the same amount of nicotine as a pack of cigarettes. Over half (50.7%) reported JUUL is as harmful or more harmful than cigarettes. Prevalence of ever use was 6.1%. Among users, 11.7% reported use daily; 7.1% weekly; 6.5% monthly; and 12.2% every few months. A third (38.0%) were current cigarette smokers, 50.9% former smokers, and 11.0% never smokers. There were no differences in frequency of use by smoking status. Among users, 12.5% reported one JUUL pod lasts a day or less; 71.2% said a pod lasts 7 days or less; and 88.7% reported JUUL is the only vaping device currently used. Those who reported JUUL to be as or more harmful than cigarettes were less likely to use at least monthly compared to those who reported it is less harmful (0.09, OR: 0.03-0.35, p<0.01), after

controlling for gender, SES, and current cigarette use. **Conclusions** JUUL awareness was 34.9%, slightly higher than recent estimates. Most users were current or former smokers; 11.0% were never smokers suggesting JUUL may introduce some young adults to nicotine. Most did not know the correct nicotine content and half perceived JUUL to be as or more harmful than cigarettes, which was associated with less use. Awareness efforts are needed to correct young adults' misperceptions about JUUL's nicotine content and risk compared to cigarettes, as it has the potential to encourage use among current cigarette smokers and deter use among former and never smokers.

FUNDING: Federal

POS1-89

JUULBUZZ: EXPLORING THE AMOUNT AND CONTENT OF YOUTH-RELATED TWITTER POSTS ABOUT JUUL AND JUUL-COMPATIBLE PRODUCTS

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Objective: JUUL-a high-tech “nicotine salt”-based vaporizer has become increasingly popular since its launch in 2015, currently representing 72% of e-cigarette market. Tobacco and vaping product vendors employ innovative methods of “social selling”, including social media influencer promotion, sponsored word-of-mouth, and native advertising. Social marketing of these products has coincided with the rapid growth of use among American youth. The number of youth using JUUL is alarming and raises serious concerns that the proliferation of nicotine-related social media promotion could perpetuate social acceptance of nicotine use and dependence among youth. Our objective is to explore and characterize messages on youth-related JUUL and JUUL-compatible product promotion on Twitter. **Methods:** Keyword rules were used to collect JUUL-related posts from the Twitter Historical Powertrack from January 2017 to May 2018. Posts were classified as commercial and organic and characterized as featuring youth and new user appeals, using a combination of machine learning methods, keyword algorithms, and human coding. Metadata were analyzed to assess types of linked content and geographic dispersion of the posts. Topic modeling is used to conduct exploratory analyses of meaningful trends. **Results:** Keyword filters captured 1,462,570 relevant tweets, and the number of tweets increased 20-fold over 16-month period of data collection. Youth-related posts constituted 30% of the total post volume. Youth-related appeals included memes and hashtags referencing JUUL use at school, cartoon imagery, flavors, wraps, device sharing. Top URL content linked to video hosting sites, live streaming services, news sites. Commercial posts featured giveaways and direct user engagement strategies, including incentivized friend-tagging. **Conclusions:** The present study sheds light on the marketing influences of JUUL promotion on Twitter-a major youth medium of expression. Posts featuring JUUL-related hashtags and marketing can increase exposure to pro-e-cigarette imagery and messaging and promote JUUL use among susceptible youth and novices. Stronger regulations are needed to prevent JUUL promotion to youth.

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POS1-90

YOUNG ADULT JUUL USERS: WHO ARE THEY AND HOW ARE THEY JUULING

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Significance: Launched in June 2015, JUUL captured 45.7% of the unit share of the e-cigarette market by May 2018. While some research has examined the prevalence of e-cigarette use including JUUL use among young people, many other social and behavioral aspects of JUUL use, particularly among regular users, are not well-understood. This study assessed patterns of tobacco and e-cigarette use among young adult JUUL users on a college campus. **Methods:** An intercept survey was conducted at six campus locations at Rutgers University in May 2018. Participants were 18 years or older and were required to show field staff their JUUL device (n=213). The survey assessed participants' use of JUUL and other tobacco products including age of initiation, nicotine dependence, flavor preferences, and refilling and purchasing behaviors. **Results:** Respondents were current occasional users of other tobacco products including hookah (62.8%), other e-cigarettes besides JUUL (46.9%), cigarettes (41.5%), and cigars/cigarillos (35.9%) but few were daily users of other tobacco products. The majority (59.2%) reported using



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less than half a pod daily while roughly a quarter (28.6%) finished one pod daily. Over half (52.1%) reported using JUUL within the last hour and 25.2% reported using a JUUL less than 15 minutes after waking. One out of three (31.5%) of respondents reported using JUUL when waking at night. JUUL users most often reported purchasing their device at a gas station/convenience store (44.3%) but 38.2% had ordered from JUUL.com including among those under 21 (41.5%). Many users had refilled their JUUL pods (57.8%) or bought JUUL compatible pods (38.4%). **Conclusion:** Young adult JUUL users often reported using other tobacco products and some JUUL users indicated a high level of nicotine dependence. While JUUL pods are not intended to be refilled, the majority of users have refilled their pods. And despite a minimum purchase age of 21, over 40% of users under age 21 reported purchasing directly from JUUL.com. Understanding patterns of tobacco and e-cigarette use and purchasing among regular JUUL users will better inform tobacco researchers, policymakers, and cessation providers.

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POS1-91

EXAMINING OTHER TOBACCO AND MARIJUANA USE AMONG EXPERIMENTERS AND CURRENT USERS OF JUUL

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OBJECTIVE: Tobacco, marijuana, and now newly popular electronic cigarettes such as JUUL, are the most widely used drugs among young adults. Few studies have examined the co-occurrence of use in this population with these substances. To address this gap, this study examined the association of marijuana use and the use of tobacco products among young adult current or ever JUUL users. **METHODS:** Survey respondents were 752 U.S. adults ($M_{age} = 32.6$ years) registered on Amazon Mechanical Turk (MTurk) who reported ever using JUUL. Survey items included measures assessing JUUL and other tobacco product use behaviors/history, frequency/quantity and harm perceptions of marijuana use, and self-reported nicotine and/or marijuana addiction. Differences were examined using chi-square, logistic regression, and independent samples t-tests by JUUL use status (current user vs. experimenter). **RESULTS:** The sample was comprised of approximately 60% JUUL experimenters (n=448) and 40% current JUUL users (n=304). Current JUUL users were younger than JUUL experimenters ($p < .001$) and were more likely to use other tobacco products ($p = .001$). Current users also tried JUUL at a younger age ($p < .001$) and reported higher levels of nicotine addiction ($p < .001$). Interestingly, experimenters were more likely to use marijuana in the past 30 days ($p = .001$) than current users, but reported vaping ($p = .017$) and smoking ($p = .006$) less marijuana per session. While current users and experimenters perceived similar levels of harm from smoking and vaping marijuana, current JUUL users rated marijuana edibles ($p = .002$) as more harmful than experimenters. No differences were observed for self-reported marijuana addiction between groups. **CONCLUSIONS:** In this sample, current JUUL users reported using JUUL more frequently, had higher nicotine addiction scores, tried JUUL at a young age, and reported using a greater quantity of marijuana. Prevention and intervention programs may need to target poly-use of electronic cigarettes, marijuana, and tobacco rather than focusing on a single risk behavior during these critical years.

FUNDING: Federal; State

POS1-92

TRENDS IN TOBACCO 21 MEDIA COVERAGE AND POLICY SUPPORT: AN EXPLORATORY CONTENT ANALYSIS USING MACHINE LEARNING

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Significance: A growing number of US states and municipalities have raised the legal age of tobacco purchase to 21. Prior research found consistent and high support for Tobacco 21 (T21) policies among adults and non-smoking youth. However, a recent study found support among 13-20 year-old smokers increased from 2014 until mid-2016 and then declined steadily through mid-2017. As this is the group most impacted by T21 policies, we wondered if media coverage was related to their changing support. Yet, little is known

about coverage of T21 policies. We conducted an exploratory content analysis of T21 media coverage from 2014 to 2017 and compared it to policy support among young smokers.

Methods: From a large corpus of tobacco texts (N=135,961 from the AP, broadcast news transcripts, popular newspapers and websites), we developed and applied a supervised machine learning classifier to identify texts mentioning tobacco policies. We then fit a series of unsupervised Latent Dirichlet Allocation models to the set of 17,477 policy texts to identify a model with a cluster about T21. Through a rolling cross-sectional phone survey, data about T21 support were collected from a nationally representative sample of people aged 13-20 years (N=8,361). **Results:** We selected a 9-topic model which assigned 1,453 texts to the T21 cluster. Limiting our focus to texts that were assigned higher probabilities of belonging to this cluster than to others, we plotted the summed model-assigned probabilities of T21 coverage over time. Comparison with a plot of temporal trends in support for T21 policies among young smokers revealed similarities between these trends. Media coverage and policy support increased from mid-2014 until 2016, then declined through the end of 2016.

Conclusions: To date, there have been no content analyses of T21 media coverage. We used machine learning to identify and assess temporal trends in T21 coverage over a 3-year period during which many of these policies were enacted. As such coverage showed a similar pattern to young smokers' T21 support during this time period, it is possible that T21 coverage impacted support for T21 policies among members of this group.

FUNDING: Federal; Academic Institution

POS1-93

DESIGN FEATURES AND MARKETING APPEALS OF CIGARETTE PACKS IN MEXICO

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SIGNIFICANCE: Since ratifying the FCTC in 2004, Mexico has restricted tobacco advertising, promotion, and sponsorship, increasing the importance of cigarette packs as a marketing tool. Through design elements, packs build brand identity to maintain smokers' loyalty and attract new users. Assessing pack features can shed light on techniques tobacco companies use to target users and potential users. **METHODS:** The Tobacco Pack Surveillance System (TPackSS) systematically collects unique cigarette packs sold in low- and middle-income countries with high tobacco use. In 2013, vendors were selected from 12 low, middle, and high socioeconomic areas in 3 cities (Mexico City, Guadalajara, and Merida) resulting in the purchase of 134 unique cigarette packs. Packs were double coded for information on design features and marketing appeals. Two packs without Mexican health warning labels were excluded. **RESULTS:** Camel (26), Pall Mall (20) and Marlboro (19) comprised almost half of the sample. Across the sample, 60% of the packs highlighted the existence of a filter and 26% stated a reduced number of sticks per pack (14 instead of 20). The most prevalent marketing appeals included "classic" imagery (44%) and terminology (33%), such as established years and crests, seals, and coat of arms. Luxury terminology (41%) highlighting quality, and mentions of the USA, specific states or cities (34%) were also prevalent. Flavor was conveyed in different ways on the packs and sticks. We observed flavor terminology (e.g. menthol/mint) in 17% of the packs and illustrations of flavor capsules, such as power/play/skip track buttons (13%) and balls (8%), as well. 20% of the sample had a flavor change indicator on the stick (e.g. click and roll, activate freshness) to illustrate flavor capsule technology. **CONCLUSION:** We identified a focus on filters, capsules and flavor, reduced number of sticks per pack, and terminology and imagery communicating luxury and quality. Although these data are from 2013, they can inform further monitoring of tobacco company marketing strategies and future studies, such as exploring people's interpretation of the appeals, specifically those susceptible to smoking.

FUNDING: Nonprofit grant funding entity

POS1-94

EXAMINING CHANGES IN NATIONAL TOBACCO OUTLET DENSITY OVER TIME AND YOUTH SMOKING BEHAVIOR

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Research suggests that tobacco retail outlet density is associated with smoking behavior among young people. Most existing studies, however, have examined density in relation to smoking outcomes at a single point in time only and focused on small geographic areas. This study aimed to examine changes in outlet density among a national U.S. sample of tobacco outlets and of youth and young adults to evaluate the relationship between outlet density and smoking behavior as the retail environment changes. A national sample of tobacco outlets was collected at two time points: January 2015 (n=286,599) and June 2016 (n=286,741). This dataset was linked to a national longitudinal probability-based sample of 15-21 year olds with surveys every 6 months over 3 years (n=6,041). Adaptive-bandwidth kernel density estimation was used to construct the density surface and categorized into 4 cutpoints based on the distribution (50th, 75th, 90th percentiles). We conducted hotspot analyses of the density surfaces and examined changes in the surface over time. Generalized estimating equations were used to assess associations between outlet density and outcomes of ever smoking and past 30-day smoking, adjusting for covariates. Results indicated minimal changes in outlet density overall over the 18-month period. Analyses demonstrated that the odds of ever smoking significantly increased as outlet density increased (AOR: 1.24 at 50th quartile; 1.28 75th quartile; 1.37 90th quartile, compared with lowest quartile, averaged over all waves, all p<.05). There were no consistent associations over time in the odds of current smoking and outlet density. This analysis is the first to examine changes in a longitudinal national sample of tobacco retail outlets and youth. Results demonstrate that tobacco outlet density is changing minimally over time. Further, density may be more influential on experimental smoking than established smoking as youth and young adults age over time. Policy implications will be discussed.

FUNDING: Nonprofit grant funding entity

POS1-95

EFFECTS OF E-CIGARETTE PRICES AND VAPING RESTRICTIONS ON ADOLESCENT E-CIGARETTE USE: EVIDENCE FROM MONITORING THE FUTURE

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Significance: Global sales of e-cigarettes (ECs) exceed \$8 billion annually, with US consumption accounting for 43% of that market. Although ECs may influence smoking cessation, they generate public health concerns given that e-cigarettes may pose potential health risks, renormalize cigarette smoking, and may serve as "gateway" to cigarette smoking. Our study explores the associations between cigarette/EC prices, smoking/vaping restrictions, EC use, and cigarette and EC dual use among middle and high-school students in the United States. **Methods:** Data came from the Monitoring the Future survey 2014, 2015, and 2016 with a total of 39408 middle- and high-school students. Average cigarette prices, e-cigarette prices in the market level were constructed from Nielsen ScanTrack. Smokefree and vapefree air laws data were provided by the ANRF Database. These data include smokefree/vapefree air laws in workplaces, restaurants, and bars at the state, county, and municipality levels. Integration of these diverse data sources, while accounting for year and respondents' residential locations, afforded a rich dataset, containing smoking/EC use, demographics, household socioeconomic status, cigarette/EC retail prices, and smoke/vape free air policies. We estimated adjusted logit model of EC use and EC and cigarette dual use. **Results:** EC price was negatively associated with EC use and EC and cigarette dual use. Respondents living in a county with a higher population coverage of laws regulating use of ECs in 100% smokefree venues were significantly less likely to use ECs or dual use. **Conclusion:** This study provides clear evidence that EC use is price sensitive among adolescent. Laws restricting ECs in the 100% smokefree venues may denormalize the use of tobacco products and ultimately discourage adolescent EC use and dual use.

POS1-96

ADVERTISING RECEPΤIVITY MEDIATES A DISPARITY TO PROGRESSION TO REGULAR CIGARETTE USE AMONG SEXUAL AND GENDER MINORITIES

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Significance: Despite a decades long general decline in cigarette use, sexual and gender minorities (SGM) continue to use at a higher rate. Explanations for this disparity are largely unknown although exposure to pro-tobacco marketing is higher among SGM and SGM youth report advertising as a reason for smoking. In addition, exposure to advertising is a risk-enhancing variable, targeted advertising is perceived more favorable among the SGM population, and SGM community members respond positively to tobacco marketing. The aim of the current study was to elucidate the role of pro-tobacco advertising receptivity in the association between SGM status and progression or reduction of cigarette use among 18-24 year olds. **Methods:** Data from Waves 1 and 2 of the Population Assessment of Tobacco and Health (PATH) study were used. Advertising receptivity was measured with a composite score from the answers to 3 questions. Progression was defined as advancement to everyday or some day cigarette use, while reduction was defined as decreasing from at least some day use to less than some day use. The analysis tested for a disparity in progression or reduction among SGM compared to heterosexuals and whether advertising receptivity plays a mediating role in either association. **Results:** Analysis revealed no association for reduction, but a significant positive relationship between SGM status and progression (log odds .67, 95% CI .10, .32) indicating a disparity in the progression towards regular cigarette use. SGM status was also positively associated with advertising receptivity (log odds .21 95% CI: .32, 1.01) indicating the SGM population is more receptive to tobacco advertising. When accounting for advertising receptivity the relationship between SGM status and progression to regular cigarette consumption decreased significantly (coefficient change = .12 log odds, 95% CI: .03, .20), indicating that advertising receptivity plays a role in the disparate rate of progression toward some day or everyday cigarette use among SGM. **Conclusion:** The findings suggest that the disparity in progression to regular cigarette use is partly explained by an increased receptivity to pro-tobacco advertisements among SGM. This adds to the literature on the harms of tobacco advertising by highlighting its disproportionate effect on an already vulnerable population.

FUNDING: Federal

POS1-97

ADVOCATING FOR HIGHER TOBACCO TAXES: LESSONS FROM PHILIPPINES' 2012 SIN TAX REFORM

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Background: In 2012, the government of the Philippines took a critical step towards curbing alcohol and tobacco consumption by passing the Sin Tax Reform Act. This ground-breaking legislation proved to be a victory for public health as it helped finance the country's Universal Health Care Program and helped reduce tobacco consumption. Given Philippines' unique success and the dearth of research that examines the politics of tobacco control policy adoption, this study aimed to explore the factors that facilitated the passage of the Sin Tax. **Method:** We used a case study approach whereby data were gathered from key informant interviews (N=25) and documents (N=30) and analyzed using inductive and deductive coding. Member checking was also undertaken to obtain feedback. **Results:** Findings showed that elections in 2010 brought about new leaders who were keen on increasing tax collection efficiency and achieving universal health care. This created an opportunity for Sin Tax advocates to convince the new President, Benigno Aquino III, to change the existing tax structure on tobacco and alcohol products in order to generate resources for health. Aquino's ultimate support led to the emergence of several political champions including key individuals within the Departments of Health and Finance. These champions partnered with advocates in other sectors to form a cohesive broad-based intersectoral coalition, framing, for the first time, the Sin Tax as a health rather than revenue generating measure. An array of tactics including lobbying, media advocacy, and demonstrations were also used to counter opposition



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from both the tobacco and alcohol industries whose efforts were much more fragmented. **Conclusions:** This case highlights the importance of coalition building for the purpose of cultivating intersectoral action for tobacco control. The presence of such a broad-based coalition helped showcase the extent of public support and allowed advocates to align their strategies towards a common goal. The strategic shift in framing was also of vital importance as few counterarguments withstood a strong health message. Results from the study can be used to assist those striving to pass similar policies.

FUNDING: Nonprofit grant funding entity

POS1-98

GUTKA IN ALL BUT NAME: THE PRESENCE OF PLAIN TOBACCO AND PAN MASALA DOUBLE PACKS IN FIVE STATES IN INDIA

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Background: Nearly 200 million individuals use smokeless tobacco (SLT) products in India. Gutka, a popular type of SLT that combined plain chewing tobacco and pan masala spices in one packet, was banned in 29 states. Although gutka is banned, the sale of individual packets of plain chewing tobacco and pan masala spices is still allowed in most states, effectively circumventing the ban. To combat this, Maharashtra currently prohibits the sale of any SLT and flavoring/spice products in one product or packaged separately that would facilitate easy mixing by the customer. Assam has introduced a similar measure, but it has yet to be implemented. **Methods:** In November 2017, systematic data collection was conducted to capture a breadth of SLT products and individual spice mixtures in semi-urban and rural towns in five states (Assam, Maharashtra, Uttar Pradesh, Rajasthan, and Karnataka). Within each state, five towns were selected for data collection (1 semi-urban and 4 rural). All packs were visually inspected and double coded for product type. **Results:** In total, 240 unique SLT products were purchased. Almost half (n=117, 49%) of SLT products were unable to be identified due to insufficient labeling or markings on the exterior package; the next largest product type was plain chewing tobacco (n=54, 23%). Three gutka packs were also purchased. Out of 121 separate spice packets purchased, 92% (n=111) were identified as pan masala. In Maharashtra, 30 unique SLT products and 11 were purchased alongside pan masala packets. **Conclusion:** Despite SLT control efforts in Maharashtra, deficiencies in enforcement are apparent. SLT products, including pan masala were readily available for sale by the same vendor. Importantly, gutka's constituent parts, plain chewing tobacco and pan masala was available in every state collection occurred. The current state level gutka ban leaves room for plain chewing tobacco/pan masala double packs to be found in the market. Efforts in Maharashtra in closing the double pack loophole fall short. These results suggest that monitoring and compliance of regulation efforts is potentially limiting the public health impact such regulations may have.

FUNDING: Nonprofit grant funding entity

POS1-99

E-CIGARETTE MARKETING EXPOSURES AMONG YOUTH IN CANADA, US, AND ENGLAND: FINDINGS FROM THE INTERNATIONAL TOBACCO CONTROL (ITC) YOUTH SMOKING AND VAPING SURVEY

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BACKGROUND: E-cigarettes have become popular among youth globally, and limiting youth exposure to e-cigarette ads is a key objective of e-cigarette policies. However, it is unclear how youth exposure to e-cigarette ads varies across countries with different e-cigarette regulatory frameworks. This study examined e-cigarette ad exposure among youth in Canada, the US, and England, three countries with varying e-cigarette marketing regulations. **METHODS:** We analyzed data from the 2017 ITC Youth Smoking and Vaping Survey, a self-administered online survey of youth aged 16 to 19 years (Canada n=4,008; England n=3,970; US n=4,086). Participants reported the frequency of e-cigarette advertising exposure in the prior month (range=1-5), channels, and the perceived target audience. Regression models examined between-country differences in the reported measures, adjusting for socio-demographic variables, smoking, and vaping status. **RESULTS:** Compared to US youth, Canadian youth reported less frequent exposures to e-cigarette ads in the past month ($b=-0.26$, $p<.001$), and English youth reported more frequent exposure ($b=0.11$, $p<.001$). Experimental smokers ($b=0.16$; $p<.001$) and experimental vapers ($b=0.11$, $p<.01$) reported more frequent ad exposure

than never-smokers and never-vapers. Stores selling cigarettes were the most frequent channel of ad exposure in all countries (Canada=46%, US=60%, England=60%). No cross-country differences were observed for exposure via websites or social media (Canada=38%, US=41%, England=40%). In England, ad exposure at kiosks or temporary sales locations was more common (42%) than Canada (25%) or the US (27%). In all countries, over 90% of youth perceived that e-cigarette ads target smokers; however, English youth were less likely than US and Canadian youth to perceive that e-cigarette ads target non-smokers ($p<.001$). **CONCLUSION:** The prevalence of youth e-cigarette ad exposure by channel generally followed countries' regulations, except for online ads, for which monitoring and enforcement is challenging. Given such challenges, public education efforts may be needed to promote perceptions that e-cigarettes are for established smokers, not non-smokers.

FUNDING: Federal

POS1-100

A SNAPSHOT OF GLOBAL POLICIES TO REGULATE E-CIGARETTE PACK WARNINGS

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Significance: Pack warnings effectively convey health effects and risks associated with tobacco products. Just as countries require health warning labels (HWLs) for cigarettes and smokeless tobacco, they may also consider HWLs for e-cigarettes. This study examines policies that countries have undertaken to regulate pack warnings for e-cigarettes. **Methods:** National policies regulating e-cigarettes were identified primarily through media monitoring and direct contact with representatives of Ministries of Health or tobacco control experts in approximately 130 countries. Copies of written policies were reviewed and those related to health warning labeling (H WL) were identified. Policy summaries and classifications were verified by in-country experts including Ministry of Health staff. Countries were stratified by World Bank 2018 income levels and WHO regions. **Results:** Of the 83 countries with a national policy on e-cigarettes, 32 had HWL policies; 28 of these were high-income, while 4 were middle-income countries. We found no low-income countries with HWL policies. Almost all were EU countries (n=29), with policies in accordance with the European Commission regulation on classification, labeling and packaging of substances and mixtures (CLP), as well as the European Union Tobacco Products Directive (TPD) 2014, which requires e-liquid and e-cigarette packs to contain a warning about nicotine content, addictiveness and unsuitability for nonsmokers. The TPD also stipulates that text warnings ("This product contains nicotine which is a highly addictive substance. It is not recommended for use by nonsmokers.") are in the official language of member states; occupy 30% of each of the two biggest packaging surfaces; centralized; and occupy the greatest surface reserved for the warning. The TPD prohibits promotional or misleading elements on packs. Non EU countries with a HWL policy include New Zealand, Republic of Korea and the US. **Conclusion:** Most countries adopting pack warning laws for e-cigarettes are high-income and from the European region. European HWL laws were harmonized using the CLP and 2014 EU TPD. Very few low- and middle-income countries have a HWL policy.

FUNDING: Nonprofit grant funding entity



SRNT

POS1-101

KNOWLEDGE, OPINIONS, AND COMPLIANCE RELATED TO THE 100% SMOKE-FREE LAW IN HOSPITALITY VENUES IN KAMPALA UGANDA: A 16-MONTH FOLLOW-UP BY THE KOMPLY PROJECT

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Significance: Uganda's comprehensive 100% smoke-free (SF) law came into effect in May 2016, prohibiting smoking in indoor public places. This study evaluated knowledge, opinions, and compliance related to Uganda's SF law among hospitality venues in Kampala, before and after enforcement of the law. **Methods:** This observational pre-post study included 222 and 212 bars and restaurants at baseline and at follow-up respectively. Compliance data were collected by: (1) a quantitative systematic observation checklist of smoking behavior and signage; (2) interviews with venue owners/staff; and (3) measuring air quality levels of tobacco particulate matter (PM_{2.5}). Data were collected from June-August 2016, and in October 2017. **Results:** Between pre-and post-measures, systematic observations showed an increase in active indoor smoking (18% to 20%). Some smoking indicators improved slightly, such as an increase in 'no-smoking' signage (31% to 37%), and a decrease in the presence of smoking cues like ashtrays (13% to 10%) and cigarette remains (47% to 35%). A large proportion of venues still had designated smoking areas (36% to 32%). More interviewed respondents agreed to having been informed of the smoke-free law (29% to 51%), although their awareness of the penalties for smoking violations (43% to 42%) had not changed. Disconcertingly, negative attitudes towards the smoke-free law increased, where more owners/staff believed that the law is having a negative effect on their business (40% to 51%), discouraging patrons from visiting (26% to 54%), and an unfair restriction to smokers (47% to 68%). PM_{2.5} measures showed that second-hand-smoke was present in 82% of venues, and the levels were hazardous (152.6ug/m³). Overall, there was no significant difference in measured PM_{2.5} concentrations by venue type ($p>0.05$). **Conclusions:** Hospitality-venue compliance with Uganda's comprehensive SF law remained poor 16-months post-implementation. Some measures have worsened over time, including negative attitudes towards the law by venue staff. These growing negative opinions may be a reflection of smoker's attitudes and/or industry interference.

FUNDING: Academic Institution; Nonprofit grant funding entity

POS1-102

PREVALENCE OF DESIGNATED SMOKING AREAS IN RESTAURANTS, LOUNGES, HOTELS IN 8 INDIAN CITIES, AND COMPLIANCE WITH THE NATIONAL LAW

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Significance: In India, smoking is banned in many public places and workplaces including healthcare, educational, government facilities and public transport. The federal Cigarettes and Other Tobacco Products Law (COTPA), permits designated smoking areas (DSAs) in airports, hotels having 30 or more rooms, and restaurants/lounges having seating capacity for 30 or more patrons. The following study sought to understand the prevalence of DSAs in hotels, restaurants, and lounges in 8 cities: Bangalore, Chennai, Guwahati, Jaipur, Kolkata, Lucknow, Mumbai, and New Delhi. **Methods:** The hospitality search websites Zomato (restaurants and lounges), TripAdvisor and MakeMyTrip (hotels) were used to generate a list of hospitality venues in each city. Venues were telephoned by an Indian-based market research firm using a two-step calling protocol; for each step, the firm made up to 10 attempts to reach the venue. In the first step, venue management

was surveyed about room/seating capacity to assess if the establishment would be permitted based on size, to have a DSA. All venues were re-called during step 2 (regardless of their completion of step 1) and asked if they have a "separate indoor smoking area" where a patron could smoke. **Results:** The sample generated from hospitality search websites included 5,373 venues with working phone numbers, roughly proportional to the population in each of the 8 cities. Surveys from step 1 and/or step 2 were completed by 3,461 venues. Across the 8 cities, 20% (n=803) of venues reported that they had a DSA, ranging from 30% in Chennai (n=118) to 17% in Lucknow (n=29). Of the venues that reported having a DSA, 8% (n=61) completed step 1 and reported having fewer than 30 rooms/seats for patrons. **Conclusion:** The findings of this study indicate that about one in five hospitality venues in 8 cities report having a DSA. The study identified 61 venues that report having a DSA despite not meeting the size requirements stipulated by COTPA. Venue management may have been motivated to report the presence of a DSA to entice possible patrons who smoke to visit their establishment. Restricting smoking to DSAs do not provide adequate protection from dangerous tobacco smoke.

FUNDING: Nonprofit grant funding entity

POS1-103

REASONS FOR USING HEATED TOBACCO PRODUCTS AMONG ADULT CURRENT AND FORMER SMOKERS IN JAPAN: FINDING FROM 2018 ITC JAPAN SURVEY

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Significance: Heated tobacco products (HTPs) such as 'IQOS', 'Ploom' and 'glo' were launched in 2014 and became extraordinarily popular in Japan. Major tobacco companies have actively promoted HTPs to Japanese consumers, claiming that they are less harmful, stylish, hi-tech, clean, and socially acceptable. However, little is known about the consumer's perceptions of HTPs and whether they are in line with the marketing claims. This study is one of the first to examine the leading reasons of using HTPs among current and former smokers in Japan.

Methods: Data were drawn from the first wave (2018) of the International Tobacco Control (ITC) Japan Survey. The sample comprised of HTP users who were either current (n=555) or former (n=114) cigarette smokers who were asked about the reasons for their using HTPs. These reasons included less harmful to others, social acceptability, curiosity, enjoyment, stress reduction, to use in smoke-free areas, and to help to either continue or stop smoking cigarettes.

Results: Among current smokers, the leading reasons for using HNB were curiosity (92.3%), less harmful than cigarettes (88.2%), less harmful to others (83.9%), enjoyment (75.2%), and social acceptability (72.6%). 55.4% of HTP users who were also current smokers (dual users) used HTPs to help to quit smoking. However, about the same percentage of HTP users (52.1%) used HTPs so that they could continue smoking. Among former smokers, the leading reasons were less harmful than cigarettes (96.6%), less harmful to others (92.6%), curiosity (91.1%), enjoyment (78.9%), and social acceptability (78.6%).

Conclusion: Our findings demonstrate that the curiosity towards and perceived social and health benefits of HTPs were the leading reasons for their use. The perceived benefits of HTP users closely aligned with the marketing claims. Of concern is the finding of about half of current smokers did not have to stop smoking cigarettes because they were using HTPs.

FUNDING: Federal; State; Other

POS1-104

RESOLVING THE UNCERTAIN LEGAL STATUS OF SYNTHETIC NICOTINE IN THE UNITED STATES

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The Family Smoking Prevention and Tobacco Control Act (FSPTCA), along with a subsequent FDA deeming rule that has survived an early court challenge, have clarified the regulatory status of tobacco-derived liquid nicotine in the United States. However, because the text of the FSPTCA defines FDA tobacco jurisdiction to include "any product made or derived from tobacco," synthetic liquid nicotine that is not derived from tobacco appears to fall outside FDA tobacco jurisdiction. Until the legal status of these products is resolved, makers of Alternative Nicotine Delivery System (ANDS) can potentially substitute synthetic nicotine for tobacco-derived nicotine to avoid FDA



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tobacco regulations. This article will first describe what synthetic nicotine is and how it differs from tobacco-derived nicotine. Then, it will expand on the uncertainties surrounding the legal status of synthetic nicotine, focusing on the legal status of all ANDS prior to passage of the FSPTCA as a logical starting point for assessing the legal status of synthetic nicotine ANDS today. This section will be framed by judicial rulings and opinions from 2010 that made explicit determinations about whether FDA could have applied drug or device provisions of the Federal Food Drug and Cosmetic Act (FDCA) prior to passage of the FSPTCA. Special attention will be given to DC Circuit Court of Appeals opinions from Judge Merrick Garland, who argued that FDA could have applied FDCA drug-device provisions to ANDS prior to FSPTCA passage, and Judges Brett Kavanaugh and Stephen F. Williams, who argued that FDCA drug-device provisions could not have been applied to ANDS. Other legal and regulatory decisions dating back several decades will be considered as well. The last section will focus on ways forward. This will begin with an analysis of how the FDA, the Courts, and Congress are likely to act. After discussing the likely approaches and actions that can be anticipated from each branch of government, the concluding discussion will focus on the public health implications of intermediate or final outcomes where synthetic nicotine continues to be regulated differently from tobacco-derived nicotine.

FUNDING: Unfunded

POS1-105

THE IMPACT OF CARTOON BASED MARKETING STRATEGIES ON E-CIGARETTE USE AND EXPECTATIONS OF USE

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SIGNIFICANCE: Recent research indicates that e-cigarette manufacturers are using cartoons to market products, but there are limited data on whether exposure to this marketing strategy increases risk of e-cigarette use among young adults. We examined cross-sectional associations between exposure to e-liquid packaging with cartoons and current e-cigarette use, susceptibility to use, and expectations of benefits and risks of use. **METHODS:** Young U.S. adults (N=778; Mean age = 23.5 years; 62% women) completed a survey via Amazon's Mechanical Turk. They first completed questionnaires assessing e-cigarette use, susceptibility to use (in never users), and expectations about use, including perceived benefits and risks. Then they were presented with 22 e-liquid packaging images (with and without cartoons in random order), and were asked to endorse whether or not they had seen the product. Cartoon exposure was calculated as a proportion: number of endorsed cartoon images divided by total number of endorsed images. We evaluated whether level of cartoon exposure was associated with each e-cigarette outcome, controlling for age and gender. **RESULTS:** Overall, 467 participants (60% of the sample) reported exposure to at least one product image; approximately 35% of exposure was cartoon-based. Higher cartoon exposure was associated with current e-cigarette use (compared to never use: OR[95%CI] = 2.06[1.01, 4.21]). Among never users, higher cartoon exposure was associated with susceptibility to use (OR [95%CI] = 4.10[1.05, 16.10]), and with increased expectations of negative affect reduction and taste enjoyment (betas=0.14-0.15; ps<.05). There were no other associations between cartoon exposure and other measures of perceived benefit or risk. **CONCLUSIONS:** Cartoon-based marketing exposure was associated with increased risk of e-cigarette use and susceptibility to use, which is consistent with previous research on exposure to cartoon-based marketing for combustible cigarettes. These data suggest that restrictions on the use of cartoon-based marketing strategies should be considered, as these practices may be an important contributor to increased use of e-cigarettes among young adults. Supported by NCI FDA TCORS P50-CA180905.

FUNDING: Federal

POS1-106

YOUTH ACTIVITY SPACES, EXPOSURE TO TOBACCO OUTLETS, AND PERCEPTIONS OF EXPOSURE TO TOBACCO RETAIL MARKETING

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We investigated youth daily activity spaces, exposure to tobacco outlets, and perceptions of exposure to tobacco retail marketing, using Geographical Ecological Momentary Assessment (GEMA). Data were collected from 101 participants (16-20 years old) in 8 California cities for 14 days (1,483 assessments). Using GPS-enabled smartphones with a survey application, youth responded to brief daily surveys and location coordinates (latitude and longitude) were obtained at one-minute intervals. Tobacco outlet addresses and GPS location coordinates were geocoded. Activity spaces were constructed by joining sequential location points. We measured size of activity spaces by calculating the number of km participants traveled each day. Exposure measures included the number of tobacco outlets within 50m or 100m of activity space polylines and the amount of time participants were within 50m or 100m of tobacco outlets each day. Participants reported whether they saw any ads for cigarettes, e-cigarettes or any other tobacco or nicotine products inside or outside of a store or on a billboard in or near their (1) neighborhood, (2) school, (3) workplace, and (4) anywhere else daily. They also reported how much time they traveled from place to place by (1) car, (2) public transportation, (3) bicycle, skateboard or skates, and (4) walking. In multilevel mixed effects regression models controlling for demographics, larger activity spaces were associated with greater exposure to outlets within 50m and 100m of participants' polylines ($b=0.10$, $p<0.005$; $b=0.12$, $p<0.005$) and with increased time spent within 50m or 100m of tobacco outlets each day ($b=0.19$, $p<0.005$; $b=0.35$, $p<0.005$). Larger activity spaces also were associated with greater perceived exposure to tobacco retail marketing ($b=0.003$, $p<0.05$), and the proportion of time participants walked within their activity spaces moderated this relationship such that perceived retail marketing was greater among youth who walked more ($b=0.01$, $p<0.05$). Results suggest that larger activity spaces may create greater cumulative exposure to tobacco outlets and increase perceived exposure to tobacco, especially for youths who travel by walking.

FUNDING: Federal; State

POS1-107

NICOTINE ARMS RACE AND JUUL INITIATED PUBLIC HEALTH CRISIS

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Objective: To evaluate the degree to which JUUL, with its 72% US market share and 5.9% nicotine, has spurred a nicotine arms race among electronic nicotine delivery systems. **Methods:** A comprehensive online search was undertaken to identify recently introduced devices which both emulate JUUL in their design (JUUL-a-likes) and offer high nicotine ($\geq 5\%$) e-liquid. Google search terms included: nicotine salts, high nicotine, nicotine e-liquid, nicotine e-juice, nicotine pod, vapor pods, and JUUL compatible pods. A large number of online vapor stores and brand websites were reviewed. A JUUL-a-like was defined as a small pod based system of similar size to JUUL. **Results:** Fourteen brands market JUUL compatible pods, some with even higher nicotine concentrations than JUUL. Twelve of these offer closed pods pre-filled with e-liquids and 3 were refillable. Ten of the 12 closed pod systems undersell JUUL's pod price of \$4 by as much as \$1.50. JUUL's most popular flavor is mango. Seeking to emulate JUUL's success, all but one vendor of JUUL compatible pods offer mango flavor. JUUL knock off devices are proliferating rapidly with 39 identified of which 19 were pre-filled, enclosed pod systems, 3 were disposables, and 17 were re-fillable pod systems. Most brands offer high capacity pods than JUUL (1ml vs 0.7ml). More than 70 e-liquid brands sell high nicotine products ($\geq 5\%$) in bulk ($\geq 30cc$) equivalent to >40 cigarette packs at a cost of @40¢ each. All of these products come in multiple youth appealing sweet and fruity flavors. **Conclusions:** JUUL has triggered a rush among vapor purveyors to market e-juice in unprecedentedly high nicotine concentrations and at substantially lower cost. This is a crucial factor in youth adoption as adolescents are notably price sensitive due to their limited discretionary income. This nicotine arms race threatens to addict a generation of American youth and, when sold in large quantity bottles, represents a serious childhood poisoning risk. **Policy Implications:** The potent addictiveness and potential toxicity of these products makes it imperative that regulators act swiftly to curtail this health risk to the American public.

FUNDING: Unfunded



SRNT

POS1-108

PRESENCE OF WEDDING CIGARETTE PACKS IN CHINA: A CULTURAL MARKETING APPEAL

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Significance: China remains the largest tobacco manufacturer and consumer in the world, responsible for producing forty percent of the world's cigarettes and home to nearly one third of the global population of smokers. Exchanging cigarettes is a common practice in traditional Chinese culture, often seen during special events including festivals and weddings. We examined Chinese cigarette packs for wedding terminology and imagery.

Methods: In February 2017, cigarette packs were collected from Beijing, Guangzhou, Shanghai, Kunming, and Chengdu using a systematic protocol designed to capture unique packs. Cigarette packs were coded by two independent coders for text and imagery of traditional Chinese wedding symbols as identified by Chinese researchers. The coded terms in reference to weddings included "double happiness," "dragon and phoenix," "wedding," "marriage," and other traditional Chinese wishes for a happy marriage. Imagery of the double happiness symbol, the dragon and phoenix, and other cultural and traditional images including Mandarin ducks and brides and grooms were also coded. A descriptive analysis was conducted using Stata14.

Results: Of the 739 unique cigarette packs, 68 (9.2%) had either lexical or imagery appeals for weddings. 56 (7.6%) packs contained both lexical and imagery appeals for "double happiness." 12 (1.6%) packs referenced the phrase "dragon and phoenix" and 12 (1.6%) packs referenced other Chinese wedding terminology. With some packs containing multiple terms, a total of 66 (8.9%) packs contained any mention of lexical wedding appeals. 15 (2.0%) packs had dragon and phoenix imagery and 6 (0.8%) packs displayed other wedding imagery. Some packs contained multiple images -- 67 (9.1%) displayed any imagery for wedding appeals.

Conclusion: China's tobacco industry takes full advantage of the gifting and sharing culture, marketing specific packs for events such as weddings. With only a 35% text health warning label, manufacturers have much pack real estate to make them attractive for gifting. Requiring graphic health warning images may make Chinese cigarette packs less desirable for gifting.

FUNDING: Nonprofit grant funding entity

POS1-109

GENDER DIFFERENCES ON REASONS FOR STARTING SMOKING, PERCEPTIONS AND BEHAVIOUR AMONG AFRICAN SMOKERS: FINDINGS FROM THE ITC ZAMBIA AND KENYA SURVEYS

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Significance: Gender disparities in tobacco use is an issue in both high income countries (HICs) and low- and middle-income countries (LMICs). But few studies have assessed gender disparities in the African Region. This paper presents results from two national studies of smokers in Kenya and Zambia to assess gender differences in reasons for starting smoking, perceptions and behavior about smoking. **Methods:** Data came from the International Tobacco Control (ITC) Kenya Wave 1 Survey (2012) and ITC Zambia Wave 2 (2014) Survey—longitudinal cohort surveys of nationally representative samples of adult smokers in Kenya (N=1,078) and Zambia (n=1,043). Analyses compared male and female smokers' reasons for starting smoking, perceptions and behaviour about smoking. Analyses adjusted for age, smoking frequency, and time-in-sample. **Results:** The most frequently mentioned reasons reported for starting to smoke in both countries were: having friends/family who smoke (KE=90%; ZM=91%), curiosity (KE=66%; ZM=59%), reducing stress (KE=47%; ZM=32%), pleasure (KE=46%; ZM=51%), and taste (KE=40%; ZM=42%). There were no gender differences in Kenya, and only one gender difference in Zambia: female smokers were more likely to report having smoking friends/family as a reason (97% vs 91%; p=0.01). There were no gender differences in either country on awareness that smoking causes stroke or heart disease, quit intentions, quit attempts, smoking dependence, and overall opinion about smoking. In Zambia, female smokers were more likely to have future health concerns (80% vs 65%; p=0.04), and were more likely to correctly believe that smoking increased their chance of lung cancer (94% vs 88%; p=0.03). Kenyan (73%) and Zambian (89%) smokers

strongly supported a total ban on tobacco products; there was no gender difference in either country. **Conclusion:** Across 24 measures, there were no gender differences for Kenyan smokers. However, there were a few gender differences for Zambian smokers in reasons for starting smoking and future health concerns. Additional research is required to uncover possible reasons for the gender differences in Zambia to help inform prevention and cessation programs.

FUNDING: Federal; State

POS1-110

YOUTH DAILY EXPOSURE TO TOBACCO OUTLETS WITHIN THEIR ACTIVITY SPACES AND CIGARETTE SMOKING BEHAVIORS

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We compared youth exposure to tobacco outlets within their activity spaces with their exposure to tobacco outlets around homes and investigated associations with daily cigarette smoking and number of cigarettes smoked. Using Geographical Ecological Momentary Assessment (GEMA), data were collected from youth (N=101; 16-20 years old) in 8 California cities for 14 days (1,483 assessments). Using GPS-enabled smartphones with a survey application, youth responded to brief daily surveys and location coordinates (latitude and longitude) were obtained at one-minute intervals. Tobacco outlet addresses and GPS location coordinates were geocoded. Activity spaces were constructed by joining sequential location coordinates. Exposure measures included the number of tobacco outlets within 100m of activity space polylines and within 400m of home. Each day, youth reported whether they smoked at least one cigarette (yes/no) and the number of cigarettes they smoked. We used multilevel mixed effects regression models to control for clustering of observations within participants over time. On average, there were 3.9 tobacco outlets within 100m of participants' activity space polylines, compared with an average of 0.4 outlets within 400m of their homes. The correlation between these exposure measures was low ($r=0.10$). Controlling for demographics (age, sex, race, ethnicity and socioeconomic status), increased number of tobacco outlets within 400m of homes was associated with increased likelihood of cigarette smoking ($OR=9.3$, $p<0.05$) and the number of cigarettes smoked ($b=0.4$, $p<0.05$). Although no association was found between daily exposure to tobacco outlets within 100m of activity space polylines and the likelihood of smoking, greater numbers of outlets within 100m of participants' activity space polylines was associated with increased numbers of cigarettes smoked on a given day ($b=0.02$, $p<0.005$). A likelihood ratio test showed that including an activity space exposure measure in our model resulted in a statistically significant improvement in model fit. Results suggest that daily exposure to tobacco outlets within activity spaces increase youths' risk for heavier smoking.

FUNDING: Federal; State

POS1-111

VAPE SHOP MARKETING AND RETAIL PRACTICES IN SIX METROPOLITAN AREAS IN THE UNITED STATES

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Significance: Vape shops have proliferated in the past 5 years. This study sought to establish a baseline for marketing outcomes prior to specific e-cigarette regulations that may impact vape shops. **Methods:** Using a newly developed surveillance tool, two trained data collectors conducted retail marketing surveillance at randomly selected vape shops in 6 metropolitan areas (Atlanta, Boston, Minneapolis, Oklahoma City, San Diego, Seattle; n=180) in June-July 2018. Inter-rater reliability and descriptive statistics are reported. **Results:** The tool demonstrated good inter-rater reliability across more stable, easily observable dimensions (e.g., minimum age signage, existence of ads;



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Kappas=0.70 to 0.95), with lower reliability for less visible, more subjective measures (e.g., health claims or warnings on ads, cartoon imagery on ads; Kappas=.36 to .50). Moderate to high Kappa items were examined. Most shops had exterior signs indicating minimum age to purchase (66%) or to enter (75%); however, only 32% verified age upon entry. All sold open-system devices, whereas only 60% of shops sold closed systems, 30% herbal/dry chamber vaporizers, and 20% combined wet/dry vaporizers. A majority of shops (64%) marketed their own e-liquid brand, and three-quarters sold nicotine salt e-liquids. Cannabidiol (CBD) e-liquids were available in 40% of shops; 18% sold other CBD products. Sale of other tobacco products, pipes, or glassware was rare (2 to 12%). Exterior ads for devices and e-liquids were uncommon (18.2% and 20.3%, respectively), while many shops displayed interior ads for devices (40%) and e-liquids (80%). Pricing for devices and e-liquids varied greatly. The two most common price promotions were for e-liquids (40%) or involved membership/loyalty programs (32%). Free samples were provided by 15%, while 65% provided other ways to sample (e.g., at low cost, through membership). **Conclusions:** Results indicate a wide range of product offerings, pricing strategies, and promotional strategies, with some gaps in adherence to regulations (e.g., age verification, free sampling). Continued surveillance and increased enforcement efforts will be needed as FDA regulations are implemented.

FUNDING: Federal

POS1-112

RJ REYNOLDS' CAMEL SNUS MODIFIED RISK TOBACCO PRODUCT APPLICATIONS FAIL TO DEMONSTRATE ADEQUATE COMMUNICATION OF RISK TO CONSUMERS AND THE BENEFIT TO PUBLIC HEALTH

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Significance: RJ Reynolds (RJR) submitted a Modified Risk Tobacco Product (M RTP) application to FDA, seeking authorization to market six Camel snus products with modified risk claims. **Methods:** We examined RJR's M RTP application studies that were submitted to the FDA and made publicly available. **Results:** RJR's studies included "Consumer Comprehension and Persuasion" (CCP) and "Likelihood of Use" (LU) studies, a literature review, and a population health model among other materials. CCP studies did not use randomized experimental design and, therefore, did not demonstrate how the advertisement materials affected consumer comprehension. LU studies selectively asked some questions of smokers with and without quitting intentions in a way that obfuscates the effects of these advertisements on different groups. RJR presented an incomplete literature to support their claim that consumers overestimate risks of smokeless tobacco compared to cigarettes and ignored relevant papers that contradict their position. The Executive Summary claimed that advertisements did not increase interest among smokers who are likely to quit, but the actual studies reported that advertisements increased interest in both smokers who are and are not likely to quit. RJR's population health model only considered mortality and ignored morbidity, underestimated likelihood that Camel Snus will delay smoking cessation, did not consider additive effect of dual- and poly-use, omitted the impact on non-users, especially youth and young adults, and used problematic data for validation. **Conclusion:** RJR's M RTP application did not demonstrate that its marketing would accurately impact consumer understanding. Modified risk claims are likely to increase Camel Snus uptake among tobacco non-users, especially youth and adolescents, a point RJR did not address in its M RTP application. The flavored Camel Snus products are even more likely to attract youth and adolescents than unflavored products. RJR's population health model is biased in favor of finding benefit, so FDA should not rely on its results. RJR's M RTP application did not support FDA allowing Camel snus to be marketed as a reduced risk product.

FUNDING: Federal

POS1-113

DO BIRDS OF THE SAME FEATHER FLOCK TOGETHER? SPATIAL INDICES TO ASSESS PATTERNS OF TOBACCO & MARIJUANA CONCENTRATION IN HIGH RISK AREAS

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Tobacco density reduction policies are aimed at reducing the concentration of tobacco retailers in low income and racially minority neighborhood. Simultaneously, legalization of recreational marijuana poses a challenge to the local tobacco control policies as marijuana dispensaries may also target the same population that has been targeted by tobacco industry. Current policies aimed at regulating the density of marijuana outlets have stipulated minimum distance from youth sensitive areas and from existing marijuana outlets. However, they have not taken into consideration the concentration of marijuana outlets in relation to proximity and density of tobacco outlets. We examine co-location of tobacco and marijuana retailers in San Francisco and Alameda county and factors associated with co-location in these two countries. We use measures of spatial concentration, dissimilarity index, spatial entropy index to assess patterns of concentration of tobacco and marijuana outlets based on race, income, and land use pattern. Our approach has practical implications for guiding marijuana licensing policy for local governments and preventing exposure from tobacco and marijuana in vulnerable communities.

FUNDING: Academic Institution

POS1-114

ADULTS' ATTITUDES TOWARD PROHIBITING THE SALE OF MENTHOL CIGARETTES, UNITED STATES, 2018

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Significance: Characterizing flavors in cigarettes, except for menthol, were prohibited in the US in 2009. Menthol's cooling effects can mask the harshness of cigarette smoke and suppress cough, thus easing smoking initiation and impeding quit attempts. Historically, marketing and promotion of menthol cigarettes have targeted African Americans, youth, and women. As of August 2018, at least 12 US communities have restricted or prohibited the sale of menthol tobacco products. This study assessed adults' attitudes toward prohibiting the sale of menthol cigarettes in the US. **Methods:** Respondents (n=4,088) to the 2018 *Summer Styles*, an Internet survey of US adults aged ≥18 years, were asked, "Do you favor or oppose prohibiting the sale of menthol (mint) cigarettes?" Weighted prevalence estimates of favorability (strongly favor, somewhat favor, somewhat oppose, strongly oppose) were assessed overall and by sex, age, race/ethnicity, education, cigarette smoking status, non-cigarette tobacco product use, US region, and annual household income. Adjusted odds ratios (OR) of favorability (strongly or somewhat favor) were calculated using logistic regression. **Results:** Overall, 11.3% strongly favored, 18.2% somewhat favored, 38.5% somewhat opposed, and 32.0% strongly opposed prohibiting menthol cigarettes sales. By cigarette smoking status, 27.1% of never smokers, 30.2% of former smokers, and 40.7% of current smokers favored such restrictions. Adjusted odds of favorability for prohibiting menthol cigarette sales was higher for current cigarette smokers (OR=1.79, 95% CI: 1.17-2.73) compared to never smokers. Favorability did not vary by other assessed covariates. **Conclusions:** More than one-quarter of US adults favored prohibiting the sale of menthol cigarettes, with greater favorability observed among current cigarette smokers than former and never smokers. Menthol sales restrictions are a relatively new policy strategy, implemented by only a few localities at the time of this data collection. These results can provide a baseline for assessing public attitudes toward prohibiting menthol cigarette sales as such policies are implemented in the future.

FUNDING: Federal

POS1-115

PATTERNS OF ENACTMENT OF STATE TOBACCO CONTROL LEGISLATION, 2010-2015

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Introduction: Although states enacted many evidence-based tobacco control policies (e.g., smoke-free air and taxes) over the past decade, recent progress has stalled. Whether this reflects a shifting of attention to other tobacco control policy initiatives is unknown. To understand which tobacco control topics and products are gaining traction in state legislatures, we assessed all tobacco control bills introduced into state legislatures between 2010-2015. **Methods:** Using LexisNexis State Net, we identified all tobacco control bills introduced between 2010-2015 in all 50 U.S. states, excluding resolution and budget bills. Coders assessed tobacco control topics and tobacco product types of each bill and also coded whether the bill was enacted. Multiple tobacco control topic and product regulations were coded in each bill. We then modeled associations of tobacco



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control topic or tobacco product type with bill enactment. **Results:** A total of 2801 state bills were introduced between 2010-2015, 17.4% of which were enacted. Clean air bills were most prevalent among those introduced (n=1188), followed by taxing/pricing policies (n=582). However, both had a significantly lower odds of enactment (OR=0.52 and 0.51, respectively). In contrast, only 147 bills regulating tobacco product manufacturing were introduced, but these bills had the highest odds of enactment (OR=3.59). Other topics with significantly higher odds of enactment were tax evasion (OR=2.93), product availability/placement (OR=1.66), licensing (OR=1.62), and youth access (OR=1.49). Of introduced bills that specified product type, cigarettes were most common (n=1188) followed by cigars (n=571), loose/pipe (n=456), and e-cigarettes (n=363). However, enactment did not significantly differ by product type. **Conclusion:** Despite introduction of numerous bills addressing traditional evidence-based tobacco control strategies, these strategies were less likely to be enacted than those regulating tobacco in other ways. Research on whether political and state factors also influence enactment is needed to better understand the state tobacco control policy arena.

FUNDING: State; Academic Institution

POS1-116

U.S. ADULTS' OPINIONS ABOUT, RISK PERCEPTIONS OF, AND EXPOSURE TO SECONDHAND MARIJUANA SMOKE IN PUBLIC PLACES, 2018

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Significance: As of 2018, non-medical use of marijuana (MJ) is legal in nine US states and the District of Columbia. Policies legalizing non-medical MJ have included rules and regulations about where it can be consumed. To date, MJ smoking is generally prohibited by states in public indoor and outdoor spaces, although some states have considered allowing MJ use in public areas. This study assessed attitudes about public use of MJ, including perceptions of harm from MJ secondhand smoke (SHS) and exposure to MJ SHS among US adults. **Methods:** Data came from Summer Styles (n=4,088), an Internet panel of US adults aged ≥18 years, fielded in June-July, 2018. Respondents were asked about current (past-30 day) tobacco product use, current MJ use, opinions about allowing MJ smoking in indoor public places, perceptions of harm from MJ SHS, and past-7 day exposure to MJ SHS in public indoor or outdoor areas. Weighted prevalence estimates were computed and correlates were assessed using logistic regression. **Results:** Overall, 7.3% of U.S. adults strongly favored allowing indoor MJ smoking in public places, 11.7% somewhat favored it, 21.0% somewhat opposed it, and 60.0% strongly opposed it. Additionally, 12.3% felt exposure to MJ SHS was not at all harmful, 19.7% a little bit harmful, 22.4% harmful, 30.0% very harmful, and 15.6% did not know. Correlates of favoring indoor use of MJ in public spaces included being male; younger in age; non-Hispanic black; of lower educational attainment; a current MJ user; a current tobacco product user; and perceiving low harm from MJ SHS. Overall, 25.7% of adults reported past 7-day MJ SHS exposure in indoor or outdoor public areas; younger adults, non-whites, males, and current MJ or tobacco users were more likely to be exposed. **Conclusion:** About 1 in 4 US adults report recent MJ SHS exposure, while a majority believe MJ SHS is harmful and 4 in 5 oppose public MJ use. Policies legalizing adult MJ use present an emerging risk to comprehensive state and local smoke-free policies. Understanding public attitudes regarding public MJ use and MJ SHS harms is important to inform public health policy and practice.

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POS1-117

THE MARKET FOR BIDIS AND SMOKELESS TOBACCO IN INDIA: EVIDENCE FROM SEMI-URBAN AND RURAL TOWNS IN FIVE STATES

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Significance: Bidis and smokeless tobacco (SLT) account for 81% of tobacco consumption in India. Almost 200 million Indians use SLT products and over 70 million use bidis. The products are particularly popular outside of urban areas and among poorer, less educated consumers. This study examines the brand variability, price, and proportion

of bidi and SLT packs without an Indian health warning label (HWL) in semi-urban and rural towns. **Methods:** The Tobacco Pack Surveillance System (TPackSS) systematically collects unique tobacco packs sold in low- and middle-income countries with high tobacco use. From October 26 to November 23, 2017, bidis and SLT products were collected in five states (Maharashtra, Uttar Pradesh, Assam, Rajasthan, and Karnataka). These states were selected based on geographic diversity and prevalence of bidi and SLT users. Within each state, five towns were selected across population tiers 3-5, one semi-urban and four rural. **Results:** Across the five states we collected 71 state-unique bidi and 240 state-unique SLT packages. Initial estimates of market segmentation show bidis as the more segmented market. There were over 55 brand names found for 71 bidi products. For SLT products, there were over 130 brand names found for 240 products. The median price for a pack of bidis was 12 rupees (₹) with a range from ₹5 to ₹25. The median price for SLT products was ₹5 with a range from ₹1 to ₹300. For perspective, ₹65 was worth about 1 USD when data collection started. All bidi packs had an Indian HWL, and 4 SLT packs (2%) had no HWL or a foreign HWL. **Conclusions:** No bidis and very few SLT products were found without an Indian HWL (regardless of it being current or compliant). This may be indicative of localized production and distribution of these products in India. The observed brand variability provides the appearance of smaller producers and more product diversity within bidis and SLT products. Compared to cigarettes collected in the same areas (about 10% without an Indian HWL, 29 brands for 71 packs, median price of ₹95), the bidis and SLT products were more likely to have an Indian HWL, had more brand variability, and were more affordable products.

FUNDING: Nonprofit grant funding entity

POS1-118

ADULTS' AWARENESS OF NICOTINE E-LIQUID HANDLING PRACTICES IN HOMES WITH YOUNG CHILDREN

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Significance: In the United States (US), cases of childhood nicotine e-liquid (NEL) exposures have risen sharply in recent years. This study sought to: document adults' knowledge of NEL handling practices in homes where electronic vapor products (EVPs) are used; examine whether reported handling practices differ based on demographic characteristics and EVP-use status; and examine associations between harm perceptions and NEL handling practices. **Methods:** US adults (≥ 18 years, $n = 433$) living in EVP-using homes with a child (≤ 6 years) completed online surveys administered on Amazon's MTurk platform in April 2018. Bivariate frequencies (by EVP-use status) and multinomial logistic regression analyses were used to examine relationships between demographic characteristics, EVP-use status, NEL-related harm to children perceptions, and NEL-related handling practices in the home. **Results:** A minority of EVP-users (11.7%, 95% CL: 7.6-15.8) and non-users (19.6%, 95% CL: 13.6-25.7) perceived NEL exposures as being *very dangerous* to children in the bivariate analysis. In the multinomial logistic regression model, perceiving NEL exposures as *very dangerous* (versus *minimally or not dangerous at all*) to children (≤ 6 years) was associated with significantly higher odds of reporting *always* using child-proof caps on NEL containers (aOR: 3.7, 95% CL: 1.1-12.0). Also, non-users (versus EVP-users) had significantly higher odds of responding '*I don't know*' regarding NEL-related practices, including: using child-proof caps (aOR: 3.2, 95% CL: 1.3-7.7), replacing bottle cap with pouring tip (aOR: 10.9, 95% CL: 3.8-30.9), and mixing NEL in their homes (aOR: 12.1, 95% CL: 3.5-42.2). **Conclusion:** While perceptions that NEL exposures are *very dangerous* to children were associated with *always* using child-proof caps, only a minority of the sample endorsed having such perceptions. EVP non-users have greater odds of responding they *don't know* how NEL are being handled in the home. Public Health educational and policy interventions to improve adults' knowledge of nicotine's risks to children may increase NEL safe handling practices such as *always* use using child-proof caps on NEL containers.

FUNDING: Federal



POS1-119

YOUTH KNOWLEDGE OF MINIMUM LEGAL AGE TO PURCHASE TOBACCO PRODUCTS AND ITS ASSOCIATION WITH SUSCEPTIBILITY TO TOBACCO USE

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Background: Raising the minimum legal age (MLA) of tobacco sales from 18 to 21 has recently been advocated as a method to reduce tobacco use prevalence but empirical evidence on the impact of this change is lacking. As of June 2018, 19 cities or localities in Kansas adopted Tobacco 21 (T21), representing 777,246 Kansas residents. This study assessed youth knowledge of the MLA to purchase tobacco products across T21 and Non-T21 regions in Kansas as an early indicator of T21 impact and potential indicator of susceptibility to tobacco use. **Study Design:** Data were collected using an annual state-wide survey of middle and high school students in Kansas. Thirty-four pairs of schools (20 pairs of middle schools and 14 pairs of high schools) in T21 and Non-T21 areas were matched on demographics and baseline smoking prevalence. **Results:** Of 16,948 students responding to the question about "What is the legal age to purchase tobacco products in your city?", fewer students responded correctly about the MLA in T21 regions than in control regions (37.0% vs. 48.8 responded correctly, 28.1% vs. 22.4% responded incorrectly; 35.0% vs. 28.8% responded "I don't know"). This pattern was consistent across socio-demographic factors (i.e. and tobacco use status. For instance, only 45% of students aged 15+ responded "21 years" at T21 regions as compared to 70% of their counterparts responding "18 years" at non-T21 regions. 52% of cigarette users and 49% of e-cigarette users responded "21 years" about MLA at T21 regions as compared to 77% and 79% of their counterparts responding "18 years" at non-T21 regions. In multivariate analysis, among non-current tobacco users in T21 regions, students who responded "<21 years" as the MLA to purchase tobacco products had higher odds of reporting susceptibility to tobacco use in next 12 months (AOR=1.6, 95% CI [1.4 - 1.8]) than those who correctly responded "21 years". **Conclusions:** There was a large gap in youth knowledge about MLA to purchase tobacco products, and misperception of the MLA was associated with elevated risk of susceptibility to use tobacco in the future. Education on the MLA and harms of tobacco products among youth is needed.

FUNDING: Nonprofit grant funding entity

POS1-120

EXPLORING E-LIQUID FLAVOR PREFERENCES, ATTITUDE, AND RISK PERCEPTION: DIFFERENCES BETWEEN E-CIGARETTE USERS, DUAL USERS, SMOKERS, AND NON-USERS

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Background The availability of many different e-liquid flavors increases attractiveness and may stimulate e-cigarette use among smokers, but also among non-users. Different age and user groups may be attracted to different types of flavors. This study aims to investigate flavor preferences among specific user groups and how this may influence attitude and risk perception. **Methods** A cross-sectional survey (n=731) among 61 exclusive e-cigarette users, 122 dual users, 407 non-users, and 141 cigarette smokers was conducted in the Netherlands. Demographics, smoking and vaping behavior, attitude, risk perception, hypothetical flavor preference among non-users and smokers, and the first and current e-liquid flavors used by e-cigarette users and dual users were assessed. Adolescents (13-17 years) and adults (≥18 years) were distinguished. We classified flavors into 13 categories based on literature. Differences in attitude and risk perception among user groups were assessed using a Mann-Whitney U test. **Results** Of the 407 non-users and 138 smokers, respectively 53% and 11% were not interested in trying any e-liquid flavor. Most smokers preferred tobacco flavor, while most non-users preferred menthol and sweet flavors. Dual users and e-cigarette users both used tobacco or menthol flavored e-liquids for their first and current e-liquid flavors, but e-cigarette users shifted towards using more fruit and sweet flavors. Non-users had a negative attitude towards e-cigarettes and perceived the most risks with regard to e-cigarettes. Attitude and risk perception differed significantly between particular flavors preferred. **Discussion** Flavor preferences differed between smokers and non-users, and between first and current e-liquid flavor use by dual users and e-cigarette users. We found significant differences in positive and negative attitudes and the perception

of risks towards e-cigarettes when comparing flavor preferences. These results suggest the potential for developing targeted tobacco control measures to prevent e-cigarette initiation among non-users and prevent dual use among smokers.

FUNDING: Nonprofit grant funding entity

POS1-121

SOCIAL NORMS TOWARDS SMOKING AND E-CIGARETTES IN SEVEN EUROPEAN COUNTRIES: FINDINGS FROM THE 2016 INTERNATIONAL TOBACCO CONTROL (ITC) EUROPE SURVEYS

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Significance: Social norms towards smoking differ across countries with varying policies and prevalence, yet little is known about social norms towards e-cigarettes (EC). We explore social norms towards smoking and EC in seven European countries. Of these, England scored highest on the 2016 Europe Tobacco Control Scale and has the lowest smoking prevalence; Spain has the lowest EC prevalence. **Methods:** Respondents were adult (18+) smokers from Wave 1 (2016) of the ITC 6E (Germany, Greece, Hungary, Poland, Romania, Spain, n=4261) and 4CV (England, n=3536) Surveys. Prevalence of reporting (a) over half of friends smoke, (b) public approve of smoking, (c) over half of friends use EC, and (d) public approve of EC were estimated. Logistic regressions assessed associations between country and (a)-(d) adjusted for age, sex, income, education, smoking status, heaviness of smoking, and EC status. Analyses were pre-registered online: osf.io/c83pe. **Results:** Overall, 50% reported over half of friends smoke, 13% perceived public approval of smoking, 24% reported over half of friends use EC and 32% perceived public approval of EC. (a) Friend smoking was substantially lower in England (19%) compared with all six countries (65% to 84%, OR=6.9 to 24.0, all p<.001). (b) Public approval of smoking was lower in England (5%) compared with all six countries (6% to 37%, OR=1.7 to 15.8, all p<.02). (c) Friend EC was lower in Spain (6%) compared with all six countries (14% to 36%, OR=2.0 to 8.5, all p<.001). (c) Public approval of EC was lower in Spain (24%) compared with Germany, Poland, Hungary and Greece (32% to 40%, OR=1.5 to 2.0, all p<.01), but not Romania or England (26% and 32%, p>.05). Overall, favourable smoking social norms were highest in Hungary and Romania; favourable EC social norms were highest in Poland and Greece. **Conclusion:** More respondents reported having smoking friends than friends who use EC, yet more perceived public approval of EC than smoking. Consistent with the 2016 Europe Tobacco Control Scale and smoking prevalence, England had the least favourable smoking norms. Consistent with EC prevalence, Spain had the least favourable EC norms overall.

FUNDING: Federal; Nonprofit grant funding entity

POS1-122

PROFILING RACIAL AND ETHNIC DISPARITIES IN YOUTH EXPOSURE TO TOBACCO ADVERTISING

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Background: Tobacco advertisement (ad) exposure increases the risk of cigarette smoking among youth, yet literature on current tobacco ads and association with youth substance use and demographics is limited. The purpose of this study is to profile disparities among youth in exposure to tobacco advertising through various channels. **Methods:** Adolescents (n=1360) aged 13-18 who were current cigarette smokers (n=674) or nonsmokers susceptible to tobacco use (n=686) completed an in-person survey during September 2016-April 2018. An overall ad exposure index was created summarizing the frequency of tobacco ad recall in print, outdoors, and online in the past 30 days. Logistic regression tested the association between the overall ad exposure index and smoking cigarettes, while adjusting for demographics and past 30 day use



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of e-cigarettes, alcohol, and cannabis. Subsequent analyses examined the sociodemographic determinants of ad exposure. **Results:** The majority of youth were African American (AA; 60.4%), female (51.8%), and aged 13-17 (61.1%). A one unit increase in overall ad exposure was associated with 6% increased odds of current cigarette smoking ($p=0.02$). Covariates associated with increased odds of cigarette smoking included past 30 day use of e-cigarettes (Adjusted Odds Ratio [AOR]=3.67), alcohol (AOR=2.39), and cannabis (AOR=4.24) and being 18 years old (AOR=1.69; $p<0.01$ each). Higher overall ad exposure was associated with being 13-14 years old, identifying as AA or Hispanic, increased sensation seeking, feeling sad in the past year, current cigarette smoking, and past month alcohol or cannabis use ($p<0.05$ each). Racial/ethnic and age disparities in overall tobacco ad exposure were driven by differences in exposure to outdoor ads and online ads but not print ads. **Conclusions:** Youth with high tobacco ad exposure are at increased risk for cigarette smoking, with youth who are younger and identify as a racial/ethnic minority reporting the highest levels of exposure relative to other groups. Future work should identify whether current tobacco marketing regulations are insufficient to prevent and control tobacco use among these populations.

FUNDING: Federal; Nonprofit grant funding entity

POS1-123

THE POPULARITY OF ELECTRONIC CIGARETTE BRANDS AMONG CALIFORNIA YOUTH

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Significance. E-cigarette use among students is a major concern to the public health community. Using national data as a reference, this study focuses on changes in popularity of e-cigarette brands among California middle & high school students. **Methods.** The study examines data from PATH, a national survey on tobacco use. 241 youth (12-17) who currently used e-cigarettes (last 30 days) in 2013-14, and 269 in 2014-15 answered the question on brand. In 2017-18 California Student Tobacco Survey (CSTS), 11,669 middle & high school students currently using e-cigarettes were asked "Which brand do you use most often?" Those who preferred not to answer were excluded, leaving $n=8,861$. **Results.** In 2013-14, PATH data showed blu as the dominant market leader (39.1% of youth claimed it as their usual brand), followed by e-Swisher 8.5%, Logic 5.5%, and NJOY 4.2%. These 4 brands accounted for 57.3% of vapers among US youth. In 2014-15, PATH data showed blu was still the market leader (25.8%), although popularity dropped from the previous year. The market did not shift much overall; eGo overtook NJOY as 4th. Top 4 brands accounted for 43.6% of vapers among US youth. The 2017-18 CSTS data show a dramatic shift in the market. The market leader among youth was Suorin 29.7%, followed by JUUL 28.5%, Smok 12.7%, Phix 4.8%, and blu 3.0% as 5th. Top 4 brands accounted for 75.7% of vapers among CA youth who provided a brand. The two most popular brands are pod-based systems. Together, these two account for 58.2% of all brands reported. Suorin, relatively unknown in the literature, became the top brand, edging out the brand that has drawn most media attention. Price differential appears to be a factor. Suorin users spent an average of \$30.40/month compared to \$44.10/month for JUUL users. **Conclusion.** To the surprise of researchers and market analysts, e-cigarette brands & device types used by young vapers changed dramatically in recent years. Though JUUL is often discussed, Suorin was actually more popular, at least among CA youth in 2017-18. Pod mods appear poised to dominate the youth e-cigarette market, particularly alarming given the high concentration of nicotine often used with them.

FUNDING: State; Academic Institution

POS1-124

THE ITC PROJECT: ADVANCING GLOBAL TOBACCO CONTROL THROUGH DISSEMINATION OF POLICY EVALUATION RESEARCH

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Since 2002, the International Tobacco Control Policy Evaluation Project (the ITC Project) has conducted longitudinal cohort surveys across 29 countries covering over two-thirds of the world's tobacco users. A central objective of the ITC Project is to evaluate the behavioral and psychosocial impact of national-level tobacco control policies of the WHO Framework Convention on Tobacco Control (FCTC) and to disseminate research findings that support governments in making effective tobacco control policy decisions. ITC dissemination activities have been recognized for their policy impact by the American Association for Public Opinion Research, the Canadian Institutes for Health Research, and the WHO. ITC Project evaluations of FCTC policies have provided evidence to strengthen and accelerate the implementation of global tobacco control policies across all stages of the public policy cycle. This presentation will describe case studies illustrating how ITC findings have advanced tobacco control at various stages including: 1) documenting the need for stronger health warnings in the US and China; and to support refreshing pictorial health warnings in Canada and the adoption of plain packaging in the UK; 2) supporting efforts to block proposed revisions in tax structure from uniform to tiered in Kenya; 3) evaluating the impact of strong vs. weak policy implementation, e.g., Malaysia's pictorial warnings compared to China's text warnings; and 4) evaluating the impact of comprehensive smoke-free laws in Ireland and other ITC countries compared to partial bans in China. The presentation will also describe how ITC research has provided key evidence to support countries defending against legal challenges (e.g., Uruguay defending key policies against Philip Morris International's bilateral investment treaty challenge, and Australia's defense of plain packaging at the World Trade Organization). These case studies will cover how ITC research evidence is used to advance tobacco control in countries that have not yet implemented key FCTC policies, as well as to support stronger tobacco control in countries with well-established policies.

FUNDING: Federal; Industry Source; Nonprofit grant funding entity; Other

POS1-125

IQOS POINT-OF-SALE MARKETING STRATEGIES IN ISRAEL: A PILOT STUDY

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Significance: Heat-not-burn (HNB) tobacco products, such as Philip Morris International's IQOS, have penetrated the global tobacco market. Many countries will face regulatory implications related to these new products. Therefore, understanding the HNB product market in other countries is critical in advancing regulatory efforts in jurisdictions anticipating the release of such products into the market. In Israel, one of the first countries to have IQOS in its market, the IQOS device is sold in specialty stores and online; the heat sticks burned by IQOS, called HEETS, are sold at traditional retailers. Advertising restrictions in many contexts including Israel have shifted industry marketing efforts to point-of-sale (POS); thus, assessing product POS marketing is critical. Hence, we conducted a pilot study of IQOS POS marketing strategies, adapting the Standardized Tobacco Assessment for Retail Settings and assessing a subset of Israeli retailers. **Methods:** Data collectors conducted POS assessments of product offerings, pricing, promotional strategies, and placement in a sample of 15 IQOS retailers in 3 Israeli cities (Beer-Sheva, Haifa, Jerusalem). **Results:** All retailers sold cigarettes; many carried other forms of tobacco (e.g., cigars). Average price for a HEETS package was 30.2 Shekels ($SD=2.7$); average price for the least expensive cigarette pack was 27.4 ($SD=1.5$). In all but one retailer, HEETS were sold at higher prices, on average 9.5% more expensive. Posted ads were uncommon; rather, product displays were prominent. HEETS packages were often separated from other tobacco products and rather placed



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in a separate display box. In 2 retailers, HEETS displays were placed at higher and more noticeable positions and closer to consumers, with colour coding to differentiate flavouring and strength. Additionally, 11 retailers placed cigarettes and 10 placed HNB products near youth-oriented merchandise. Also, 9 retailers placed cigarettes and HNB products, respectively, within 1 meter of the floor. **Conclusion:** This study represents the first step in assessing IQOS POS practices, which is critical in advancing the ability to facilitate related research and regulation.

POS1-126

CULTIVATING A TOBACCO-FREE GENERATION: SMOKE- AND TOBACCO-FREE COLLEGE CAMPUS POLICY TRENDS

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Significance: Among adults who become daily smokers, nearly all first use of cigarettes occurs by 18 years of age (88%), with 99% of first use by 26 years of age. Tobacco companies' advertising and promotions heavily target young adults between the ages of 18 - 24. Thus, college is a crucial time to prevent smoking initiation and promote cessation. Research demonstrates that smoke-free college campus policies can have a positive impact on college students' smoking behaviors and attitudes, and also protect them from exposure to secondhand smoke. Changing social norms about smoking and other tobacco use on college and university campuses may help reduce smoking initiation and promote smoking cessation, and help set these students on a healthier path for their adult lives. The American College Health Association initially issued position statement calling for smokefree college campuses in 2009 and strengthened its position to call for tobacco-free campuses in 2011. Additionally, U.S. Department of Health and Human Services launched the Tobacco-Free College Campus Initiative in 2011. A Healthy People 2020 objective (TU-13.17) calls for establishment of laws in states and the District of Columbia that prohibit smoking on college and university campuses. Each of these actions has impacted the adoption of campus policies and the strength of these policy protections. Of the nearly 5,000 2- and 4-year degree granting institutions of higher learning in the U.S., 2,212 are 100% smokefree campuses; 1,853 of these are 100% tobacco-free and 1,790 prohibit the use of e-cigarettes anywhere on campus. Despite this encouraging trend, a large portion of college campuses do not have a strong tobacco-free policy. **Conclusion:** This presentation will summarize current policy trends and discuss research findings on the impact of smoke- and tobacco-free campus policies on policy adoption process across campuses by geographic region and by type of college (e.g., Private, Public, Community, Tribal, Historically Black Colleges and Universities) and suggest opportunities to increase policy protections.

FUNDING: Unfunded; Nonprofit grant funding entity; Other

POS1-127

SMOKING DEPENDENCE CORRELATES OF SUPPORT FOR A GOVERNMENT POLICY TO REDUCE NICOTINE CONTENT IN CIGARETTES AND PLANNED BEHAVIORAL RESPONSE AMONG US ADULT SMOKERS

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The FDA recently issued advanced notice of proposed rulemaking to reduce cigarette nicotine content, which could minimize chemical addictiveness and potentially reduce consumption. Biological dependence (time to first cigarettes (TTFC), craving) is important but behaviors or cues associated with smoking dependence (automaticity, cue-induced craving) may contribute to continued use. This study examined smokers' support for this policy, planned behavioral response and how this varied by dependence measures. Analyses included 923 smokers (aged 18-54) from a nationally representative 2018 survey. Smoking dependence measures included: TTFC (≤ 5 min; 6-30 min; 31-60 min; >60 min); Wisconsin Inventory of Smoking Dependence Motives (WISDM) craving (ex. cannot ignore urge); WISDM automaticity (ex. smoke without thinking); and Autonomy over Smoking cue-induced craving (ex. want cigarette after eating) subscales (all continuous). Outcomes were support for reduced-nicotine policy and predicted behavior change if only lower-nicotine cigarettes available (quit tobacco use; switch to e-cigarettes; use lower-nicotine cigarettes). Separate weighted logistic regressions modeled association between each outcome and smoking dependence measure, adjusting for demographics and nicotine health beliefs. Policy support was high (73%). Participants said they would quit tobacco use (62%), use lower-nicotine cigarettes (79%) and switch to e-cigarettes (46%). Smokers reporting TTFC of 31-60 min (vs. >60 min) had greater odds of policy support (aOR=2.4, 95%CI:1.04-5.7). Participants reporting high levels of dependence

(TTFC: ≤ 5 min, 6-30 min; higher craving, automaticity, cue-induced craving scores, respectively) had significantly greater odds of planned e-cigarette use and lower-nicotine cigarette use. Smoking dependence measures were not significantly associated with quitting. Smokers supported a reduced-nicotine policy; however, individuals reporting more dependence had greater odds of low-nicotine cigarette use if implemented. Evidence can inform policymakers and identify complementary messaging to promote cessation, particularly for smokers experiencing high levels of cue-induced dependence.

FUNDING: Nonprofit grant funding entity

POS1-128

CEASE AND DESIST? THE PERSISTENCE OF MARLBORO BRAND IMAGERY IN RACING VIDEO GAMES

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Introduction: Since 1972, Philip Morris (PM) has sponsored motorcycle and auto racing to increase Marlboro brand recognition and craft brand identity. This type of advertising has been causally linked to youth smoking initiation. Racing video games are a popular genre among youth and often emulate their real-life counterparts, including branding. We examined racing video games for the presence of Marlboro imagery and explored the history of efforts to remove or regulate such imagery. **Methods:** We systematically searched the Truth Tobacco Industry documents for documents related to video games and the tobacco industry and the website www.mobygames.com for driving/racing video games published between 1972-2018 containing Marlboro trademarks and related imagery. **Findings:** We identified 169 video games that contained Marlboro trademarks and/or drivers and livery sponsored by PM, with publication dates ranging from 1979-2018. Internal tobacco industry documents showed that in 1989, negative publicity surrounding the presence of the Marlboro logo in racing games led PM to threaten legal action against two game makers for copyright infringement. A settlement was reached; however, no noticeable chilling effect resulted from it, and PM failed to bring legal action against other game makers who included Marlboro trademarks in their games. Moves by legislators to regulate video game content led the video game industry to establish the Entertainment Software Ratings Board in 1994. It rated games by age appropriateness and applied content descriptors, including "use of tobacco" and "tobacco reference." Among the games in our sample that had received a rating, all but one received an "E" rating, indicating appropriateness for everyone, and all but two lacked tobacco content descriptors. **Conclusion:** Racing video games have been and continue to be a vehicle for exposing adolescents to the Marlboro brand and image. Because voluntary efforts by PM and the video game industry to prevent youth exposure to tobacco brands in video games have been ineffective, policymakers may wish to consider regulating tobacco content in video games.

FUNDING: State

POS1-129

INDEPENDENT AND COMBINED INFLUENCE OF EPISODIC FUTURE THINKING AND GRAPHIC WARNING LABELS ON DISCOUNTING AND HYPOTHETICAL CIGARETTE PURCHASING

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Significance: Delay discounting (i.e., reduction in commodity value due to commodity delay) and tobacco demand (i.e., consumption as a function of commodity price) are two behavioral economic assessments that relate to heavy/problematic substance use. Episodic future thinking (EFT) and the presence of cues (cueing) are two manipulations known to change discounting and demand. No studies have examined how EFT and cueing interact to influence discounting and demand. **Methods:** Adult smokers (N=610) were recruited with Amazon Mechanical Turk and randomly assigned to 1 of 8 exposure conditions: (1) EFT; (2) Episodic Recent Thinking (ERT - a control for EFT); (3) graphic warning labels (GWL - a cueing manipulation); (4) no warning label (NWL); (5) EFT+GWL; (6) ERT+NWL; (7) ERT+GWL; or (8) EFT+NWL. Following exposure, each participant completed a monetary discounting task and a cigarette purchase task (tobacco demand). **Results:** EFT and ERT groups did not differ in discounting or demand. GWL participants showed steeper discounting than NWL, but did not differ in indices of demand. However, a different story emerged when conditions were combined. GWL led to decreased discounting and decreased demand elasticity (less price-sensitivity) for EFT participants, but increased discounting and increased demand elasticity for



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ERT participants. GWLs also led to increased demand intensity (consumption at lowest price) for both EFT and ERT participants. **Conclusion:** Researchers exploring EFT and cueing often seek to decrease discount rates, decrease demand intensity, and increase elasticity. In this study, combining EFT and GWL helped reduce delay discounting but counterproductively increased demand intensity and reduced elasticity. GWL without EFT (i.e., with ERT control manipulation) helped increase elasticity, but counterproductively increased delay discounting and increased demand intensity. EFT and GWL could be characterized as individual and population level manipulations, respectively. Thus, these data highlight how individual-clinical and population-policy level manipulations may have competing effects on behavior. **Funding:** R01DA042527, T32DA007209

Funding: Federal

POS1-130

TOBACCO INDUSTRY INTERFERENCE WITH THE 2017 THAI TOBACCO PRODUCT CONTROL ACT

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Background: Thailand is among the earliest Asian countries to feel the force of the industry's influence because of trade disputes in the late 1980s. This provided Thailand insights on how to work against industry interests. These lessons have previously been researched through qualitative analysis of Thailand's policy and action. Methods Information from tobacco industry documents and specific policies and strategies used against the industry are illustrated and are applied to an examination of recent industry efforts: economic arguments from business interests and front groups, attempts to discredit established research findings, and using litigation to delay or block government tobacco control legislation/regulation. Result Counter actions were implemented early, developed continually, and shifted from being reactive to proactive as industry strategies became clear. Essential features of counter efforts included carefully monitoring tobacco industry activities, informing stakeholders of industry activities through coordinated communications, and countering industry proposals, marketing efforts, and public relations activities, including corporate social responsibility actions. Examples of interference to delay implementation of the new 2017 tobacco control law are provided. These include how the industry established front groups such as the Thai Tobacco Trade Association (TTA) and the Thai Tobacco Growers, Curers and Dealers Association (TTA), both exaggerating economic consequences from the new law. Interference was seen through trade organizations, media, and attempts to meet high ranking authorities prior to the passage of the new law in March 2017. Interestingly, similar tactics had been used by the tobacco industry to interfere with the adoption of the previous Thai tobacco control law in 1992. Conclusion Exposing how the industry seeks to undermine the very authority of state policy provides lessons about the exploitative and irresponsible nature of the industry that can serve to warn and empower politicians and all policymakers to reject CSR and other fraudulent actions of the industry.

Funding: Academic Institution

POS1-131

SMOKE-FREE TURKEY: COMPLIANCE WITH SMOKE-FREE LEGISLATION WITHIN OUTDOOR AREA OF PUBLIC PLACES

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SIGNIFICANCE: The Turkish Ministry of Health released a circular, proposing a ban on the use of tobacco products in certain outdoor areas at public institutions and agencies, as well as public outdoor areas used by children in 2015. The objective of this study was to apply the smoke-free compliance guide in three largest Turkish cities (Istanbul, Ankara, and Izmir) to evaluate compliance with smoke-free legislation in outdoor public places. **METHOD:** In this cross-sectional observational study, we observed smoking, smell smoke, ashtray, cigarette butt, and designated smoking zone in outdoor areas of public venues within the urban districts of each city. The Turkish Statistical Institute randomly selected 10 sampling points in each city. Around each sampling point, fieldworkers

visited the closest bars/nightclubs, cafes, government buildings, hospitals, restaurants, schools, shopping malls, traditional coffee houses, universities, children playground, parks and open markets. The fieldwork was conducted in April-May 2016. **RESULTS:** 477 venues were observed, covering 1017 outdoor locations in which 17737 people were observed. Smoking in outdoor areas ranged from 3.7% around schools to 90% in open markets, and was also very common around hospitals (80%), traditional coffee houses (76.5%), universities (72.7%) and shopping malls (72%). In addition to schools, other venues that had lower outdoor smoking included children's playgrounds (25%), government buildings (32.1%), and restaurants (45.8%). Cigarettes butts were more often observed in the open market (100%), shopping mall (96%), university (95.5%), and parks (93.3%). Smoking in an outdoor area around schools was significantly lower than in around other venues after adjustment for city, observation time, observed cigarette butts and ashtrays. **CONCLUSION:** The compliance level was better around the schools which covered by legislation. Additional efforts are needed to improve the implementation of legislation prohibiting smoking in outdoor public areas in Turkey, especially in areas where used by children.

Funding: Nonprofit grant funding entity

POS1-132

LGBTQ COMMUNITY PERCEPTIONS OF THE NICOTINE REDUCTION ENGAME STRATEGY

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Significance: In 2017, the FDA announced plans to begin public dialogue about restricting cigarette nicotine content to non-addictive levels. This strategy has the potential to bring the U.S. to endgame prevalence rates and reduce disparities in tobacco-related death and disease. However, little is known about perceptions and levels of support for such policies in communities most impacted by tobacco use. In particular, LGBTQ communities have prevalence rates much higher than non-LGBTQ populations and have long been targeted with tobacco industry marketing. This study investigates LGBTQ smoker perceptions of hypothetical nicotine-reduction policies.

Methods: Interviews with LGBTQ daily smokers (n=22; ages 24-60) explored smoking behaviors and reactions to policies. Participants were recruited through flyers and word-of-mouth in LGBTQ-specific locations around the Twin Cities (MN) metro. Transcriptions were deductively analyzed and coded for thematic content according to the study aims using NVIVO software.

Results: Most participants smoked menthol (73%) and averaged 13 cigarettes per day. Overall, there was little awareness of the FDA's nicotine reduction goals, with only one participant noting a newspaper article on the topic. There was variability in support for nicotine reduction strategies. Participants who supported reduction strategies (36%) noted the impact that it would have on addiction and preventing future generations from smoking. Most participants who did not support nicotine reduction (45%) felt that it would lead to compensatory smoking and may cause an increased financial burden. Several participants felt that smokers should be able to select their own nicotine content in cigarettes the same way that they can with e-cigarettes.

Conclusions: Support for nicotine reduction strategies is mixed within LGBTQ communities in Minnesota. In order to build public support for endgame strategies, additional education is needed on current tobacco industry practices, and the impact that nicotine reduction policies would have. Advocacy efforts should also focus on engagement of LGBTQ community members to create support for policies and increase community-driven action.

Funding: Unfunded

POS1-133

AWARENESS OF COURT-ORDERED CORRECTIVE STATEMENTS AND ATTITUDES TOWARD TOBACCO CONTROL POLICY ISSUES AMONG STATE AND LOCAL LAWMAKERS IN THE UNITED STATES

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Significance: The tobacco industry has heavily influenced public policy. Progress in enacting key tobacco control policies has stalled. After violating federal racketeering laws, tobacco companies began publishing court-ordered corrective statements in November 2017. This study examines state and local lawmakers' awareness of



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the corrective statements and related court findings as well as attitudes toward tobacco control policies and potential tobacco company influences on policymaking. **Methods:** All state legislators (n = 7,327) from the 50 US states and all council members (n = 3,930) from the 456 US cities with populations >75,000 were invited by email to take an online survey in May 2018. A total of 436 lawmakers (195 state/241 local) completed the survey. Respondents read the 18 corrective statements and 10 related court findings and reported their prior awareness of each. They then reported their attitudes toward 14 tobacco control policies, seven potential tobacco company influences, and other relevant issues. Political leanings (conservative, moderate, and liberal) were measured using two seven-point scales (fiscal and social). Calibration weighting was used to reduce nonresponse bias. **Results:** Among all respondents, majorities were aware of 15 of the 18 corrective statements and seven of the 10 court findings. There were no significant differences between state and local lawmakers for any of the awareness items. Political leanings were significantly associated with seven awareness items specifically related to tobacco company behaviors. When asked how much more or less likely they were to support adoption of stronger tobacco-related laws after reading the corrective statements and court findings, 35.1% were much more likely, 33.2% were somewhat more likely, and 28.3% were neutral. Majorities of both state and local lawmakers supported 13 of the 14 policies and agreed with refusing six of the seven potential influences. However, state lawmakers were significantly less likely to support any of the policies or to agree with refusing three potential influences specifically related to campaign contributions from tobacco companies or tobacco company lobbyists. Political leanings were significantly associated with attitudes related to all 14 policies and all seven potential influences. **Conclusions:** Although risk of nonresponse bias is a study limitation, these results suggest that ensuring all state and local lawmakers are aware of the corrective statements and related court findings may aid tobacco control policy initiatives.

FUNDING: State; Academic Institution

POS1-134

VAPE-FREE/CLEAN INDOOR AIR LAWS: A GLOBAL REVIEW

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Significance: Because e-cigarette aerosol can contain nicotine, formaldehyde, volatile organic compounds, ultrafine particles, metals and toxic compounds, albeit in lower concentrations than typically found in cigarette smoke, there have been calls for clean indoor air laws to include e-cigarettes as a public health measure to protect non-users and improve enforceability of smoke-free laws. This study examined how countries approach regulating use of e-cigarettes in public and private spaces. **Methods:** National policies regulating e-cigarettes were identified primarily through media monitoring and direct contact with representatives of Ministries of Health or tobacco control experts in approximately 130 countries. Copies of written policies were reviewed and those related to clean-air/vape-free laws were identified. Policy summaries and classifications were verified by in-country experts including Ministry of Health staff. Countries were stratified by World Bank 2018 income levels and WHO regions. **Results:** Out of 83 countries identified to have a national policy on e-cigarettes, seven countries ban e-cigarette use, while 33 countries include e-cigarettes in clean indoor air laws. Of these, 22 were high-income, 14 middle-income, and two low-income countries. Most (n=17) of the countries were from the European region; others were from the Americas (n=10), Africa (n=1), Eastern Mediterranean (n=2), South-East Asia (n=3) and Western Pacific (n=6) regions. Austria, Belgium, Croatia, Cyprus, Denmark, Fiji, Greece and Togo prohibit use of both nicotine and non-nicotine e-cigarettes in public places. Use in private vehicles with minors is prohibited in Cyprus (18 years), Finland (15 years), Malta (16 years) and Slovenia (18 years). Cyprus also prohibits use in personal vehicles with a pregnant woman. **Conclusion:** Nearly half of the countries with any policy on e-cigarette, also regulate its use in public and certain private spaces. Most of these are European or high-income countries with existing restrictions on smoking. Monitoring the status of e-cigarette legislation will support further research to measure the impact or effect of policies.

FUNDING: Nonprofit grant funding entity

POS1-135

VAPE SHOPS: PROMOTING CESSATION OR RECREATION?

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Significance: Vaping organizations claim widely that they are in the business of helping customers quit smoking combustible cigarettes. However, preliminary observation suggests that they also promote recreational vaping. This point-of-sale study examines the extent to which vape shops in Ontario, Canada serve smoking cessation and recreation purposes. **Methods:** We conducted structured observations in 23 vape shops in 5 Ontario cities and we conducted interviews with staff in 13 of the shops. **Outcomes:** Ten out of the 13 vape shops had a strong focus on serving recreational users and only 3 were mainly smoking cessation focused. Those with a strong focus on recreational users also served smokers trying to quit smoking, but a large proportion of customers vaped only recreationally. Data from observations and interviews indicated that these shops had a 'fun' vibe which often included recreational activities - TVs, video games, arcades and dartboards. All 10 had sampling available, 5 lounges, 5 a bar with seating, 5 a social media presence, and 3 mixed e-juices. Recreational vapers were described by vape shop staff as either 1) individuals who began using e-cigarettes for smoking cessation purposes transitioning to using e-cigarettes as a recreational activity; or 2) nonsmokers who start vaping often due to peer pressure. Staff in the vapes shops that were mainly cessation focused estimated that 99% of their customers were using e-cigarettes to quit smoking. All 3 of these shops had clean and bright store interiors, which in combination with their supportive environments, suggests a clinical, health-oriented atmosphere. **Conclusions:** Findings raise questions about the extent to which vape shops are in the business of promoting vaping to quitting smoking with the ultimate goal of quitting vaping, as opposed to promoting long-term use for recreation. Cessation and recreational use may not be mutually exclusive activities and some vape shop environments promote vaping as a fun, long-term activity both for smokers and for non-smokers. More research is needed to understand the risks and benefits for those who quit smoking by vaping and then become long-term recreational vapers.

FUNDING: State

POS1-136

INDUSTRY TACTICS IN INDIA AND THE PHILIPPINES: A CROSS-CASE ANALYSIS

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Introduction: Tobacco industry interference in policy making poses a huge threat to tobacco control efforts seeking to reduce tobacco use. Interference in low- and middle-income countries (LMICs) is particularly concerning given that the vast majority of smokers reside in LMICs. In this study, we compare tactics used by the tobacco industry during policy initiatives in two LMICs to extend understanding of tobacco industry tactics beyond single cases to the broader contexts of LMICs in general. A better conceptualization of industry tactics can prepare advocates in other LMICs to fight the opposition of the tobacco industry. **Methods:** A cross-case analysis design was employed to compare commonalities and differences in tobacco industry tactics across two case studies, one covering the passage and implementation of large health warning labels (HWLs) in India and the other studying the passage and implementation of higher tobacco taxes in the Philippines. **Results:** The tobacco industry, their front groups, and their political allies wrote letters and made presentations to policy makers to lobby their positions, paid for news stories opposing tobacco control legislation and supporting industry arguments, publicly questioned scientific evidence (i.e. the link between tobacco use and cancer), and used front group demonstrations to protest the legislation in both the fight for HWLs in India and higher tobacco tax in the Philippines. Use of litigation and suspected involvement in the removal of a key figure at the Ministry of Health were tactics unique to the India case, while industry attempts to collaborate with or sway advocates was a tactic only seen in the Philippines. **Discussion:** The identification of common industry tactics can help advocates organize their strategy to anticipate industry tactics and more successfully mount their campaigns for successful tobacco control legislation. It is clear that the industry uses similar tactics across countries, even when the tobacco control policy varies; however, the industry does not exactly replicate its strategy in each case and more data are needed to identify when some tactics, such as litigation, are most likely to be used.

FUNDING: Nonprofit grant funding entity



SRNT

POS1-137

TRACKING SUCCESSFUL PUBLIC HEALTH LAW MOVEMENTS: HOW POLICY SURVEILLANCE SUPPORTS TOBACCO-RELATED RESEARCH AND POLICY ADVOCACY

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Significance: Evidence-based strategies provide a solid rationale to support policy and research endeavors. Collecting objective laws data on public health issues can be a challenge; however, the field of tobacco control is unique in that it has access to a national database of local and state tobacco-related laws and regulations. The U.S. Tobacco Control Laws Database, developed in early 1980s, represents one of the most thorough collections of local policy data available, and it presents a unique opportunity for research, program planning, and public education in the field of tobacco control. The database currently includes 15,500 laws in over 5,700 jurisdictions, representing all 50 states, and each of the U.S. commonwealths and territories, and contains law provisions addressing smokefree indoor air and outdoor environments, youth access, point of sale, advertising, excise taxes, Tobacco21, the use and sale of electronic smoking devices, and the use of marijuana in smokefree environments. A standardized analysis tool of more than 370 variables is applied to every piece of legislation collected. Research projects utilizing the data have ranged from economic impact of smokefree laws to evaluating low birthweight trends in places with and without smokefree laws, the density of hookah lounges around colleges, responsiveness to cigarette prices by different racial/ethnic groups, and tobacco control policy adoption dynamics. **Conclusion:** As more states have developed comprehensive tobacco control programs and more jurisdictions are adopting a variety of tobacco-related laws, the need for access to a detailed history of policy development in a jurisdiction is essential for both policy advocates and researchers to demonstrate the public health benefits of tobacco law provisions. This presentation will illustrate the current depth and breadth of policy surveillance data available in the Laws Database, as well as the applications of the Database to program planning, surveillance, research, and education of the public, media, and policy makers.

FUNDING: Unfunded; Federal; Nonprofit grant funding entity

POS1-138

YOUTH ARE LESS SENSITIVE TO ELECTRONIC CIGARETTE PRICES AFTER EXPOSURE TO ELECTRONIC CIGARETTE ADVERTISEMENTS

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Significance: Electronic cigarette (ECIG) use among youth is rising alongside ECIG advertisement (ad) spending. However, few regulations exist to restrict ECIG ads. To inform ECIG ad regulations, we examined the effect of exposure to different ECIG ad themes on how much demand for ECIGs changes among youth when ECIG prices change. **Methods:** In an in-person survey, n=1360 youth aged 13-18 years were randomized to a control condition (water ads) or 1 of 3 ECIG advertising conditions differing by ad theme (general, flavor and taste, people and youth). Themes were derived from a content analysis of static (e.g., print, online banner) ECIG ads. Each condition involved exposure to three ads followed by a modified ECIG purchase task asking youth to report the probability that they would purchase an ECIG on a scale from 0 (Definitely NOT buy) to 10 (Definitely WOULD buy), across a range of prices (\$0-\$140). Participants with poorly fitting demand curves were excluded, leaving an analytic sample of n=641. Linear regressions tested the log-transformed price sensitivity (elasticity of demand) of each ad theme compared to the control condition, while controlling for smoking status, past-month ECIG use, gender, age, race, and prior tobacco ad exposure ($p<0.05$). **Results:** After controlling for demographic and tobacco-related covariates, exposure to general ($\beta=-0.28$) and people/youth ($\beta=-0.22$) themed ECIG ads was associated with significantly lower log-price sensitivity. This translates to reductions in price sensitivity of 24% for general ECIG ads and 20% for people/youth-themed ECIG ads compared to ads for water. Smoking status, older age, past-month ECIG use and greater prior exposure to tobacco ads all significantly decreased price sensitivity, while Hispanic ethnicity significantly increased price sensitivity. **Conclusions:** Exposure to ECIG ads may increase abuse liability for ECIGs among youth, and this effect may differ by ad theme. To a greater extent than other ECIG ad themes, general and people/youth-themed ECIG ads may make youth less sensitive to price changes. These findings can inform regulations that seek to restrict ECIG ad content to promote public health.

FUNDING: Federal; State

POS1-139

YOUNG PEOPLE'S RESPONSES TO STANDARDISED PACKAGING ONE YEAR AFTER FULL IMPLEMENTATION IN THE UK: A QUALITATIVE STUDY

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Background In May 2017, two major pieces of legislation, the Standardised Packaging of Tobacco Products Regulations and a new Tobacco Products Directive (TPD), transformed the appearance of tobacco packs in the UK. The legislation stipulated standardised packaging, enhanced health warnings including large pictorial warnings on the front and back of packs, a ban on misleading pack descriptors and a minimum pack size. While there has been considerable research with adult smokers on standardised packaging, there is an absence of qualitative research with youth in a market where this has been fully implemented. This study qualitatively explored youth response to the new packs in the UK. **Methods** Twelve focus group discussions were conducted with 11 to 16 year olds (N = 89) across the UK in June and July 2018, 13 to 14 months after full implementation of the legislation. Participants varied in gender, social grade and smoking status. The discussions focused on: young people's awareness, perceptions and support of standardised packaging; user imagery associated with different brands of standardised packs; salience and believability of the enhanced health warnings; and the salience of brand name in the context of the pack changes. **Results** Awareness of standardised packaging was mixed. Among never smokers there was little engagement with tobacco and knowledge of tobacco brands was limited. Plain packs were consistently perceived negatively, with a very negative user image, and it was difficult for the sample to distinguish between different brands presented in standardised packaging. Brand names were not a salient feature of the pack. The enhanced health warnings generated the most discussion and very negative responses. However, some participants, particularly those more experienced with smoking, questioned the believability of such graphic images. **Conclusion** This study provides insights into how youth respond to standardised packaging one year after full implementation in the UK. Standardised packaging reduces opportunities for tobacco companies to communicate with youth and portrays a very negative image of smoking, especially through enhanced graphic health warnings.

FUNDING: Nonprofit grant funding entity

POS1-140

EXPOSURE TO TOBACCO ADVERTISEMENTS INCREASES ABUSE LIABILITY FOR E-CIGARETTES AMONG ADOLESCENTS

Andrew J. Barnes, Alyssa Rudy, Cosima Hoetger, Nicole Nicksic, Rose Bono, Caroline Cobb. VA Commonwealth University, Richmond, VA, USA.

Significance: Most adolescents in the US report exposure to tobacco product advertisements (ads) that vary widely in how these ads are regulated. With simultaneous increases in electronic cigarette (ECIG) ad spending and youth ECIG use in the face of evolving federal regulation of ECIG ads, the extent to which tobacco ads in general influence adolescents' abuse liability for ECIGs is unknown. We sought to examine how prior tobacco ad exposure affects adolescents' abuse liability for ECIGs. **Methods:** 1360 adolescents ages 13-18 who smoked cigarettes (n=674) or were susceptible to tobacco use (n=686) were surveyed. Abuse liability was regressed on an index of the frequency of exposure to tobacco ads in print media, stores, outdoors, and online. Abuse liability was measured using a modified ECIG purchase task that asked adolescents the probability of buying ECIGs at various prices (\$0 - \$140) on a Likert-type scale (0, definitely NOT buy - 10, definitely WOULD buy). Outcomes were the breakpoint, the price at which participants would definitely not buy an ECIG, and intensity, the probability of purchase if an ECIG cost \$0. Because 30% of adolescents reported not buying an ECIG at any price, two-part models were used. Logistic regressions tested for differences in the odds of having a non-zero breakpoint or intensity value across prior ad exposure, then linear regressions tested differences in log-transformed breakpoint or intensity for those with positive demand values. Models were adjusted for demographics and current smoking status. **Results:** More tobacco ad exposure was associated with larger odds of having a non-zero breakpoint (odds ratio [OR]=1.20, $p<0.001$) and of a non-zero intensity (OR=1.16, $p<0.001$). Among those with non-zero values for breakpoint and intensity, higher levels of prior tobacco ad exposure were associated with higher log-breakpoints ($\beta=0.10$, $p<0.05$) and log-intensity ($\beta=0.06$, $p<0.001$). **Conclusions:** Adolescents reporting higher levels of exposure to tobacco ads scored significantly higher on measures of abuse liability for ECIGs. Policies that restrict tobacco ads may aid in reducing adolescents' demand for, and potentially use of, ECIGs.

FUNDING: Federal; Nonprofit grant funding entity



POS1-141

AVAILABILITY AND ADVERTISING OF ELECTRONIC CIGARETTES AMONG TOBACCO RETAILERS IN VULNERABLE ETHNIC COMMUNITIES

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Significance: As tobacco control regulations increased in recent decades, the tobacco industry has shifted marketing expenditures away from printed media channels to the retail environment. Retail stores were the most common source of e-cigarette advertising exposure among adolescents. This is concerning as e-cigarettes are currently the most commonly used tobacco product among adolescents and exposure to e-cigarette advertising is linked to higher odds of current e-cigarette use among youth. Given that low income and ethnic communities have a higher density of tobacco retailers and convenience stores, it is imperative to examine e-cigarette availability and marketing within these vulnerable communities. **Methods:** Tobacco retailers on American Indian (AI) Tribal lands in California and tobacco retailers in low-income African American (AA), Hispanic/Latino (H/L), Korean (K), low-income Non-Hispanic White (NHW) communities in Southern California were recruited to complete 775 store audits from January 2016 to January 2017. **Results:** Compared to other communities, retail stores in NHW communities were the most likely to sell e-cigarette products ($\chi^2_{(4)} = 116.08$, $p<0.001$), sell flavored e-cigarette products ($\chi^2_{(4)} = 104.67$, $p<0.001$), have e-cigarettes near toys, candy or soda machines ($\chi^2_{(4)} = 36.63$, $p<0.001$), have interior e-cigarette advertising within three feet of the floor ($\chi^2_{(4)} = 10.54$, $p<0.05$), have storefront e-cigarette advertising ($\chi^2_{(4)} = 14.60$, $p<0.01$) and have self-service e-cigarette displays ($p<0.001$). E-cigarette price promotions at the point of sale were not associated with community ethnicity ($p=0.79$). The lowest priced e-cigarette products (\$1.99) were found in AA and NHW communities. **Conclusions:** Findings suggest that lower-income NHW communities are disproportionately burdened by e-cigarette availability and advertising. Given that e-cigarette products and advertising were found to be accessible to youth in NHW communities, product and marketing placement at the point of sale that target or inadvertently expose youth to tobacco products should be restricted and regulated by local and federal tobacco regulatory agencies.

FUNDING: Federal

POS1-142

USING A PATH ANALYSIS TO TEST A MEDIATION MODEL TO UNDERSTAND THE RELATIONSHIP BETWEEN TOBACCO POLICY AND ENDS USE ON COLLEGE CAMPUSES IN TEXAS

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Significance: Given the changing landscape of tobacco, and the increase in electronic nicotine delivery systems (ENDS) use among college age young adults, colleges and universities are implementing tobacco-free policies that include ENDS in an effort to curb all tobacco use on campus. However, little is known about the impact of ENDS policies on college students' ENDS use. The purpose of this study was to test a mediation model of the indirect impact of comprehensive tobacco policies on students' use of ENDS on campus through knowledge of that policy. **Methods and Measures:** Participants were 1,517 self-reported current/past 30-day ENDS using college students, aged 18-29 ($M=20.82$, $SD=2.5$; 51.0% female; 46.7% Hispanic, 33.9% non-Hispanic white, 9.8%, Asian, and 5.5% African American) attending one of 12 colleges in Texas in spring 2018. The exogenous variable, strength of actual college ENDS policy, was coded on a scale from 1 to 3 (1=no policy on ENDS; 2=partial policy on ENDS; and 3=comprehensive ENDS policy). The outcome, campus use, was measured by responses to ever using ENDS on campus and the mediator, knowledge, was measured by students' responses to whether schools have an ENDS policy and coded 1 = knowledge or 0 = no knowledge. Path analysis in M-Plus was used to test the mediation model. **Results:** The fit of the mediation model of the relationship between ENDS policy level and use of ENDS on campus through knowledge of the policy was excellent: CFI (1.00), RMSEA (0.00) and WRMR (0.20). The path coefficients indicated direct paths from policy level [$\beta=-0.13$ (0.31)] and from knowledge [$\beta=0.27$ (0.07)] to ENDS use on campus. Both paths were significant even after controlling for student sex and age. The path from policy level to knowledge, however, was not significant. **Conclusion:** Results did not support a mediation model; policy was not indirectly associated with ENDS use through knowledge. Findings, however, extend existing research focused on cigarette policies by indicating

that campus ENDS policies directly impact students' ENDS use on campus. Therefore, college administrators should strengthen tobacco policies relative to ENDS to reduce the use of ENDS on campus.

FUNDING: State

POS1-143

POPULATION MODELING ASSESSING THE HEALTH EFFECTS OF LAUNCHING TOBACCO HEATED PRODUCTS IN JAPAN

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The principles of Tobacco Harm Reduction were outlined by the Institute of Medicine (IOM) in 2001 in their monologue called 'Clearing the smoke', summarising that population health benefits could be realised by replacing risky tobacco products like cigarettes with lower risk products. Since then, mainly two new categories, commonly known as e-cigarettes and tobacco heated products (THPs) are trying to provide potentially safer alternatives to smoking. Mathematical models have been used to measure the magnitude of the potential impact from launching these products on the health of the population as a whole. Most of the published projections in this area have focused on e-cigarettes due to their earlier introduction worldwide. Japan has been used since (2016) as a lead market for the introduction of the new generation of THPs and it is now considered to be well established. We performed a 4000 self-administrated cross-sectional survey on 4000 individuals multi-stage sampling. Participants were asked about their current and past nicotine use to calculate transitions among different products. Data collected from this survey in addition of public Japanese historical smoking data were used to inform a population model previously published to obtain projections of the potential impact from launching THPs in Japan. To our knowledge these projections are the first of its kind for THPs and they suggest a great potential for harm reduction for most credible scenarios.

FUNDING: Tobacco Industry

POS1-144

WHAT IS THE RESPONSE OF RETAILERS TO TOBACCO 21?

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Most of the U.S. has the minimum legal sales age (MLSA) for tobacco set at 18. Yet since 2005, over 310 states, counties, cities, and towns have become "Tobacco 21" and raised their MLSA for tobacco to 21. Columbus, OH, recently joined these ranks by becoming Tobacco 21 in autumn 2017. Tobacco retailer staff are at the forefront of the tobacco sales transaction and it is their behavior that ultimately determines MLSA compliance—and the policy's success. Yet extremely little research has examined clerks' understanding and perceptions of Tobacco 21. Therefore, the purpose of this study was to determine how well retailers are transitioning to Tobacco 21 in Columbus. We interviewed staff working at a random sample of over 130 tobacco retailers (convenience stores, gas stations, vape shops, etc.), asking both quantitative and open-ended survey question. Analysis of participant demographic characteristics indicated an extremely diverse sample, with ages ranging from 18 to 82, and places of birth totaling 19 different countries; for nearly 40% of the sample, the first language learned was not English. Findings indicated that the majority (over 97%) of staff interviewed were aware that the MLSA for tobacco was 21. However, less than 80% knew they needed to ID anyone who looked under age 30, and less than 75% had received training or instructions on how to check customers' IDs. Support for Tobacco 21 was moderate overall, and stronger support was associated with the belief that the policy would help reduce youth smoking. Staff who reported a greater number of barriers to compliance with Tobacco 21 had lower support for the policy; more reported barriers was also associated with not knowing to card anyone under age 30, a lower confidence in one's ability to card, and not speaking English as a first language. Staff with more positive attitudes about the tobacco industry were more likely to view tobacco as less addictive for youth, not speak English as a first language, to be older, and to have a more advanced position in the store. Overall, these findings identify potential opportunities for retailer education and outreach to improve Tobacco 21 compliance.

FUNDING: Other



SRNT

POS1-145

ASSESSMENT OF LEVEL OF COMPLIANCE WITH THE MEXICO CITY SMOKE-FREE LAW IN SELECT PUBLIC PLACES, APRIL-JULY 2018

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Significance: In 2008, the Law of Non Smokers' Health Protection was amended to establish smoke-free indoor public places, workplaces (e.g. government facilities, healthcare facilities, cultural institutions, restaurants and bars) and public transportation. Smoking is allowed in outdoor areas annexed to public places (such as terraces, patios and gardens), under specific conditions. The goal of this study is to assess the level of compliance with the comprehensive smoke-free law in select public places in Mexico City. **Methods:** This is an observational study that employed a random sampling approach (n=509) that was stratified by venue type (restaurants, cafes, bars, and nightclubs) and by municipality (Mexico City is composed of 16 municipalities). Venues were selected from the 2017 National Inventory of Hospitality Services. Data collectors observed a venue for up to 30 minutes or until smoking was observed, whichever happened first, and then completed an online survey tool. A venue was considered compliant with the law if no smoking, ashtrays, or cigarette butts were observed indoors and/or outdoors (in places that do not meet the conditions). We estimated the level of compliance by venue type and by municipality. **Results:** Overall compliance with the law citywide was 84%. Compliance was highest in restaurants (91%, n=329) and cafes (84%, n=76), and lowest in bars (60%, n=63) and nightclubs (63%, n=41). The municipalities with the highest levels of compliance were Milpa Alta (96%) and Tlalhuac (96%) and the lowest levels of compliance were Cuauhtémoc (73%, n=67), and Benito Juárez (76%, n=34). Smoking occurred primarily in outdoor areas (44%, n=110) that did not meet the requirements of the law, regardless of venue type. **Conclusions:** The results of this observational study indicate that the majority of smoking occurs in nightclubs and bars, within municipalities with the most bars and nightclubs, and especially in venues that have outdoor areas. Based on these results, efforts to strengthen compliance with the smoke-free law in Mexico City should be directed at nightclubs and bars and venues with outdoor areas.

FUNDING: Nonprofit grant funding entity

POS1-146

MENTHOL CIGARETTE PACKAGING ACROSS 9 MIDDLE INCOME COUNTRIES

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Background: Menthol is the most widely used flavor in tobacco products. In addition to its distinctive taste, it contributes to increased initiation and smoking dependence and reduced cessation. Assessing the design features and marketing appeals on cigarette packs can help us identify the strategies tobacco companies use to promote menthol cigarettes. We describe the features and appeals on menthol (or mint) cigarette packs from 9 countries. **Methods:** In 2015-17, we purchased unique cigarette packs in Bangladesh, Brazil, China, India, Indonesia, Philippines, Russia, Thailand and Vietnam using a systematic protocol. Two independent coders examined the cigarette packs for design features and appeals including brand family name, primary pack color, flavor terminology and imagery, number and color of capsules, and capsule descriptors. We identified menthol products based on menthol or mint terminology (e.g. premium menthol, mint blast) or imagery (e.g. mint leaves) on the pack. **Results:** We purchased 2337 cigarette packs from the 9 countries and 203 packs (8.7%) were categorized as menthol. The most common brand family was Marlboro (n=32 packs). The most frequently observed primary pack color for menthol cigarettes was green (67%). Fifty-three (23%) of the 203 menthol cigarette packs collected had a flavor capsule. Of the menthol packs with a capsule, 45 (85%) had one capsule. Forty-nine (92%) of the menthol capsule packs had one or more of the following flavor descriptors: menthol/mentholated (n=21), mint (n=20), and ice/icy (n=12). Also, color words (purple, blue, yellow, and ruby) were used to describe flavor capsules (n=10). There was some variation in the depiction of capsule colors used on packs, but 89% had at least one capsule depiction as green or blue.

Conclusion: These findings demonstrate the common use of flavor capsule descriptors including the terms 'menthol/ mentholated', color words and green capsule colors on menthol flavor packs. These findings can reinforce policy efforts towards plain packaging.

FUNDING: Nonprofit grant funding entity

POS1-147

TOBACCO COMPANIES ARE STILL MISLEADING CONSUMERS: TAR NUMBERS ON CIGARETTE PACKS IN SOUTH KOREA

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Background: Smoking prevalence was 22.5% in 2015 in South Korea; Euromonitor reports that "low" and "ultra-low" tar cigarette sales are projected to increase in the coming year. South Korea bans the use of misleading descriptors such as light and mild on cigarette packaging, but does not prohibit the quantitative reporting of cigarette constituents, such as tar and nicotine. The reporting of these figures could lead consumers to believe that some cigarettes are safer than others. **Methods:** In August 2018, cigarettes were collected from nine neighborhoods (4 middle and 5 high-income) in Seoul, and 4 neighborhoods (1 middle and 3 high-income) in Busan. Neighborhoods were selected on the basis of areas where affluent young adults live and/or frequent, including but not limited to university campuses and nightlife districts to capture new or innovative cigarette products marketed in these areas and our target audience. Unique cigarette packs were purchased using a systematic protocol. **Results:** 182 unique cigarette packs were purchased. 177 packs with the current graphic health warning label present were assessed. All 177 packs displayed a value indicating the machine reported tar and nicotine values in milligrams on one minor side of the pack. 103 packs (58%) reported an additional number that either matched or corresponded to the machine reported tar value. Of those packs, 97 (92%) displayed that number on at least the front principal display area. 39 packs (38%) displayed "mg" alongside the reported number, with 30 appearing on at least the front principal display area. **Conclusion:** Misleading descriptors are banned in South Korea, but the widespread display of the machine tested tar values on cigarettes can be just as misleading. FCTC article 11 recommends that Parties prohibit the display of quantitative statements for constituents that might imply that one brand is less harmful than another. Policymakers must take into account further design elements in cigarette packaging, including colors, numbers and the reporting of constituent levels on tobacco packages, in future tobacco control efforts in order to protect the public from potentially misleading claims.

FUNDING: Academic Institution

POS1-148

SELF-REPORTED SMOKE FREE POLICY NON-COMPLIANCE: A CROSS-SECTIONAL SURVEY IN BEIJING, SHENZHEN, AND SHANGHAI

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Significance: Beijing (BJ), Shenzhen (SZ), and Shanghai (SH) implemented or updated comprehensive smoke free laws in June 2015, January 2017, and March 2017, respectively. However little is known about non-compliance with each law. The purpose of this analysis was to examine self-reported non-compliance with the smoke free laws for indoor or enclosed public places. **Methods:** A cross-sectional survey was conducted in December 2017 in BJ, SZ, and SH. Approximately 535 adult (18+) smokers residing in each city were recruited via street intercept (50% male and 50% <40 years of age) to conduct a 25 minute tablet-based survey, which included questions about smoke free compliance. Smokers were asked, "Have you smoked cigarettes in any of the following indoor or enclosed public places in the past week? Please select all that apply." T-tests were conducted to compare non-compliance between the three cities for each type of public place. **Results:** Our analyses indicate SZ (75%) and BJ's (74%) self-reported non-compliance was significantly higher than SH's (62%) in terms of smokers smoking in any of the indoor public places. For indoor workplaces, BJ smokers (31%) reported significantly higher non-compliance than SH smokers (23%). For restaurants, SH (38%) and BJ's (42%) non-compliance was significantly higher than SZ's (32%), while for bars, SH (29%) and SZ's (23%) non-compliance was significantly higher



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than BJ's (19%). There were no differences among the three cities for hotels (19-22%), public transportation (13-15%), airports (3-4%), or schools/universities (1-3%). **Conclusion:**

Overall SH had the lowest self-reported non-compliance with BJ, SH, and SZ each performing better relative to one another for different yet important public places, including workplaces, restaurants, and bars. Lower non-compliance might reflect stricter law enforcement at each place; however, it could also be an artificial effect resulting from fewer respondents traveling to the places during the week prior. Relative to findings from BJ and SH during 2013-15, our data suggests compliance may have improved, but smokers are still smoking inside. Improved enforcement may be needed in all three cities.

FUNDING: Academic Institution; Nonprofit grant funding entity

POS1-149

UNDERSTANDING THE EFFECT OF TOBACCO MARKETING ON THE ASSOCIATION BETWEEN OPINIONS AND TOBACCO USE IN ADULTS OVER 55

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Significance: Over 4.2 million older adults in the United States use tobacco products, increasing their risk of disability and death. Opinions towards tobacco are associated with tobacco use, but little is known about the mediating effect of tobacco marketing. This study assesses the influence of retail store advertising and direct marketing on the association between opinions towards tobacco and tobacco use in adults aged 55 and older. **Methods:** A sample of adults ages 55 and above tested the association between opinions towards tobacco and tobacco use across 10 tobacco products in two waves ($N_{wave1} = 7,068$, $N_{wave2} = 6,273$) of the Population Assessment in Tobacco and Health (PATH), a nationally representative sample of tobacco use in the United States. The associations between opinions and tobacco use were tested using logistic regression while adjusting for the influence of receiving coupons via mail, email and exposure to tobacco store advertising across all tobacco products. **Results:** The prevalence of current tobacco product use varied across products and was relatively consistent between Wave 1 (0.1% [snus]-31.7% [cigarettes]) and Wave 2 (0.2% [snus]-33.2% [cigarettes]). There was a significant association between opinions towards tobacco and current use across multiple tobacco products in both waves ($OR_{wave1} = 3.7-13.9$, $p<0.001$ and $OR_{wave2} = 2.4$, $p<0.01-12.7$, $p<0.001$). The associations between opinions and tobacco use across five products were reduced after adjusting for the influence of coupons and store ads in both waves ($OR_{wave1} = 3.6-11.0$, $p<0.001$ and $OR_{wave2} = 2.2$, $p<0.05-11.0$, $p<0.001$). The odds of being a current smoker was also larger for older adults that received coupons in both waves ($OR_{wave1} = 1.59$, $p<0.001$; $OR_{wave2} = 2.47$, $p<0.001$) or were exposed to tobacco store advertising ($OR_{wave1} = 1.48$, $p<0.001$; $OR_{wave2} = 1.273$, $p<0.001$). Results varied by race and gender across products. **Conclusion:** Tobacco marketing influences older adults' opinions towards tobacco and tobacco use. This study highlights the heightened need for regulations towards coupons and retail store advertising as they would also serve to protect older adults from increasing tobacco use.

FUNDING: Academic Institution

POS1-150

LITTLE CIGARS AND CIGARILLOS POINT OF SALE MARKETING ON AND NEAR CALIFORNIA TRIBAL LANDS

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Significance: American Indians have the highest cigarette smoking prevalence of any racial/ethnic group in the U.S. Tobacco marketing at point of sale is associated with smoking, possibly due to easy access to cheap tobacco products. The sale of novel tobacco products like little cigars/cigarillos has increased in recent years, which may further complicate combustible tobacco use among American Indians. Therefore, we sought to investigate the relationship between the availability and advertising of little cigars/cigarillos on and near California Tribal lands. **Methods:** Between October 2015 and February 2017, trained community health workers collected little cigar/cigarillo product and price information by conducting observational tobacco retailer audits on Tribal lands ($n=53$) and within a one-mile radius of Tribal lands ($n=43$) in California. Chi-square analyses were performed to examine associations among the availability and advertising of little cigars/cigarillos, including advertised interior little cigar/cigarillo price promotions, and whether the store was located on or within a one-mile radius of

Tribal lands. **Results:** Overall, 85.4% of stores on and within a one-mile radius of Tribal lands sold little cigars/cigarillos, 76.0% of stores sold flavored little cigars/cigarillos, and 51.0% sold individual little cigars/cigarillos. Little cigars/cigarillos were available for less than \$1 at 49 (51.0%) stores and little cigars/cigarillos price promotions were present at 45 (46.9%) stores. Stores within a one-mile radius of Tribal lands sold significantly more little cigars/cigarillos ($p<0.01$) and flavored little cigars/cigarillos ($p=0.01$) than stores on Tribal lands. Stores within a one-mile radius of Tribal lands displayed significantly more little cigars/cigarillos priced at less than \$1 ($p<0.01$) than stores on Tribal lands. **Conclusion:** This study indicates that little cigars and cigarillos are widely available in stores on and near California Tribal lands. Stores located near Tribal lands sell more little cigars/cigarillos, including flavored versions, sell more little cigars/cigarillos priced below \$1, and advertise more price promotions than stores on Tribal lands. Policy makers and Tribal leaders should consider regulations that would limit access to little cigars/cigarillos at point of sale to help prevent youth initiation and reduce smoking-related diseases among American Indians.

FUNDING: Federal

POS1-151

WHAT FACTORS INFLUENCE ADVOCACY FOR SMOKING BANS? EXAMINATION OF DISCRETE EMOTIONS, ATTITUDES, AND SOCIODEMOGRAPHIC CHARACTERISTICS

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Significance: The purpose of this study was to examine predictors of intentions to advocate for smoking ban policies. **Methods:** Data was used from the Emotions and Health Study, an online experimental study that tested the causal effect of fear, anger, sadness, and disgust on smoking-related cognitions (ie. intentions). Emotions were elicited through short movie clips that were pre-tested. Participants ($N=399$; 61.2% female, 70.2% non-Hispanic White) were adults (mean age=38.1 (SD=12.6) recruited online through Mechanical Turk. Survey data collected emotions, sociodemographics, smoking status, and attitude toward smoking bans, and collective (ie. *Likelihood to support a law banning smoking in shared living spaces*) and behavioral (ie. *If someone started smoking near you, how likely would you remind them about the smoking ban policy*) intentions. **Results:** In multivariate analyses females ($B=-0.3, p=.04$) and non-Hispanic Whites (NHW; $B=-0.5, p<.01$) had lower behavioral intentions, while non-smokers ($B=0.5, p<.01$) had higher behavioral intentions. This indicates females and NHW were less likely to actively restrict themselves and vulnerable people (children and pregnant women) from secondhand smoke (SHS) exposure. On the other hand, non-smokers were more likely to restrict SHS exposure. NHW ($B=-0.4, p=.03$) also had lower collective intentions, indicating a decreased likelihood to support smoking ban policies. Smoking ban attitudes were significantly associated with collective ($B=1.1, p<.001$) and behavioral intentions ($B=2.7, p<.001$). Surprisingly, emotions were not associated with advocacy intentions. Policy preferences and individual intentions (ie. intentions to quit) have been shaped by emotional information; however fear, anger, sadness, and disgust were not associated with advocacy intentions in this study. **Conclusion:** Different approaches to advocate for policy changes need to be considered, especially since women and NHW are more likely to vote. Framing smoking ban policy messages to women and NHW may be helpful in increasing advocacy efforts. Future research is needed to explore the association of other discrete emotions (ie. worry, hope) and advocacy intentions.

FUNDING: Academic Institution

POS1-152

FREQUENTLY USED INGREDIENTS IN E-LIQUIDS CLASSIFIED BY FLAVOR: AN OVERVIEW OF THE DUTCH MARKET

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Significance E-liquids are marketed in a wide variety of flavors. Flavoring ingredients increase e-liquid appeal and may be harmful to users. Research on flavoring composition may help regulators to develop policy measures on flavor content in order to decrease attractiveness for specific user groups and toxicity of e-liquids. According to the European Tobacco Product Directive, e-liquid manufacturers are required to provide data, such as brand name, ingredients, and emissions, on the products they have marketed in each member state. Previously, we used this data to create an overview of e-liquids



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available on the Dutch market, classified in 16 flavor categories. The current study aims to identify the most common ingredients and differences between flavor categories. **Methods** E-liquids available on the Dutch market on 30 November 2017 (n=19,266) were classified by two independent reviewers using the following information from the European Common Entry Gate: brand (subtype) name, product identification, and general comment. E-liquids were classified in a standardized way using the main and sub categories of our recently developed flavor wheel. The most common ingredients overall and per flavor category were identified. **Results** The average number of ingredients was lowest for *unflavored* e-liquids (3: propylene glycol, glycerol and nicotine). E-liquids in the other categories contained 16 ingredients on average, ranging from 9 (*spices*) to 26 (*dessert*). The most common flavoring ingredients were vanillin (vanilla flavor), methyl cyclopentenolone (caramel flavor), ethyl butyrate (fruity flavor) and ethyl maltol (sweet flavor). Other flavorings, such as menthol (mint flavor), anethole (anise flavor), benzyl alcohol (fruity flavor), cis-3-hexenol (fresh/grass flavor), isoamyl acetate (banana flavor), and ethyl vanillin (vanilla flavor), were specific for a particular flavor category. **Conclusion** Data from manufacturers shows that e-liquids contain common flavorings as well as characteristic flavorings that differ between flavor categories. Combining this data with knowledge about toxicity and attractiveness may contribute to flavor regulation for e-liquids.

FUNDING: Federal

POS1-153

CAUSES AND EFFECTS OF VARIATION IN THE LEGAL STATUS OF RECREATIONAL NON-TOBACCO NICOTINE PRODUCTS OVER TIME: PUNCTUATING EVENTS, IMPACTS ON FIRM BEHAVIOR, AND LINGERING UNCERTAINTIES

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Although widespread consumption of Alternative Nicotine Delivery Systems (ANDS) that deliver nicotine without tobacco is a recent phenomenon largely confined to the past decade, there is much longer history of actions and events that have affected the legal category of products to which ANDS belong: Recreational Non-Tobacco Nicotine Products (RNTNPs). Critical FDA actions, court decisions, and legislation have caused the legal status of RNTNPs to vary over time. This variation has in turn altered the course of RNTNP innovation due to firms' perceptions of higher or lower barriers associated with the introduction and marketing of such products. This article will first track the legal status of RNTNPs over time. This status derives from the inclination of FDA decisionmakers to apply drug or device rules to these products, as well as legislative activities and court decisions that have expanded or constricted FDA jurisdiction over RNTNPs. Beyond highlighting punctuating decisions and events, attention will be devoted to the lack of complete certainty over the true legal status of some or all RNTNPs. This uncertainty has never been completely absent even after seemingly clarifying events, and it persists to this day. Next, evidence will be presented from primary source documents that demonstrate how and why the perceived legal status of RNTNP's affected product development decisions within tobacco firms. Documents from various time periods, and from nearly every major tobacco firm, demonstrate how perceptions about levels of and changes to regulatory barriers affected decisions about ongoing or prospective RNTNP projects. Lastly, lingering uncertainty about the legal status of certain RNTNPs will be discussed, including the role of "substantial equivalence" and the status of synthetic nicotine that is not derived from tobacco. After endeavoring to describe the range of possible regulatory and legal outcomes that might resolve these uncertainties, the advantages and disadvantages of each outcome will be considered from a public health perspective. This evaluation will emphasize lessons that can be gleaned from past regulatory and legal approaches to RNTNPs.

FUNDING: Unfunded

POS1-154

TOBACCO PRODUCT PREFERENCES AND RETAILERS' COMPLIANCE WITH FDA REGULATIONS IN VULNERABLE COMMUNITIES: INCREASING COMPLIANCE AT THE POINT-OF-PURCHASE

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BACKGROUND: Since 2009, the Food and Drug Administration (FDA) has had the authority to regulate tobacco at the point-of-purchase, holding tobacco retailers accountable for compliance with regulations. **METHODS:** Seven hundred seventy-five (775) tobacco retail store audits were conducted utilizing the Standardized Tobacco Assessment for Retail Settings (STARS) surveillance tool in vulnerable communities in Los Angeles. We assessed tobacco products sold and compliance with FDA regulations. Vulnerable communities were defined as low socioeconomic status non-Hispanic-White (NHW), African-American (AA), Hispanic/Latino (H/L), Korean American (KA), and American-Indian (AI) communities. Stores were considered non-compliant if they sold FDA banned tobacco products, cigarette packs with < 20 cigarettes, open packages of cigarettes or chew, if they distributed free samples of cigarettes or chew, or if they had self-service displays. **RESULTS:** Fifty-eight (57.5%) of retailers in AA communities reported Newport to be their most commonly sold brand, while Marlboro was reported to be the most common among retailers in H/L (90.5%), KA (86%), AI (66.7%) and NHWs (86.5%) communities. Compared to retailers in NHW communities, retailers in AA communities had significantly higher odds of selling flavored cigarillos and little cigars (OR=4.5; 95% CI=2.12-9.63), than retailers in KA (OR=2.3; 95% CI=1.07-5.05) and H/L (OR=2.2; 95% CI=1.11-4.23) communities. Varying degrees of compliance were found. More retailers in the AA (12.9%) communities were non-compliant compared to other communities (9.2% NHW, 2.6% H/L, 9% KA, and 9.4% AI) (X²(4)=13.350 p<0.01). **CONCLUSIONS:** Newport and Marlboro were the most popular brands sold in vulnerable communities. Flavored cigarillos and little cigars were mostly sold in AA communities. AA neighborhoods had the highest degree of non-compliance; H/L neighborhoods had the lowest. Educational materials that are culturally tailored for different communities is important. Findings also highlight areas for potential point-of-sale regulations that may reduce youth initiation rates and progression to addiction among vulnerable populations. **FUNDING:** National Cancer Institute and FDA Center for Tobacco Products (CTP) (PIs Samet, Pentz) grant number P50CA180905

FUNDING: Federal; Nonprofit grant funding entity

POS1-155

TOBACCO CONTROL RESEARCH NETWORKS: BUILDING LOCAL EVIDENCE

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Background: Legislators and advocates in low- and middle-income countries often request localized evidence that is specific and timely to a country's policy needs. FCTC Articles 20, 21 and 22 emphasize the importance of research in tobacco control. We have supported tobacco control research networks in Bangladesh (2013-present) and Indonesia (2012-present) with the aim of expanding the local evidence base for tobacco control research, building tobacco control research capacity and cultivating an associated research network.

Method: We are collaborating with in-country partners who lead day-to-day administration of the initiative and support seed research grants (70 grants funded in Bangladesh and 22 in Indonesia to-date). The grantees conduct policy relevant research aimed at supporting national tobacco control efforts and present their findings in an annual conference attended by tobacco control advocates, government officials and the media. Throughout the grant period, grantees receive trainings to refresh their research skills and are mentored by local experts. The grantees become part of the research network with ongoing efforts to expand and support local policy relevant research. **Results:** In Bangladesh, seven studies have been published in international journals and in both countries, researchers have presented their findings at national and international conferences. Research skill building and mentoring are needed to support effective seed grant implementation and ensure quality outcomes. In order for the networks to be fully independent and capable of fostering localized research, multi-year commitments that build the network infrastructures and cover the cost of seed grants are needed. In Bangladesh, the network has become an independent entity with the capacity to seek alternate sources of funding.

Conclusions: A dedicated research network can positively contribute to a country's tobacco control movement. Government and other stakeholder commitment and involvement are needed to nurture and advance such networks to help sustain tobacco control efforts in the long term.

FUNDING: Nonprofit grant funding entity



POS1-156

TOBACCO CONTROL POLICIES AND NORMS IN RURAL MICHIGAN: A FOCUS GROUP STUDY

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Significance Tobacco use is a significant issue in the rural United States. For example, according to national survey data, 27.8 percent of rural residents smoke, compared to 22.7 percent of urban dwellers and smokeless tobacco is used at almost 2x the rate in rural communities as opposed to urban communities. Community-level norms, beliefs, industry marketing and policies all contribute to high tobacco use rates. This study seeks to describe the complex intersection of norms, marketing exposure and beliefs on both tobacco use behavior and on perception and implementation of current and possible tobacco control policies. **Methods** We completed focus groups in eight counties in rural Michigan. All counties were rural and were selected based on two criteria: Whether they were or were not adjacent to a county with a metropolitan statistical area and did or did not have a significant tourism economic base. We interpreted the data using an iterative, qualitative, thematic analysis. **Results** Primary themes were, Independence; Respect; Social Context; and Economic Calculus. People in our rural contexts preferred to smoke with friends as opposed to family. Issues of respect and protecting children were perceived by participants as acceptable rationale for tobacco control policies. Policies focused on point of sale tended to be perceived as irrelevant. Tobacco control policies were problematic when they were not perceived to be respectful. Policies themselves played a significantly role in perception of tobacco-use norms. **Conclusion** Policy development and implementation must include significant community representation and participation in rural communities. Community involvement may increase perceptions of respectfulness and legitimacy. For example, policies that can be shown to protect children or vulnerable populations may be more socially acceptable and therefore effective. The link between policy and norms was strong, at least in counties similar to those we recruited from in Michigan, suggesting that policy implementation may significantly affect smoking behavior through norms.

FUNDING: Academic Institution

POS1-157

INEQUITY IN SMOKEFREE WORKSITE POLICIES IN CALIFORNIA

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California was first to amend its state Labor Code requiring employers to prohibit smoking in enclosed workplaces. Widely perceived as comprehensive at the time, the 1994 law had many exemptions. In a legal epidemiologic study, we coded efforts by cities and counties (536 of 539) to close 19 loopholes in smokefree workplace laws. Double coding indicated 87% inter-rater agreement. Linking policy coding with census data for jurisdictions and 2014-16 county smoking prevalence, we hypothesized that early adopters in closing the loopholes would be nonrural jurisdictions with larger populations, higher income, and greater % non-Hispanic White residents, and at the county level, lower smoking prevalence. The jurisdictions averaged 5.9 loopholes closed (SD=5.4, Med=4, R:0-18). The most common loophole closures were for recreational spaces (67%), hotel common areas (46%), small businesses (43%) and vape shops (43%). Less common were smokefree air protections for family daycares (6%), community streets/districts (10%), theatres/playhouses (15%) and tobacco shops (18%). Rural jurisdictions closed fewer loopholes (Med 2 v 5), and loophole closure scores (LCS) positively correlated with logscales for population size ($r=.26$), median household income ($r=.30$) and %White ($r=.18$, $p<.001$). Weighting jurisdiction LCS by population size aggregated to the county level (N=58), LCS negatively correlated with smoking prevalence ($r=-0.49$, $p<.001$). In June 2016, California state law closed 5 of the 19 loopholes, raising the mean LCS to 8.8 (Med=7.8) and reducing variation between jurisdictions (SD=3.7). Jurisdictions benefitting the most were less populated ($r=-0.26$), with lower income ($r=-0.28$) and fewer %White ($r=-0.17$, $p<.001$). Rural areas had more loopholes closed by the state (Med 4 v 2), and LCS aggregated at the county level correlated positively with smoking prevalence ($r=.44$, $p<.001$). Early adopter jurisdictions tended to be nonrural, more populated, more affluent and non-Hispanic white. Recent statewide efforts reduced inequity in workplace smokefree policies. Remaining loopholes need attention. With direct relevance to California, the findings have national significance.

FUNDING: State

POS1-158

NEARLY TWENTY-THOUSAND E-LIQUIDS CLASSIFIED BY FLAVOR: AN OVERVIEW OF THE DUTCH MARKET

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Significance E-liquids are available in a wide variety of flavors. It is important for regulators to monitor this market, as some flavors seem to be harmful or increase attractiveness for specific consumer groups (e.g. adolescents). Systematically classifying e-liquids by flavor helps to structure the huge variety in market supply, and can serve as a tool for policy makers in developing rules for flavor regulation. According to the European Tobacco Product Directive, e-liquid manufacturers are required to provide data on the branding and composition of products they have marketed in each member state. This study aims to provide a comprehensive overview of e-liquid flavors available on the Dutch market, by analyzing data from manufacturers. **Methods** Two independent reviewers classified 19.266 e-liquids (available on the Dutch market on 30 November 2017) according to flavor, using the following information from the European Common Entry Gate: brand name, subtype name, product identification, and general comment. E-liquids were classified using a standardized approach based on our recently developed e-liquid flavor wheel. Subsequently, the number of products and subcategories were identified for the sample as whole and for each main category. **Results** Based on available information, 16.300 (85%) e-liquids could be classified in one of the 16 main categories of the flavor wheel. The largest main categories were *tobacco*, *fruit-other*, and *fruit-berries*, containing 2.667, 2.507, and 2.164 e-liquids, respectively. Within each main category, except for *unflavored*, multiple subcategories were defined, ranging from 4 (*spices*) to 46 (*desserts*), with 246 subcategories overall. **Conclusion** More than two-hundred subcategories were created to classify the huge variety of e-liquid flavors on the Dutch market. In addition to previously described flavor categories, various uncommon flavors were found, such as sandwich, buttermilk, cucumber, raisin, honeysuckle, cannabis, cactus, and lavender. This overview of available flavors can be used in future research to identify common flavoring ingredients within each of the categories.

FUNDING: Federal

POS1-159

DIFFERENTIATION BETWEEN TOBACCO PACKAGES AMONG YOUTHS AND YOUNG ADULTS IN NORWAY AND THE ASSOCIATION TO SMOKING AND SNUS USE SUSCEPTIBILITY

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Background: A focal goal of marketing is to make a product different from other similar products in ways that matter for the preference of buyers. This can involve any aspect of the product, including packaging and features unrelated to the material product. Particularly in markets where products are similar and advertising is restricted or prohibited, product and packaging design is important for consumers' differentiation of tobacco products. We analysed the association between differentiation between tobacco packages/brands and smoking and snus use susceptibility. **Methods:** We collected data in a web survey among 1200 youths aged 16-21 (55% female). The participants answered questions about experience with tobacco use and about differentiation between packages as regards appeal, perceptions of harm and addictiveness and ease of quitting. **Results:** Preliminary analyses showed that smoking susceptible respondents more often agreed to statements like 'Some cigarettes are easier to smoke than others' (susceptible 49% agreed, non-susceptible 9%), 'Some cigarettes have better looking packs than others' (susceptible 63% agreed, non-susceptible 37%), 'Some cigarette brands have more harmful content than others' (susceptible 31% agreed, non-susceptible 14%) and 'Some cigarette brands are more addictive than others' (susceptible 14% agreed, non-susceptible 7%). A similar pattern was evident as regards differentiation between snus packages among snus use susceptible respondents. Smoking susceptibility was also associated with more differentiation between snus packages/brands, and similarly, snus use susceptibility was also associated with more differentiation between cigarette packages/brands. **Conclusion:** Differentiation between tobacco packages/brands was associated with smoking and snus use susceptibility. This supports the assumption that removing package designs through standardized packaging policies has the potential to reduce tobacco use among young people.

FUNDING: Academic Institution



SRNT

POS1-160

TRENDS IN THE DUAL EPIDEMICS OF LUNG CANCER AND SMOKING, CALIFORNIA COMPARED TO THE REST OF THE UNITED STATES

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Significance: Cigarette smoking causes lung cancer, the leading cause of cancer death worldwide.

California's Tobacco Control Program, launched in 1989, focused on changing social norms around smoking, particularly regarding secondhand smoke and youth initiation. The program lost impetus in the 2000s. Other US programs started later and focused on smoking cessation. This research aims to compare trends in smoking behavior (initiation, smoking intensity, and quitting) and lung cancer mortality before the rise of e-cigarettes in California and the rest of the US.

Methods: Smoking behavior was taken from the 1974-2014 National Health Interview Surveys (NHIS) with 962,174 respondents. Time trends in smoking behaviors were compared using spline regression analyses with a knot at year 2000. Lung cancer mortality data for 1970-2013 was obtained from the national Surveillance, Epidemiology, and End Results (SEER) Program. The main outcome measures assessed were trends in age-specific smoking initiation, cigarette consumption, quitting, and lung cancer mortality rates in California and the rest of the US.

Results: Before the year 2000, the California Tobacco Control program was associated with major declines in smoking initiation, smoking intensity and increased quitting among those aged < 35 years. After 2000, Californian rates of change slowed. In 2012-14, among Californians under age 35 years, only 18.6% (95% CI, 16.8%-20.3%) had ever smoked, and smokers consumed only 6.3 cigarettes/d (95% CI, 5.6-7.0). Further, 45.7% (95% CI, 41.1%-50.4%) of ever-smokers had quit by age 35. Each of these metrics was at least 24% better than in the rest of the US. There was no marked California effect on quitting or intensity among seniors.

From 1986-2013, annual lung cancer mortality decreased more rapidly in California and by 2013 was 28% lower (62.6 vs 87.5/100,000) than in the rest of the US.

Conclusion: The 20 year faster decline in lung cancer in California reflects earlier trends in smoking initiation. The Tobacco Control Program was most effective with young Californians. It reduced initiation and cigarette consumption while increasing cessation by age 35 years. Unless the e-cigarette phenomenon changes future smoking rates, lung cancer mortality should be dramatically lower in California when these young people enter the at-risk years.

FUNDING: State; Nonprofit grant funding entity

POS1-161

SMOKING AND CIGARETTE PACK SIZE: EVIDENCE FROM 75 COUNTRIES 2007-2014

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Significance: There is debate regarding the effectiveness of small pack size on reduced cigarette smoking. Small packs may encourage youth and individual of lower income smoke. Alternatively, small packs could benefit some smokers by regulating their cigarette consumption. Our study provided global evidence on the association between cigarette pack size (minimum pack size (MPS) \leq 10, variety of pack sizes available on the market, and sales of loose cigarettes) and cigarette smoking among adult population by utilizing global databases from 75 countries. **Methods:** The information on cigarette pack size regulations, cigarette price, six MPOWER scores, and country economic conditions during 2007-2014 came from the WHO MPOWER datasets and the World Bank data. Annual smoking prevalence and cigarette consumption were from Euromonitor International country reports. The datasets were aggregated and linked using country and year identifiers. Fractional logit regression and ordinary least squares methods were applied to examine the associations between pack size regulations and smoking prevalence and cigarette consumption, controlling for country-level GDP per capita, cigarette price, percent population aged 15-64, percent population aged 65 and over, MPOWER policy scores, country fixed effects, and year indicators. **Results:** Our findings suggest that larger MPS is associated with lower smoking prevalence. In addition, larger

MPS is significantly associated with lower cigarette consumption. Availability of single cigarette is significantly associated with increased cigarette consumption. Conclusion: Prohibiting the sale of cigarettes in individual or small packages may potentially reduce cigarette smoking.

FUNDING: Federal

POS1-162

A DELPHI STUDY AMONG AN INTERNATIONAL EXPERT PANEL TO DEVELOP WATERPIPE SPECIFIC HEALTH WARNING LABELS

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Significance: Waterpipe (WP) smoking is increasing globally. The rise of WP has been fueled by widespread misperception of reduced-harm compared to cigarettes. Health warning labels (H WLs) are one strategy to communicate smoking-related risks and address reduced-harm misperceptions. Therefore, the development of WP-specific H WLs represents a priority for WP control.

Methods: A group of experts in WP science developed 28 WP-specific H WLs corresponding to five themes (health risks, addiction, harm to others, WP-specific harm, WP harm compared to cigarettes). Then, an online 3-round modified Delphi study was conducted among international expert panel (n=30; 40% male) to reach consensus on a set of the most effective H WLs for each theme. Participants were instructed to view the H WLs in each theme and rank them in order of importance to their effectiveness (from 1 most important, to 5 least important) and were given this prompt: "To aid judgment of importance you may want to consider the effect of the H WLs in term of: attention (notice, general design); communication (clarity, understandability, believability); and effect (e.g. harm perception, intention to quit). Levels of agreement between experts were assessed using interquartile deviations (IQD), and the rank between the tied H WLs was based on the median. **Results:** Starting with 28 H WLs stratified according to five WP-related themes, our international expert panel reached consensus on the 13 most effective WP-specific H WLs (IQD is less than 2). Labels with the highest agreement were related to oral and heart disease, WP's harmful effects on newborn children, and the amount of smoke inhaled from WP compared to cigarettes (IQD ranged from 0 to 0.75). **Conclusion:** This study is the first to systematically develop and evaluate potential WP-specific H WLs based on the scientific evidence about WP's harmful effects, scientific understanding of H WL for cigarettes, and the opinions of experts in WP science, tobacco control, and health communication. The final selected H WLs can be adapted based on the context and policy landscape of the target country, and can be further fine-tuned based on feedback from WP smokers and nonsmokers.

FUNDING: Federal

POS1-163

LOW AWARENESS OF HARMS OF SECONDHAND SMOKE AMONG NON-SMOKERS: FINDINGS FROM THE ITC PROJECT

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Significance: Globally, secondhand smoke (SHS) causes 600,000 premature deaths annually. SHS causes many diseases including lung cancer, heart disease, and respiratory problems. Although some research has focused on smokers' beliefs, awareness, and behavior regarding smoking in public places, there has been limited research on awareness of the harms of SHS among non-smokers, and no research on this topic across different low- and middle-income countries (LMICs). This study assessed the level of awareness of the harms of SHS among non-smokers and their exposure to SHS across five LMICs of the International Tobacco Control (ITC) Project. **Methods:** Data



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came from longitudinal surveys conducted by the ITC Project, i.e., Bangladesh (BD, 2014-15), China (CN, 2013-15), India (IN, 2012-13), Kenya (KE, 2012), and Zambia (ZM, 2014). Non-smokers were asked whether SHS causes heart attack, lung cancer, asthma in children, COPD, tuberculosis (TB), and harm to an unborn child. Self-reported exposure to tobacco smoke was also gathered. Analyses adjusted for gender, age, and time-in-sample. **Results:** Knowledge of the harms of SHS among non-smokers varied widely across countries. The percent of non-smokers who didn't know that SHS causes various harms ranged as follows: harm to unborn child ranged from 50% in ZM to 11% in BD; COPD from 45% in ZM to 15% in CN; heart attack from 40% in CN to 12% in BD; asthma in children from 34% in ZM to 8% in BD; lung cancer from 33% in ZM to 10% in BD; and TB from 32% in ZM to 10% in BD. Percentage of non-smokers exposed to SHS in restaurants ranged from 82% in BD to 2% in ZM; in bars from 79% in IN to 51% in ZM; at workplace from 48% in CN to 8% in ZM; at home from 51% in CN to 7% in ZM; and in public transportation from 40% in BD to 4% in KE. **Conclusions:** Knowledge of the harms of SHS among non-smokers and exposure to tobacco smoke varied considerably across the five LMICs. Non-smokers exposure to tobacco smoke in various venues ranged from low to very high. There is need to educate the public about the harms of SHS coupled with strengthening the enforcement of comprehensive smoke-free laws to protect non-smokers from exposure to tobacco smoke.

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POS1-164

HEALTH, LAW, AND INDUSTRY: "BIG TOBACCO" AND THE BATTLE TO MAKE SOUTH AFRICA TOBACCO FREE

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Significance: Strong tobacco control legislation curbs tobacco use globally. South Africa, a pacesetter in tobacco control in Africa, is currently behind her peers in tobacco control. In May 2018, a new bill, the *Control of Tobacco Products and Electronic Delivery Systems Bill* was opened for public comments. This study maps tobacco control legislation in South Africa and explores the current tobacco control temperature in the country in relation to policy formulation and industry interference. **Methods:** A comparative analysis of three tobacco control documents: the WHO Framework Convention on Tobacco Control (FCTC), and two South Africa's legislative documents (the new bill and the Tobacco products control Act 83 of 1993 amended 2003) was done. Also was a systematic search of online newspaper articles published from May 2017 to August 2018 and related to tobacco control legislation in South Africa. Fifty-five articles were retrieved. Thematic analysis of the content of these articles was done to highlight the aspects of South Africa's tobacco bill being targeted and discursive strategies used. **Results:** South Africa's new tobacco control bill better complies with FCTC requirements. The tobacco industry and its third party allies have launched an attack on the new tobacco control bill in South Africa. The industry is working to turn the public against the bill through the Tobacco Institute of South Africa, and the Fair-trade Independent Tobacco Association as well as through front groups and third party allies. Groups which have spoken against the bill in the "language" of the tobacco industry include Free Market Foundation, Agri-SA, Food and Allied Workers Union, South African Spaza and Tuckshop Association, South African Informal Traders Association. Japan Tobacco International also carried out a "HandsOffMyChoices" campaign in traditional and new media against the bill. Some of the discursive strategies being employed against the bill include: highlighting negative economic consequences, scare tactics involving highlighting the punishment for contravening the law and mobilizing professionals to speak against the content of the bill. **Conclusion:** South Africa is a strategic country in sub-Saharan Africa to both public health and the tobacco industry. There is need for international tobacco control partners to give the needed helping hand to South African researchers and tobacco control advocates to counter the industry's strategies deployed to oppose the new bill, if gains made on tobacco control in other parts of Africa are to be consolidated.

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POS1-165

DISPARITIES IN RURAL TOBACCO USE AND BEST PRACTICES POLICIES

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Significance: In rural areas of the U.S., tobacco related disparities are manifest in that rural populations are not experiencing the recent declines in tobacco use that are occurring in other populations. Rural residents have higher age-adjusted death rates

that likely, in part, can be attributed to tobacco use. This presentation describes tobacco related disparities in best practice policies, specifically tobacco-free policies and tobacco taxes, and rural tobacco use. **Methods:** A health librarian-assisted literature search using PubMed, Web of Science and Google, with limits of the past 10 years and the English language, was conducted to identify articles describing disparities in best practice policies, tobacco use, and tobacco-free environments. In addition, we analyzed the relationship between the rural status of states and state cigarette excise taxes using the Pearson correlation coefficient. **Results:** Tobacco control policies benefit urban areas more than rural areas. In a study of 10 states, urban areas were more likely to have strong smoke-free laws. Workplace policies and smoke-free parks are less common in rural areas. In some states, rural residents were less likely to have smoke-free homes. A significant correlation was found between lower state cigarette tax rates and rurality ($p = 0.003$). Most recent data sources identified tobacco use prevalence in rural populations as higher than in non-rural areas with differences varying by regions. Rural residents smoke more cigarettes per day and smokeless tobacco use is double. Adolescent smoking is directly related to rurality. Rural children are more exposed to secondhand smoke. **Conclusion:** Of the best practices discussed in this paper, protecting people from secondhand smoke, through public or workplace policies, such as statewide comprehensive tobacco free laws or tobacco-free parks, is essential to improve rural health. Increasing tobacco excise taxes is highly recommended to reduce rural consumption. An issue of social justice arises when the disparity of tobacco related policies and tobacco use in rural areas results in rural populations disproportionately suffering the adverse health effects of tobacco. Best practice policies exist that can and should be implemented to address this disparity.

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POS1-166

EXPLORING RETAILERS' EXPERIENCES IMPLEMENTING CHICAGO'S MENTHOL CIGARETTE SALES BAN

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Local ordinances to restrict flavored tobacco sales, such as menthol cigarette bans, are a growing policy approach in the United States. However, limited attention has been given to retailers' implementation of such bans. Effective February 2017, Chicago was one of the first US cities to ban menthol cigarette sales as part of its partial ban on flavored tobacco sales in stores within 500 feet of high schools. In August 2017, semi-structured interviews were conducted with retailers in 31 affected stores to explore how they managed ban implementation and their opinions on the partial ban, specifically the menthol cigarette restriction. Data were coded using an inductive approach and transcripts compared to identify major themes and patterns across store type. Results suggest that retailers in smaller convenience stores and gas stations were concerned about perceived profit losses in part due to their inability to serve as a "one stop shop" for customers who purchase menthol cigarettes along with other products. Stores managed these concerns by increasing tobacco and non-tobacco products offered and, in some cases, non-compliance with the ban. Retailers saw the government as their main information source. Yet, many felt existing guidance on what was a flavored or menthol cigarette product was incomplete and ambiguous, sometimes leading to non-compliance. Other retailers viewed tobacco representatives as allies who supported store implementation efforts (e.g. breaking menthol cigarette contracts). Finally, retailers questioned whether the 500 feet buffer zone changed access to menthol cigarettes and suggested more equitable approaches to reduce product use, such as a comprehensive, city-wide ban. Findings suggest that a partial ban on menthol cigarette sales may disproportionately impact the financial viability of affected stores while making limited gains in reducing access to menthol cigarettes. Results highlight opportunity for local jurisdictions to actively build partnerships with retailers to capitalize on their potential support for more comprehensive efforts tobacco control efforts and enhance compliance by addressing retailers' implementation needs.

FUNDING: Federal; Academic Institution



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EFFECT OF A SIMULATED MENTHOL BAN ON SMOKING BEHAVIOR

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Significance: With the Food and Drug Administration considering regulating menthol flavoring in tobacco products, it is important to determine the effect that banning menthol in cigarettes would have on the smoking behavior of current menthol cigarette smokers. **Methods:** In this study, 122 African American smokers of menthol cigarettes were randomized to either continue smoking menthol cigarettes (n=60) or to switch to non-menthol cigarettes (n=62) for a one month period. At the end of the month, smokers made a cessation attempt. The primary endpoint was time to lapse. Additional endpoints included number of cigarettes smoked, motivation and self-efficacy to quit, and support for a ban on menthol. **Results:** During the pre-quit period, those in the non-menthol group smoked about 1.4 fewer cigarettes per day than those in the menthol group (controlling for baseline) (p=0.08). Of the four motivation and self-efficacy to quit measures assessed during the pre-quit period, there were no differences between the two groups in three of the measures although those randomized to the non-menthol condition reported higher scores on the question "How effective do you believe your skills are for quitting smoking?" (p=0.05). There was no difference between groups on the degree to which participants supported a ban on menthol and support for a menthol ban did not decrease as a result of participating in this study. Support for a ban (on a 10 point scale) at baseline and after one month of assigned cigarettes was 5.46 (3.4) vs. 5.94 (3.3) in the menthol group and 5.68 (3.4) vs. 6.28 (3.3) in the non-menthol group. The hazard ratio for time to lapse was 0.82 (non-menthol relative to menthol; p=0.33) with median time to lapse in the menthol group being 1.07 days vs. 2.55 days in the non-menthol group (p=0.08). **Conclusions:** These data suggest that no greater harm resulted from the elimination of menthol cigarettes and that there may be some benefits. Further research is needed to determine if any early benefits of switching to non-menthol cigarettes can be extended long-term.

FUNDING: Federal; Nonprofit grant funding entity

POS1-168

EVALUATING THE IMPACT OF DULUTH'S MENTHOL RESTRICTIONS ON MENTHOL TOBACCO AVAILABILITY AND MARKETING

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Significance: Menthol is associated with greater smoking initiation among young people and reduced cessation among adults. One viable policy option to reduce access to menthol is restricting sales of menthol tobacco products at the local level. In February 2018, the city of Duluth, Minnesota was one of the first U.S. cities to pass an ordinance restricting the sale of all flavored tobacco products, including menthol, to adult-only tobacco shops. The policy went into effect in June 2018. The primary aim of this study was to evaluate policy compliance and assess changes in marketing of menthol tobacco products. **Methods:** A quasi-experimental design was used to assess policy impact. Assessments of a random sample of intervention stores in Duluth (n=46) were drawn from the city's tobacco licensing lists and compared to exempted adult-only tobacco shops (n=3) as well as a random sample of tobacco retailers (n=18) in the comparison city of Mankato. Observations were conducted approximately one month prior to and two months following policy implementation. Pre-post changes in the availability and marketing of menthol, mint, and wintergreen tobacco products were assessed. **Results:** Study findings indicated that 98% of intervention stores assessed in Duluth were compliant with the menthol restrictions. Duluth intervention stores had significantly less availability of menthol, mint, and wintergreen tobacco products post-policy implementation compared to Mankato (2.2% vs. 100.0%, p<.001). No changes in menthol tobacco availability were observed in the exempted tobacco shops. There was also a significant decrease in the mean number of outdoor ads and promotions for menthol products (cigarettes, little cigars/cigarillos, e-cigarettes, and smokeless combined) (0.3 vs. 0, p<.01). No products with ambiguous names or menthol replacement products were observed. **Conclusions:** Study findings suggest that policies designed to restrict the sale of menthol tobacco products can limit the availability of menthol as well as reduce menthol tobacco marketing at the point of sale. Ongoing retailer compliance inspection is warranted to ensure that policies are implemented as intended.

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POS1-169

DEVELOPMENT AND TEST OF A SCALE OF COMMUNAL COPING FOR SMOKING CESSATION IN DUAL-SMOKER COUPLES

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Dual-smoker couples are a highly prevalent group who report low motivation to quit smoking. Because smoking habits are tightly woven in couples' daily lives, successful quit attempts and maintenance are highly contingent on the partner—dual-smoker couples must consider what their smoking-related habits mean not only for themselves but for their partner and for their relationship. Our previous research identifies the relationship context as an important factor that might moderate interventions in this group of smokers. However, most research on relationship context has focused on support, a construct largely evaluated in a unidirectional manner with a focus on how one person attempts to help the other. Building on past theoretical and empirical research on dyadic health behavior change, we suggest that communal coping is an instrumental mechanism involved in health behavior change. Communal coping includes dyads' shared appraisal of a health threat as well as their strategies to address the threat. We proposed and evaluated a new scale to measure communal coping for smoking cessation, the Communal Coping for Smoking Cessation Scale (CCSCS). We tested the scale in the context of dual-smoker couples (N = 238) and found the best fit for the scale comes from a three-factor model considering the frequency of, confidence in, and perceived effectiveness of communal coping strategies. We evaluated hypothesized antecedents (e.g., relationship quality, smoking history) and consequents (e.g., self-efficacy, motivation to quit) of communal coping using the CCSCS and found preliminary support for its value as an assessment tool. The development of a tool for measuring communal coping in smoking cessation opens the door to better understand how dyadic processes are involved in health behavior change, particularly among the high-risk group of dual-smoker couples.

FUNDING: Federal

POS1-170

BUTTING OUT: A QUALITATIVE ANALYSIS OF RESPONSES TO TOBACCO PRODUCT WASTE

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SIGNIFICANCE: Of the more than five trillion cigarettes smoked each year, around three quarters are discarded, making tobacco product waste (TPW) the most commonly littered item in the world. Non-biodegradable cellulose acetate filters create large quantities of environmental waste and impose significant costs on local authorities. Understanding support for different waste management interventions would provide important guidance to policy makers. **METHODS:** We used social media platforms and community advertising to recruit participants whose demographic attributes and smoking behaviours varied. Using in-depth interviews, we probed how New Zealand smokers (n=16) and non- or former smokers (n=18) evaluated eight measures located at different points on a personal-to-producer responsibility continuum. These allocated the responsibility and costs of managing TPW to different actors and ranged from fines on smokers to levies on tobacco companies. **RESULTS:** Non-smokers typically favoured interventions that punished smokers for discarding butts, such as fines or levies added to the cost of tobacco but refunded when smokers returned butts in a pack. Non-smokers also supported increasing smoke-free areas to reduce butt littering. Smokers were less likely to support these measures and more likely to support population wide education or social marketing. Although both groups recognised tobacco companies' role in creating TPW, only a minority thought measures holding the industry to account would succeed and most believed the industry was likely to pass on costs to smokers or litigate to challenge the policy. **CONCLUSIONS:** Despite knowing filters are not bio-degradable, tobacco companies have relocated responsibility for TPW to smokers and refused to accept accountability for their products' environmental effects. Our findings suggest these arguments have influenced smokers and non-smokers, who seldom associate TPW with tobacco companies. A two-stage process, beginning with a social marketing strategy, could foster public support for policies that hold the tobacco industry accountable for its products and practices, and support the eventual introduction of those policies.

FUNDING: Academic Institution



POS1-171

FRAMEWORK TO REPORT TOTAL PARTICULATE MASS AND ALDEHYDE EMISSION CHARACTERISTICS FROM HOOKAH

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Significance: An emissions reporting framework is used to describe the effect of flow conditions on Total Particulate Matter (TPM) and aldehyde emissions from hookah. We propose metrics for reporting results from laboratory emissions testing of hookah. The framework quantifies the yield of compounds delivered to a hookah user as a function of user topography and consumption characteristics, providing a tool for population-level estimates of toxicant exposure from hookah use. **Methods:** Laboratory emissions testing was conducted with the PEST™-2 emissions system on an ELITE™ brand hookah filled with Al Fakher™ brand Two Apple flavor tobacco shisha and heated with one coal of Starlight™ brand instant light charcoal. Four repeated trials of nine flow conditions spanning three flow rates (150, 200, 250 mL/s) and three puff durations (2, 3.5, 5 s) were conducted to capture TPM and Formaldehyde, Acetaldehyde, Propionaldehyde, Butyraldehyde, Benzaldehyde, Acetone and Acrolein emissions. Emissions were collected using filter pads in series with parallel side-stream sorption tubes. Gravimetric, GC-MS and LC-MS analyses were conducted to evaluate the yield of each constituent for each condition. **Results:** Temperature, puff flow rate, gas phase sampling flow rate, and cumulative volume are presented as a function of time for data representative of 34 hookah emissions trials of nominally 50 minutes duration. TPM emissions are reported on 6 to 25 filter pads and nicotine emissions are reported up to 5 samples per trial to illustrate the dynamic behavior of hookah emissions. Cumulative gas phase emissions of constituents are reported once per trial. **Conclusions:** Aggregate results of all trials are presented to illustrate relationships between mass concentration (mg/mL) and mass ratio (mg/mg) of each constituent per volume of aerosol and unit mass of TPM respectively. TPM yield correlates well with shisha consumed ($R^2=0.79$) and jointly with cumulative volume and puff flow rate ($0.72 < R^2 < 0.88$) while relatively independent of puff duration. The concentration and mass ratio of gas phase compounds are shown to variously depend upon puff flow rate and puff duration.

FUNDING: Unfunded; Federal; Academic Institution

POS1-172

SOURCING ILLICIT CIGARETTE PACKS FOUND IN URBAN RETAIL LOCATIONS

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Significance: Knowing the sources and channels of illicit trade can help create policies to reduce it. Tobacco companies have used illicit trade to introduce products to new markets and avoid taxation. The industry lobbies against tobacco control efforts by warning about lost tax revenue from increased illicit trade. This study investigates the source and channel of illicit cigarette packs in urban retail locations in 2013 and 2015/2016 within nine countries (Bangladesh, Brazil, China, India, Indonesia, Philippines, Russia, Thailand, Vietnam) across four WHO regions. **Methods:** The Tobacco Pack Surveillance System (TPackSS) systematically collects unique cigarette packs sold in low- and middle-income countries with high tobacco use. In 2015-16, TPackSS returned to countries that changed their health warning regulations since a 2013 pack collection. In each country, one vendor in each of 12 low, middle, and high socioeconomic areas in 3 major cities (4 in India in 2016, 5 in China) was sampled and unique packs were purchased. The absence of country health warning labels was used to identify illicit packs. Information available on the cigarette packs was used to identify where packs originated from. **Results:** The 2013 sample of 2,034 packs and the 2015-16 sample of 2,337 packs both found that 19% of the country unique collected packs were illicit, ranging from 0% (Brazil, Indonesia, 2013; Russia, 2015) to 71% (Bangladesh, 2013). Across the two samples there were 827 illicit packs. 328 packs (40%) had "duty free" or "duty not paid" statements despite being purchased outside of a duty free store. 27 packs (3%) were to be sold in a specific country. Almost half of those packs were intended for the Gulf countries, but found in Bangladesh. Other packs in Bangladesh were intended for Guinea, Ivory Coast, and Mauritania. Packs intended for the Philippines and Thailand were found in other nearby countries. **Conclusions:** This study is limited by the use of information available on the pack, which can be misleading or intentionally wrong. Strong supply chain surveillance (e.g. track and trace) and international cooperation can help to reduce the prevalence of illicit cigarettes.

FUNDING: Other

POS1-173

PRICES AND CROSS-BORDER CIGARETTE PURCHASES IN THE EU: EVIDENCE FROM DEMAND MODELING

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Background: Previous studies of cross-border cigarette purchases in the European Union (EU) relied on survey-reported data. Results of those studies might be affected by under-reporting of tax avoidance in those surveys. This study aims to shed light on the effects of cigarette price differences between EU Member States on cross-border cigarette purchases using a method that is free from potential reporting bias. The European Commission is currently in process of revising its Tobacco Tax Directives, making this analysis of the impact of cigarette prices on cross-border cigarette purchasing timely and germane.

Data and Methods: 2004-2017 pooled time-series data and econometric modelling are used to examine cross-border shopping in the EU. Incentives for cross-border shopping are measured as a function of differences in cigarette prices between bordering countries, controlling for population density near borders. Separate incentive variables are calculated for EU internal versus EU external borders and for terrestrial versus maritime borders. Tax-paid cigarette sales are modelled as a function of cigarette price, per capita income, non-price tobacco control measures, and the incentive variables using fixed-effects models. This method was developed by Becker and colleagues in 1990 and applied in other studies on US data, but was previously never used to study cross-border shopping across the entire EU.

Results: The estimated price elasticity of cigarette demand varies, depending on the model, from -0.47 to -0.34. Estimated income elasticity varies from 0.66 to 0.70. Between-country price differences are not significantly associated with purchases across maritime borders and across borders with non-EU neighbors. In an average EU Member State, reducing incentives from cross-border shopping down to zero would increase sales by 1.5% in an importing country and reduce sales by about 6% in an exporting country, *ceteris paribus*.

Conclusions: These findings underscore the need for further efforts to harmonize taxation within the EU, such as through increasing minimum tobacco tax rates required in the Tobacco Tax Directive. An upward convergence of cigarette prices across EU Member States would reduce cross-border cigarette purchasing and improve public health by contributing to decreases in cigarette consumption.

POS1-174

EFFECTS OF NICOTINE DOSE AND FLAVOR ON THE ACCEPTABILITY OF ELECTRONIC CIGARETTES (E-CIGS) AMONG SMOKERS PARTICIPATING IN A RANDOMIZED CONTROL TRIAL TO REDUCE CIGARETTE CONSUMPTION

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Significance: It is unclear which factors influence acceptability and use of electronic cigarettes (e-cigs) among cigarette smokers interested in reducing their smoking. This study examines the effects of e-cig nicotine concentration and flavor on satisfaction with e-cig use and associated side effects.

Methods: Smokers naïve to e-cig use participated in a double-blind randomized placebo-controlled trial to evaluate the effects of e-cigs. Participants received an eGO style e-cig battery and were randomized to receive cartomizers containing either 0mg, 8mg, or 36mg nicotine liquid or a control condition (cigarette substitute; not included here). E-cig liquid flavor was participant chosen (tobacco, menthol). E-cig use (puffs per day, PPD) and cigarette use (CPD) from the past 7 days and self-reported measures of satisfaction with e-cig use and associated side effects (throat irritation, headache, dry mouth, etc.) were measured at 1, 3, and 6-month follow-up visits. Sum scores for satisfaction with use (0-24) and side effects (0-36) were modeled using linear mixed effects models after controlling for demographics, baseline CPD, average CPD and e-cig PPD at each follow-up visit, e-cig flavor, e-cig dose, and visit indicator variables.

Results: Participants (n=390) were 41.8% male, 69.0% white, and aged 46.5 years. At 1-month, the mean (SD) satisfaction sum score was 11.3 (6.2) and the mean side effects was 5.8 (5.3). E-cig dose and flavor were not significantly associated with satisfaction however greater e-cig puffs per day ($p<.01$), and fewer CPD was associated with greater satisfaction ($p<.01$). Side effects for menthol e-cig users were significantly lower compared to non-menthol e-cig users at all visits (all $p<.05$). Side effects were not significantly different between e-cig doses at any visit. Side effects decreased generally for all participants over time. **Conclusions:** Smokers using e-cigs to reduce smoking reported e-cig use as moderately satisfying and reported few e-cig-related side effects. Menthol users were the least likely to report e-cig side effects and side effects generally decreased over time for all users.

FUNDING: Federal



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POS1-175

DO GRAPHIC HEALTH WARNING LABELS ON CIGARETTE PACKAGES INFLUENCE CIGARETTE PURCHASES AT POINT-OF-SALE? MODERATING EFFECTS OF NICOTINE DEPENDENCE

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Significance: Graphic health warning labels (GWLs) on cigarette packages display intense images (e.g., autopsy photos) that are designed to educate about the health risks of smoking and dissuade consumers from using cigarettes. Past research has indicated that compared to text-only warning labels, GWLs are recalled more readily, associated with more negative cognitions about smoking, and perceived as having greater effectiveness for preventing smoking and helping smokers quit. However, little is known about whether GWLs deter cigarette purchasing at retail point-of-sale (POS), and how effects of GWLs may differ across subgroups of smokers. This experiment tested whether the presence of GWLs on cigarette packages deterred adult smokers from purchasing cigarettes, and whether differences in nicotine dependence moderated this relationship. **Methods:** The study was conducted in the RAND StoreLab (RSL), a life-sized replica of a convenience store that was developed to evaluate how POS tobacco advertising influences tobacco use outcomes during simulated shopping experiences. Adult smokers ($n = 294$; 65% female; 59% black; 35% white) were randomly assigned to shop in the RSL under one of two experimental conditions: GWLs present versus absent on cigarette packages. In both conditions, cigarette packages were displayed on a tobacco power wall behind the cashier counter. The outcome variable was whether participants purchased cigarettes while in the RSL. Participants also provided information on demographic characteristics and nicotine dependence (time to first cigarette) via a paper survey. **Results:** The presence of GWLs did not influence participants' purchase of cigarettes as a main effect. However, nicotine dependence acted as a significant moderator of experimental condition (significant condition*dependence interaction; $p = 0.03$), such that GWLs reduced likelihood of cigarette purchases for smokers lower in nicotine dependence, but had no effect on smokers higher in dependence. **Conclusion:** Graphic health warning labels may be more effective in deterring cigarette purchasing for some subpopulations of smokers than others. Among more dependent smokers, GWLs may not reduce cigarette purchasing at retail POS, which could limit their potential public health benefits.

FUNDING: Federal

POS1-176

THE EFFECTS OF CIGARETTE PACK INSERTS WITH EFFICACY MESSAGES ON RESPONSES TO HEALTH WARNINGS

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Background: Fear appeals theory suggests that threatening tobacco warnings may backfire in the absence of sufficient efficacy to deal with the threat. Inserts inside cigarette packs, which provide information about how (self-efficacy: SE) and why (response efficacy: RE) to quit smoking may provide a method of increasing smokers' efficacy, thereby reducing negative reactions to warnings. There has been little experimental research examining the impact of 'efficacy inserts' and no studies examining how efficacy inserts influence reactions to warnings. **Methods:** In 2018, we conducted an online experiment with 466 current adult smokers in the UK. Participants were randomised to view either four control inserts (CI) or four efficacy inserts (EI), prior to viewing either three pictorial (high threat) or three text-only (low threat) warnings mocked up on cigarette packs. After viewing the inserts, participants reported their SE and RE, as well as reactions to the warnings. All responses were on a 1-5 scale. **Results:** Although participants reported that the EI were more helpful for quitting than CI (Mean Difference (MD)=0.82, 95% CI=0.68 to 0.96, $p<0.001$), EI did not increase either SE (MD=0.05, 95% CI=−0.18 to 0.27, $p=0.7$) or RE (MD=0.11, 95% CI=−0.03 to 0.24, $p=0.5$). As expected, participants viewing pictorial warnings reported higher perceived message effectiveness (PME; $p=0.002$), negative affect ($p=0.003$) and reactance ($p<0.001$) than those viewing text warnings. Crucially, there was little evidence that efficacy insert condition influenced any of the reactions to the warnings (PME: $p=0.2$, negative affect: $p=0.6$, reactance: $p=0.2$) and there were no insert type x warning type interactions (all $p>0.3$). **Discussion:** Contrary to predictions based on fear appeals theory, viewing efficacy inserts did not impact responses to threatening (i.e. pictorial) warnings. However, this may be because the inserts did not increase SE or RE. These findings suggest that other types

of messages and interventions may be necessary to increase smokers' efficacy. More research is needed to explore the ongoing debate regarding the importance of efficacy and threat for effective fear communication.

POS1-177

OPTIMIZING WARNINGS ON E-CIGARETTE ADVERTISEMENTS

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Significance: Consumers often fail to notice health warnings on tobacco advertisements, which reduces the opportunity for risk communication. We examined the effect of visual optimizations to improve warning text recall.

Methods: We used Amazon's Mechanical Turk to recruit 1855 young adult (18-34) current e-cigarette users, ever e-cigarette users, or susceptible non-users. We conducted a between-subjects 3x2x2 factorial experiment to examine the influence of color (black text on white background [BW] vs black on yellow [BY] vs yellow on black [YB]), shape (rectangle vs novel), and signal word (presence vs absence of the word "warning"). We randomized participants to view one of 12 warnings, each containing the FDA-mandated nicotine warning text, on a fictional e-cigarette advertisement, and asked participants to recall the warning text. We coded open-ended recall responses into 3 categories: (1) recalled *nothing* from the warning text, (2) recalled *something*, and (3) recalled the *concept*. We examined the main effects of color, shape, and signal word on warning text recall using multinomial regression, adjusting for demographics, sexual orientation, and e-cigarette user status. We also examined differences in attention, aided recall, perceived message effectiveness, appeal, and intentions to use.

Results: Those exposed to BW or BY warnings were more likely than those exposed to YB warnings to recall *something* compared to *nothing* (AOR=1.6, AOR=1.5, respectively) or the *concept* compared to *nothing* (OR=1.4, BW). Those exposed to the novel shape (44.7% novel vs 37.9% rectangle; $p=.003$) or color warnings (44.5% of BY vs 41.9% of YB vs 37.5% of BW; $p=.04$) were more likely to report attention to the warning. In aided recall, those exposed to the signal word were more likely than those not exposed to select the correct response (64.0% vs 31.3%; $p<.0001$). We did not find differences across color, shape, or signal word for perceived messages effectiveness, appeal, or intentions to use.

Conclusions: Visual optimizations such as color may influence recall of warning text on a fictional e-cigarette advertisement and may be useful to consider when implementing new warnings. Future research should continue to explore variations for optimizing warnings to maximize attention to warning text.

FUNDING: Federal

POS1-178

THE BATTLE FOR LARGER HEALTH WARNING LABELS: LESSONS FROM INDIA

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Background: While tobacco control policies have been adopted across the globe, implementation continues to be a major challenge, particularly in low- and middle-income countries like India. In 2014, India's Health Minister issued a notification that would increase the size of HWLs to 85% of the front and back of each tobacco pack. Implementation, however, was delayed for more than a year as a result of industry interference. This study aimed to understand the processes and determinants that led to the successful implementation of 85% HWLs in India. **Method:** A mixed methods case study approach was used. Between June and September 2017, data were gathered from documents ($N=68$) and key informants ($N=22$) who played a key role in the passage and/or implementation of the 85% HWLs; these informants included individuals from the media, government agencies, the Supreme Court, non-government organizations and multi-lateral organizations. Questions pertaining to the tactics and arguments used by proponents and opponents were asked. Subsequently, all data were analyzed using inductive and deductive coding. **Results:** Findings showed that the appointment of a physician and tobacco control advocate as Health Minister in 2014 served as an external shock to the system, providing proponents with an opportunity for action. These proponents worked in partnership to launch a targeted advocacy campaign which focused on three complementary tactics - litigation, media advocacy and lobbying. A keen understanding of the scientific literature and the political context helped proponents frame their tactics and arguments more effectively, allowing them to ultimately defeat the rather fragmented opponents when the Supreme Court ordered the implementation of HWLs in 2016. **Conclusion:** Advocates need to equip themselves with a thorough understanding of the scientific evidence surrounding the harms of tobacco use and the



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effectiveness of the policy they are vying for. Moreover, this case sheds light on the need to cultivate a rigorous understanding of the political context, work in partnership to align strategies, and involve a skilled legal team that is prepared to battle it out in the courts.

FUNDING: Nonprofit grant funding entity

POS1-179

JUUL USE AMONG CURRENT COMBUSTIBLE TOBACCO AND E-CIGARETTE USERS

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Significance: The electronic cigarette (e-cigarette) JUUL has quickly taken over the market, capturing 72.1% of the e-cigarette market as of August 2018. JUUL is marketed as a product intended for current adult smokers looking for a satisfying alternative to cigarettes. Evidence suggests that frequent use of e-cigarettes is associated with increased likelihood for smoking cessation. Thus, it is important to understand how cigarette and other combustible users are using this product, and their reason for first trying JUUL. **Methods:** A survey of 1332 current 18-54 year old cigarette, e-cigarette, and cigar, little cigar or cigarillo (LCC) users was conducted in March to May 2018, using a probability-based panel. Using chi-square analyses we measured differences in JUUL use among demographic factors and tobacco use history. **Results:** Among current tobacco users, 15% had ever used JUUL and 12% had used JUUL in the past 30 days. Ever JUUL use and past 30 day use was most common among tobacco users younger than 35 ($p < 0.001$), men ($p = 0.006$), those with excellent perceived health ($p < 0.001$), every day and some day e-cigarette users ($p < 0.001$), every day and some day LCC users ($p < 0.001$), and cigarette smokers planning to quit in the next 30 days ($p < 0.002$). Those who were working had higher rates of ever JUUL use ($p < 0.001$), but not past 30 day use. Most adults who had ever used JUUL used the product 5 days or fewer in the last 30 days (74%). The most common reason for first trying JUUL was users were trying to quit smoking cigarettes (37%), closely followed by a family, friends or colleagues were using the product (32%). **Conclusion:** Our data indicate that although smokers may be using JUUL to decrease combustible use most were using the product infrequently, which may have implications for cessation success among smokers looking to quit.

FUNDING: Other

POS1-180

RELATIONSHIP BETWEEN NICOTINE PERCEPTIONS AND SUPPORT OF A LOW-NICOTINE CIGARETTE REGULATION AMONG CURRENT TOBACCO USERS

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In 2018, the FDA released an Advance Notice of Proposed Rulemaking to establish nicotine standards in cigarettes to sub-addictive levels. However, research indicates that the U.S. population is misinformed about the health effects of nicotine, often citing nicotine as the cause of negative health effects of cigarette use. This study explored the association between nicotine perceptions and public support for a reduced nicotine policy among current tobacco users. Survey data were collected in Spring of 2018 from a nationally representative sample of 18-54 year-old current tobacco users [i.e., cigarette, e-cigarette, and cigar, little cigar or cigarillo (LCC)] ($n=1332$). Correct nicotine addiction perceptions were defined as accurately identifying nicotine as the only addictive substance in cigarettes given a list of other constituents. Nicotine health risk perceptions were measured using two items characterizing how large a part of the health risks and cancer caused by cigarette smoking comes from nicotine itself. Perceived addiction to nicotine was measured by four items measuring agreement with statements about respondents perceived addiction to cigarettes, e-cigarettes, LCCs, and nicotine. Logistic regressions modeled differences in support for low-nicotine regulation, adjusting for nicotine addiction beliefs, health risk perceptions, perceived addiction, and demographics. Correct nicotine addiction perception was associated with a greater odds of supporting a low nicotine cigarette policy ($aOR=1.33$, $p=0.04$). Higher nicotine health risk perceptions were associated with a greater odds of supporting a low-nicotine cigarette policy ($aOR=1.66$, $p < 0.01$). Perceived addiction to nicotine was not significantly associated with support for a low-nicotine cigarette policy. Results suggest that tobacco users who believe that nicotine is addictive and tobacco users who believe nicotine is harmful

to health support a reduced nicotine cigarette policy. This evidence could inform the development of health messages to address knowledge and any misperception around the health effects of nicotine when garnering public support for such a regulation.

FUNDING: State; Other

POS1-181

PREDICTED BEHAVIOR RESPONSE TO AND SUPPORT FOR LOW NICOTINE CIGARETTE REGULATION AMONG SMOKERS

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In 2018, the FDA released an Advance Notice of Proposed Rulemaking to establish nicotine standards in cigarettes to sub-addictive levels. As the FDA's tobacco-control framework encourages smokers to switch to less harmful forms of nicotine, it is important to understand how smokers would respond to a low-nicotine cigarette policy. This study surveyed a nationally representative sample of U.S. adult current cigarette smokers ($n=892$). Respondents reported their predicted likelihood of various behaviors in the hypothetical situation where only low-nicotine cigarettes were legally available (predicted likelihood). Support for a low-nicotine cigarette policy was also examined. Separate weighted multivariate logistic models examined differences in predicted likelihood of each behavior and policy support by current (every day or some day) e-cigarette use, current LCC use, and time to first cigarette (TTFC), controlling for demographic characteristics. Current e-cigarette user had lower odds of predicted likelihood for quitting tobacco altogether ($aOR=0.507$, $p < 0.001$), and greater odds of predicted likelihood for using e-cigarettes ($aOR=5.922$, $p < 0.001$) and illegally buying high-nicotine cigarettes ($aOR=1.527$, $p=0.012$) compared to non-current e-cigarette users. Current LCC user had greater odds of predicted likelihood for smoking LCCs ($aOR=6.385$, $p < 0.001$) and illegally buying high-nicotine cigarettes ($aOR=1.487$, $p=0.022$) compared to non-current LCC users. Compared to individuals with TTFC > 60 minutes, individuals with TTFC < 5 minutes had greater odds of predicted likelihood for smoking low-nicotine cigarettes ($aOR=3.053$, $p < 0.001$), smoking LCCs ($aOR=2.001$, $p=0.009$), and illegally buying high nicotine cigarettes ($aOR=3.845$, $p < 0.001$). Current LCC users had greater odds of supporting such a policy ($aOR=3.969$, $p < 0.001$). These findings suggest that dual users and individuals with a shorter TTFC may be more likely to continue using tobacco products if a low-nicotine cigarette regulation were implemented, which may moderate the public health impact of this policy.

FUNDING: Other

POS1-182

EXAMINING TOBACCO 21 POLICIES AND THE RELATIONSHIPS TO TOBACCO USE PREVALENCE AND INTENTIONS TO USE TOBACCO AMONG A NATIONALLY REPRESENTATIVE SAMPLE OF YOUNG ADULTS

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Introduction: By age 21, 95% of US daily smokers report smoking their first cigarette. Evidence suggests that policies increasing minimum tobacco purchasing age to 21 (T21 policies) could reduce initiation rates and use among youth. Despite increased implementation of such policies at the state and local level, few studies have examined differences in tobacco use behaviors among teens and young adults living in areas with and without T21 policies. **Methods:** Data from a cross-sectional survey of a nationally representative cohort of individuals aged 15-24 years were collected in January 2017 ($n=11,263$). T21 policies were geocoded and merged with survey data. Bivariate analyses tested differences in ever use, current use, and intention to use various tobacco products based on respondents' residence in an area covered by a T21 policy. Multivariate logistic regressions modeled use behaviors by respondents' residence in a T21 policy area, controlling for demographic characteristics. **Results:** At the time of the study, 2 states and 206 localities had T21 policies enacted. In bivariate analyses, ever use of: cigarettes ($p=0.001$), any ENDS ($p=0.002$), hookah ($p < 0.001$), and any tobacco ($p=0.002$) was significantly higher among respondents living in areas with T21 policies vs. those that did not. Ever use of smokeless tobacco was lower ($p < 0.001$) among respondents living in T21 policy areas. Current use of any tobacco product was not associated with living in a T21 policy area. Intention to use tobacco products was not associated with



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living in a T21 policy area for all products except for hookah, which was higher in T21 policy areas ($p<0.001$). In multivariate models, respondents living in T21 policy areas had greater odds of ever use ($p<0.01$) and intention to use hookah ($p<0.05$), while those living in T21 areas had lower odds of ever use of smokeless tobacco ($p<0.01$).

Conclusion: Findings suggest that T21 policies have been implemented in localities where tobacco use initiation behaviors among youth and young adults are more prevalent. Future studies should examine changes in tobacco use behaviors and intentions to use tobacco before and after the implementation of T21 policies.

FUNDING: Nonprofit grant funding entity



NOTES SRNT



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NOTES SRNT



POSTER SESSION 2

POS2-1

SMOKERS' PERCEPTIONS OF RISKS AND HARM FROM SNUS RELATIVE TO CIGARETTES - A LATENT PROFILE ANALYSIS STUDY

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Significance: Certain types of smokeless tobacco (SLT) products, particularly snus, carry fewer health risks than cigarette smoking and might be able to serve as harm-reduction products for smokers. However, studies frequently find that smokers misperceive SLT and snus to be as or more harmful than smoking. This perception is often measured with a single general harm question, and research on underlying risk perceptions is limited. **Methods:** Using a sample of 256 current smokers from a cross-sectional survey, we utilized Latent Profile Analysis to examine response profiles to items that assessed perceived risk of specific health outcomes (lung cancer, heart disease, oral cancer) from snus relative to cigarettes, and their association with a single measure of harm from snus compared to cigarettes. **Results:** Three smoker response profiles emerged. Almost half (44.9%) of smokers perceived snus to be as or more risky than cigarettes for all three health outcomes (group 1), while over one third (38.3%) had an elevated perceived risk for oral cancer only (group 2). About 17% of smokers perceived snus to have lower risks for lung cancer only (group 3). Across each profile, perceived risk was highest for oral cancer, despite a lack of scientific evidence of this effect from snus use. **Conclusions:** If smokers are to consider snus for harm-reduction, efforts are needed to better inform smokers about their lower relative risks, including for particular health outcomes of interest. This study also suggests that smokers may vary in their level of need for information to correct their relative risk misperceptions.

FUNDING: Federal

POS2-2

BIOACCUMULATION OF ORGANIC COMPOUNDS FROM SMOKED CIGARETTES IN RAINBOW TROUT *ONCORHYNCHUS MYKISS*

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Cigarette butts are the most prevalent form of litter worldwide, often finding their way into our oceans and inland waterways. Since the 1980s, the World Health Organization reports that cigarette butts have consistently comprised 30 to 40% of all items collected per year in international coastal and urban cleanups. Cigarette butt filters have been shown to take up to 18 months to biodegrade under normal conditions. In addition to their persistence and prevalence in the environment, cigarette butt filters have been shown to leach toxic compounds trapped within the filter when exposed to a water source. Previous studies have demonstrated the ability for smoked cigarette leachate to exert acute toxicity when introduced to an aquatic environment. However, animal and human exposures to these potentially toxic tobacco contaminants through food chain remain unknown. Using standard fish bioassays, the bioaccumulation potential of organic compounds from smoked cigarettes in rainbow trout (*Oncorhynchus mykiss*) was assessed through one of two exposure pathways: direct exposure to leachate from smoked cigarette litter or feeding of pulverized smoked cigarette litter. A non-targeted analysis was conducted to identify chemical constituents accumulated in the fish. Notably, four organic tobacco alkaloids, nicotine, nicotyrine, myosmine, and 2,2'-bipyridine were identified in fish directly exposed to leachates from smoked cigarette litter. An average tissue concentration of 466 ng/g, 55.4 ng/g, 94.1 ng/g, and 70.8 ng/g was found for nicotine, nicotyrine, myosmine, and 2,2'-bipyridine respectively. Bioconcentration factors of 0.270, 84.2, 14.4, and 532 were calculated for nicotine, nicotyrine, myosmine, and 2,2'-bipyridine respectively. An additional 12 compounds were confirmed to be uniquely present in fish exposed to pulverized smoked cigarette litter in their diet. The data

presented in this study suggests the potential for biaccumulation of leachable organic compounds from smoked cigarette butts throughout the food chain, ultimately resulting in the potential for human exposure.

FUNDING: State

POS2-3

CHANGES IN PRODUCT USE AMONG DUAL USERS OF TOBACCO AND ELECTRONIC CIGARETTES OVER ONE YEAR FINDINGS FROM THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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Significance: Most electronic cigarette (e-cigarette) users continue to smoke tobacco cigarettes (so called "dual users.") There is little evidence indicating whether dual use sustains cigarette smoking, or serves as a bridge to other outcomes. This study evaluated the evolution of nicotine use among dual users over one year, and addressed whether dual use was a transition to other tobacco use or quitting behaviors. **Methods:** Data were analyzed from Waves 1 (2013-2014) & 2 (2014-2015) of the Population Assessment of Tobacco and Health (PATH) Study. Analyses focused on determining whether exclusive dual users at Wave 1 (n=1,076) transitioned to one of five outcomes at Wave 2: exclusive tobacco cigarette use, exclusive e-cigarette use, dual use, quit all nicotine, and other. Weighted binary logistic regression modelling was used to identify variables associated with the odds of being a continued tobacco cigarette user (i.e., exclusive smoker or continued dual user) or a non-tobacco cigarette user (i.e., exclusive e-cigarette user or quitter) at Wave 2. **Results:** Most dual users (84%) continued smoking tobacco cigarettes, with 58.4% transitioning to exclusive tobacco cigarette use, and 25.6% continuing dual use at Wave 2. Only 5.0% of dual users quit tobacco smoking, with 4.7% switching completely to e-cigarettes and 0.2% quitting all nicotine products. Daily e-cigarette use significantly increased the odds that dual users would abstain from smoking one year later compared to those who used e-cigarettes some days (OR: 2.87; 95% CI: 1.48-5.60). Daily use of tobacco cigarettes significantly decreased the odds that dual users would abstain from smoking one year later compared to those who used some days (OR 0.33; 95% CI: 0.18, 0.62). **Conclusions:** Over one year, exclusive dual users of tobacco cigarettes and e-cigarettes largely still used tobacco cigarettes. This study suggests that concurrent use of tobacco and electronic cigarettes is not a transition phase to quitting for the majority of dual users. Results suggest increasing frequency of e-cigarette use and decreasing frequency of smoking may increase the odds of dual users quitting smoking within one year.

FUNDING: Federal; Tobacco Industry

POS2-4

POTENTIAL HEALTH RISKS OF EXPOSURE TO TOXIC METALS IN E-CIGARETTES

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As the use of e-cigarettes continues to grow worldwide, research on the potential health risks associated with these devices is also increasing. The National Academies of Sciences, Engineering, and Medicine recently concluded that while e-cigarettes are not without health risks, they are likely to be far less harmful than conventional cigarettes. Because e-cigarettes generate an aerosol by heating an e-liquid with a metallic coil, a possibility exists for transfer of metals from the coil to the aerosol. There is a growing concern that e-cigarettes may be a potential source of exposure to metals. The objective of this study is to evaluate potential health risks associated with exposure to metals in e-cigarette-generated aerosol in comparison with conventional cigarette mainstream smoke using quantitative risk assessment (QRA). Metal concentrations in machine-generated e-cigarette aerosol and conventional cigarette mainstream smoke were obtained from the literature. Potential health risks were evaluated following a standard QRA process, utilizing toxicity values from regulatory sources and standard default exposure factors from the US Environmental Protection Agency (USEPA) and US Food and Drug Administration, supplemented with assumptions to estimate lifetime exposures. Cadmium accounts for over 80% of the health risk attributable to metals in conventional cigarette smoke. However, cadmium was rarely detected in e-cigarette aerosol, and other metals present in e-cigarette aerosol were reported at much lower levels than in conventional cigarette smoke. Estimated cancer risks of metals in e-cigarette aerosols did not exceed the USEPA's acceptable level of 1 in 1,000,000 and



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noncancer hazards are 100 to 10,000 times below the USEPA acceptable level. These risk estimates for metals in e-cigarette aerosols represent greater than 99% reduction compared with conventional cigarette smoke. Based on these findings, the potential health risk from exposure to metals from e-cigarettes is orders of magnitude below estimated risk from conventional cigarettes.

FUNDING: Unfunded

POS2-5

SMOKING TOPOGRAPHY CHARACTERISTICS OF THE FIRST CIGARETTE AFTER SLEEPING AND THE LAST CIGARETTE BEFORE SLEEPING

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The Pennsylvania Adult Smoking Study collected smokers' cigarette smoking topography for all cigarettes they smoked in their naturalistic environment for 2-4 days. We took advantage of the repeated measures of cigarette smoking time and identified the first cigarette people smoked after sleeping. The smoking topography characteristics of the first cigarette after sleeping were described, and their associations with some demographic and smoking behavior variables were examined. We also compared the topography characteristics of the first cigarette after sleeping with those for the last cigarette smoked before sleeping, as well as the second cigarette smoked after sleeping. For the first cigarette after sleeping, the mean/total puff volume, and mean/total puff duration for male smokers were all significantly higher than those for female smokers. The mean/total puff volume for mid-aged smokers (31-45 years old) were significantly higher than those for the younger group (30 years or younger) or the older group (46 years or older). The mean/total puff volume, as well as the mean puff flow for smokers employed full-time were significantly higher than those not employed full-time. Compared to the last cigarette smoked before sleeping, the first cigarette after sleeping had less number of puffs ($p=0.0123$) but similar mean puff volume, this lead to significantly less total puff volume ($p=0.0076$) and total puff duration ($p=0.0008$). It was also found that the second cigarette after sleeping was smoked more intensely than the first one with higher mean puff flow ($p=0.0001$), which lead to higher mean puff volume ($p=0.0096$).

FUNDING: Federal; Academic Institution

POS2-6

ADVERSE CHILDHOOD EXPERIENCES AND YOUTH CIGARETTE USE BETWEEN 2013 AND 2016: EMERGING DISPARITIES IN THE CONTEXT OF DECLINING SMOKING RATES

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Significance: Cigarette use has dropped dramatically among youth since 2013, but disparities in cigarette use persist. We examine who still smokes in the context of declining cigarette use rates, focusing on the role of adverse childhood experiences (ACEs). Using the Minnesota Student Survey (MSS), we specifically examine ACEs and cigarette use between 2013 and 2016. We assess how use rates changed, how ACEs relate to cigarette use, and the degree to which youth with ACEs now comprise the current smoking population. **Methods:** Data came from 2013 and 2016 MSS. We assessed past 30-day any and daily cigarette use statewide and among youth with no ACEs, high cumulative ACEs, and seven separate ACEs. We used descriptive statistics and multivariate logistic regression analyses. **Results:** Cigarette use significantly declined for all groups between 2013 and 2016. Youth with no ACEs exhibited the highest percent decrease in any and daily use. Youth with ACEs were more likely to report any and daily use in 2013 and 2016, adjusting for demographics and clustering within schools. Among youth with any 30-day use, the rate of ACEs significantly *increased* between 2013 and 2016. In addition, youth with ACEs disproportionately accounted for youth smoking populations in 2013 and 2016. For example, while 16% of all youth experienced parental incarceration, approximately 43% and 55% of youth with any and daily use experienced parental incarceration in 2016, respectively. **Conclusions:** Cigarette use declined between 2013 and 2016 for all Minnesota youth, but the decline among youth with no ACEs was faster than among youth with ACEs. Youth with ACEs now account for an increasingly high percent of youth smokers. In addition, youth with ACEs disproportionately account for all youth smokers, and this disproportionality has increased since 2013. Tobacco control efforts should focus on youth with ACEs, and parental incarceration is a specific ACE that warrants attention. Rates of parental incarceration

remain high in the U.S. and youth who experience parental incarceration now account for a near majority of current youth smokers. Future research should consider mechanisms for the ACE-smoking relationship and emerging tobacco products such as e-cigarettes.

FUNDING: Federal; State

POS2-7

CLIENT-PROVIDER INTERACTIONS REGARDING ENDS IN OUTPATIENT MENTAL HEALTH TREATMENT FACILITIES

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Significance. Individuals with mental health conditions are more likely to smoke, be more heavily nicotine dependent, and have more failed quit attempts than those without mental health conditions. As part of comprehensive cessation efforts, the New York Tobacco Control Program works with mental health treatment organizations to institutionalize the provision of tobacco dependence treatment through systems-level changes. Data on the utility and safety of ENDS is mixed and continues to emerge. There is some research on patient-provider interactions about ENDS in the medical setting, however little is known about how mental health care providers communicate with their clients about ENDS. **Methods.** In 2018, RTI conducted a mailed survey of administrators at outpatient mental health treatment organizations in New York State (n=85; RR 60.7%) and a nested sample of providers within those organizations (n=558; RR 47.9%). We asked administrators about ENDS-related policies and systems and asked providers about interactions with clients regarding ENDS. **Results.** Fewer than half of organizations (42.0%) require providers to ask clients about ENDS and document use in the client chart (43.9%). About half of providers (46.7%) ask clients about ENDS, and 50.1% of providers reported clients ask them about ENDS. When clients do not bring up ENDS, 43.4% of providers discouraged use. However, when clients brought up ENDS, 27.9% of providers discouraged use. Around 20% of providers recommend ENDS as a cessation tool or less harmful alternative to smoking, and only 38.4% of providers knew that ENDS are not FDA-approved cessation devices. **Conclusion.** As the FDA identifies and regulates alternative nicotine delivery products, it will be important to inform mental health care providers on how to communicate with their clients about emerging products. Uncertainty about whether ENDS are FDA-approved and inconsistencies in how providers encourage or discourage ENDS use with their clients provides an opportunity to educate providers. Better understanding client-provider interactions about ENDS can help inform messaging to mental health care providers.

FUNDING: State

POS2-8

PASSIVE NICOTINE EXPOSURES IN ELECTRONIC CIGARETTE VAPE SHOPS IN NEW JERSEY USA

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INTRODUCTION: Electronic cigarettes (e-cigarettes) have become popular nicotine delivery systems, providing a potentially less risky alternative to conventional cigarettes. Primary e-cigarette emissions of harmful chemicals have been shown to be lower than those of combusted tobacco, but information on second- and third-hand exposure to e-cigarette emissions, particularly nicotine, is still lacking. **METHODS:** Airborne nicotine levels in five vape shops in New Jersey were monitored for 24 hours. Indoor air nicotine was collected on a Teflon coated glass fiber filter. Stationary surfaces (e.g., countertop, wall, etc.) were wiped using a 0.1% ascorbic acid soaked KimWipe to collect deposited nicotine. In addition, several objects - pieces of glass, paper, and cloth, as well as a rubber ball, and a fur ball - were placed in the vape shops for 2 weeks to assess nicotine deposition. Nicotine collected on sample filters, wipes, and the objects was extracted with methanol and analyzed using an ultra performance liquid chromatography with tandem mass spectrometry (UPLC/MS/MS). **RESULTS:** Airborne nicotine concentrations during open hours (0.86-5.45 microgram/m³) were higher than during closed hours (0.05-1.80 microgram/m³). Surface nicotine levels were widely ranged from 4.3 to 2182 microgram/m². The tested objects exhibited considerable variability in levels of nicotine after 2 weeks of exposure. The paper surface had the highest amount of nicotine (mean=1097, SD=580 microgram/m²), followed by cloth (mean=815, SD=733 microgram/m²) and glass (mean=325, SD=548 microgram/m²). 1.4-17.5 and 0.4-1.0 microgram of nicotine had deposited on the fur ball and the rubber ball, respectively.



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CONCLUSIONS: Our study demonstrated that exhaled e-cigarette vapor generated second- and third-hand nicotine exposures in the vape shops, with substantial variability between stores. Observed airborne nicotine concentrations were within the range of levels found in second-hand smoke (1-8 microgram/m³), but measured surface nicotine levels were higher than those in studies of smokers' homes (0.06-73.05 microgram/m²). Further research is needed to characterize indirect e-cigarette aerosol exposures in other types environments, such as homes of e-cigarette users.

FUNDING: State; Academic Institution; Nonprofit grant funding entity

POS2-9

EARLY ONSET OF E-CIGARETTE USE AND FUTURE CIGARETTE SMOKING BEHAVIORS AND INTENTIONS AMONG U.S. ADOLESCENTS: A NATIONAL MULTI-COHORT STUDY

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Significance: E-cigarettes use is highly prevalent among adolescents in the US and associated with use of cigarettes and other substance use. Whether those who initiate e-cigarette use early are particularly likely to use cigarettes and other substances is not well understood. Furthermore, whether early e-cigarette use is related to future intentions to smoke is critical to public health. The objective of this study was to examine whether earlier onset of e-cigarette use was associated with greater odds of cigarette smoking, future smoking intentions, and other substance use, relative to later onset to e-cigarettes. **Methods:** Data were collected via self-administered questionnaires from 2015 and 2016 nationally representative samples of 8th grade (modal ages 13-14), 10th grade (modal ages 15-16), and 12th grade (modal ages 17-18) students (N=36,410) attending U.S. secondary schools. **Results:** Approximately three in every ten U.S. secondary school students reported lifetime e-cigarette use and 50.8% of lifetime e-cigarette users report using before 9th grade. Multivariate logistic regression analyses indicated that earlier onset of e-cigarette use was associated with significantly greater odds of cigarette smoking, future smoking intentions, drunkenness, marijuana use, nonmedical prescription drug use, and other substance use relative to later onset of e-cigarette use, after statistically controlling for relevant covariates, across all age groups. These findings were consistent across all three age groups. **Conclusions:** The present study advances our knowledge of the important role of early exposure to e-cigarettes by demonstrating that early e-cigarette use is particularly linked to cigarette, intentions to smoke, and other substance use compared to those who initiate later. These findings are important to consider alongside previous research which suggests that cigarette use and other substance use often precedes e-cigarette use (McCabe et al., 2018). This suggests that prevention programs focused on e-cigarettes should consider the use of early substances as even early initiation of e-cigarette use may be not be an adolescent's first experience with substance use. **Funding:** Supported by research grants R01CA203809, R01DA031160 and R01DA044157.

FUNDING: Federal

POS2-10

BASELINE FINDINGS FROM THE PCORI PRAGMATIC TRIAL INTEGRATED SMOKING CESSATION TREATMENT FOR SMOKERS WITH SERIOUS MENTAL ILLNESS

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SIGNIFICANCE Nicotine addiction is highly prevalent among those with serious mental illness (SMI). Recent estimates indicate that 64%-79% of those with schizophrenia spectrum disorders smoke tobacco regularly, as do 44-71% of those with bipolar disorder, and 43% of those with major depressive disorder. Clinical practice guidelines recommend all smokers be advised to quit at every visit and be offered combined pharmacologic and behavioral smoking cessation aids. Despite extensive evidence that most with SMI want to quit smoking and that first-line pharmacotherapies for smoking cessation are effective and well-tolerated in this population, few are offered evidence-based smoking cessation medication by their primary care providers (PCP). **METHODS** This 3-year study enrolled smokers with SMI who receive psychiatric rehabilitation services from one of two community-based human services agencies. Participants completed a brief survey about their smoking behavior and how their PCPs addressed their smoking in the last year, and a carbon monoxide (CO) breath test. **RESULTS** Participants (n=1,166) most frequently reported smoking 11-20 cigarettes/

mini-cigars per day (33.2%), and on average had an expired CO of 21.3± 16.0. Almost all (92.1%) reported that their PCP is aware they smoke tobacco products. While 69.7% reported that their PCP recommended cessation, only 36.4% report that their PCP prescribed treatment for cessation. Most common treatment recommended or prescribed was nicotine patch (71.2%), followed by nicotine gum/lozenge (50.8%), varenicline (16.8%) and bupropion (3.8%). Hispanics smoked fewer tobacco products per day and had lower Heaviness of Smoking Index scores compared to non-Hispanics. Hispanics reported more PCP prescription of nicotine patches and lozenges/gum and more referrals to smoking cessation groups. **CONCLUSIONS** Baseline data indicate that participants are moderate smokers. While PCPs are largely aware that their patients smoke, only a little more than one third of smokers with SMI report their PCP recommended or prescribed a first-line pharmacological treatment for smoking cessation in the past year. Very low rates of recommendation/prescription were found for varenicline, which has the highest efficacy in smoking cessation in this population.

FUNDING: Nonprofit grant funding entity

POS2-11

SELECTION OF TOXICITY VALUES FOR QUANTITATIVE RISK ASSESSMENT OF HARMFUL AND POTENTIALLY HARMFUL CONSTITUENTS IN COMBUSTIBLE TOBACCO PRODUCTS

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As required by the Family Smoking Prevention and Tobacco Control Act, the United States Food and Drug Administration (USFDA) published a list of 93 harmful and potentially harmful constituents (PHPCs) in tobacco products and tobacco smoke. FDA has classified the PHPCs as carcinogens, respiratory toxicants, cardiovascular toxicants, and/or reproductive-developmental toxicants. Due to the potential for large testing volumes and the lack of validated analytical methods for all PHPCs, FDA published an abbreviated list for HPHC testing and reporting requirements. In order to quantitatively estimate human health risks of exposure to HPHCs from cigarette smoke, cancer and non-cancer toxicity values are preferred. The use of the US Environmental Protection Agency-developed hierarchical risk assessment approach to identify toxicity values for chemicals found at Superfund sites may be inadequate for quantitative risk assessment of HPHCs. Several of these toxicity values have not been updated for decades and may no longer be scientifically defensible. Toxicity values are also available for several HPHCs from other regulatory/public health agencies. In the absence of pertinent FDA guidance, our aim was to identify the most scientifically defensible toxicity values for the FDA abbreviated list of HPHCs. A comprehensive review of US federal and state, and international databases was conducted to identify chronic inhalation cancer and non-cancer toxicity values. The approach for identification of these values and selection of the most appropriate and scientifically robust values for use in quantitative risk assessments of the abbreviated list of HPHCs will be presented. The results indicate that study quality, date of the study, and the toxicity value derivation approach are critical factors in selecting the appropriate toxicity value. Specific to non-cancer toxicity values derived using a critical effect other than a FDA-identified toxicity endpoint(s) (respiratory, cardiovascular, and/or reproductive-developmental), scientific justification is provided to describe the public health protective nature of the selected value.

FUNDING: Tobacco Industry

POS2-12

SMOKING PREVALENCE TRENDS IN MAGHREBIAN REGION, 1990-2015: A SYSTEMATIC ANALYSIS OF BURDEN FROM THE GLOBAL BURDEN OF DISEASE STUDY 2015

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Significance: Over 50 years of anti-tobacco efforts, smoking remains a leading global risk factor. Smoking has claimed more than five million lives each year since 1990, and its contribution to overall disease burden is growing, especially among lower income countries. The main objective is to estimate the trends of smoking prevalence by sex in the age group 20-24 in the Maghrebian Region which comprises 05 countries with a population of nearly 100 million people. **Methods:** For the Global Burden of Disease 2015 Study, 2,818 data sources are used to estimate daily smoking prevalence by age and sex for 05 countries (Algeria, Libya, Morocco, Tunisia and Mauritania) from 1990 to 2015. **Results:** In the Maghrebian Region, 2015, the age-standardised prevalence of daily smoking was 21.9% (95% uncertainty interval 18.9-25.0%) for men and 1.8% (1.16-2.6%) for women. The five countries had a significantly higher male prevalence



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of smoking than female. Trends from 1990 to 2015 show important changes in smoking prevalence in the region. While Algeria and Morocco show a decreasing trend of smoking prevalence in male and female. Libya presents an important increasing in male. **Conclusion:** Despite progress in some settings, the war against tobacco is far from won, particularly in the countries with the highest numbers of smokers. Intensified efforts are also greatly needed to keep smoking prevalence rates low in populations which have not experienced a devastating epidemic yet, and to prevent children, adolescents and young adults from starting to smoke.

POS2-13

SMOKING PREVALENCE AND TRENDS AMONG A U.S. NATIONAL SAMPLE OF WOMEN OF REPRODUCTIVE AGE IN RURAL VERSUS URBAN SETTINGS

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Background: U.S. smoking prevalence is declining at a slower rate in rural than urban settings and contributing to regional health disparities. Cigarette smoking among women of reproductive age is particularly concerning due to the potential for serious maternal and infant adverse health effects should a smoker become pregnant. The aim of the present study was to examine whether this rural-urban disparity impacts women of reproductive age (ages 15-44) including pregnant women. **Methods:** Data came from the ten most recent years of the U.S. National Survey on Drug Use and Health (2007-2016). We estimated prevalence of current smoking and nicotine dependence among women categorized by rural-urban residence, pregnancy status, and trends using chi-square testing and multivariable modeling while adjusting for common risk factors for smoking. **Results:** Despite overall decreasing trends in smoking prevalence, prevalence was higher among rural than urban women of reproductive age overall ($\chi^2(1) = 579.33$, $p < .0001$) and among non-pregnant ($\chi^2(1) = 578.0$, $p < .0001$) and pregnant ($\chi^2(1) = 79.69$, $p < .0001$) women examined separately. An interaction between residence and pregnancy status showed adjusted odds of smoking among urban pregnant compared to non-pregnant women (AOR = .58, [.53 - .63]) were lower than those among rural pregnant compared to non-pregnant women (AOR = 0.75, [.62 - .92]), consistent with greater pregnancy-related smoking cessation among urban pregnant women. Prevalence of nicotine dependence was also higher in rural than urban smokers overall ($\chi^2(2) = 790.42$, $p < .0001$) and among non-pregnant ($\chi^2(2) = 790.58$, $p < .0001$) and pregnant women examined separately ($\chi^2(2) = 63.69$, $p < .0001$), with no significant changes over time. Associations involving residence and pregnancy status remained significant in models adjusting for covariates ($p < 0.05$). **Conclusions:** Results document greater prevalence of smoking and nicotine dependence and suggest less pregnancy-related quitting among rural compared to urban women, disparities that have potential for direct, multi-generational adverse health impacts. <!--EndFragment-->

FUNDING: Federal; Nonprofit grant funding entity

POS2-14

ADOLESCENT RECALL OF BLU'S FAKE WARNING LABELS

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SIGNIFICANCE Blu launched the "Something Better" campaign in 2017, which featured large, boxed, positive messages about e-cigarettes at the top of advertisements, resembling warning labels. These ads appeared in popular magazines read by youth. This study reports 1) adolescent recall of these fake warning labels and 2) whether seeing an ad with a fake warning label affected recall of other ad features, including the warning message, brand, and product. **METHODS** Ohio males (N=778; mean age=15.9; 78.3% white non-Hispanic) participating in one wave of a cohort study were randomly assigned to view an e-cigarette ad that either contained a fake warning label or did not. After viewing the ad, they were asked what they remembered most. Youth were debriefed after this activity. Responses were transcribed and coded for mention of the fake warning label, repeating words from the fake warning label, mentioning the actual warning label or health risks of e-cigarette use, the brand, or the product. Chi-square test and Fisher's exact test compared the probability of recalling ad features by exposure to an ad with a fake warning label. **RESULTS** Of the participants who saw ads with fake

warning labels, 28.5% said the fake warning label was what they remembered most from the ad, and 23.5% repeated words from the fake warning label (e.g., "It said 'contains flavor'"). Compared to youth who saw ads without fake warnings, youth who saw ads with fake warnings were less likely to mention the actual warning message or health risks of e-cigarette use (9.6% vs. 3.2%, $p=0.005$). They were also less likely to mention the product being advertised (22.7% vs. 13.4%, $p=0.008$) and marginally less likely to mention the brand (15.8% vs. 10.6%, $p=0.09$). **CONCLUSIONS** Over one-quarter of male youth who saw e-cigarette ads with a fake warning label recalled it as the most memorable part of the ad. They were also less likely than adolescents who did not see an ad with a fake warning label to recall other ad features, including the actual warning message or health risks of e-cigarette use. This advertising campaign may undercut the effect of future FDA-mandated warning labels on adolescents.

FUNDING: Federal

POS2-15

ASSOCIATION OF SMOKING CESSATION AFTER ATRIAL FIBRILLATION DIAGNOSIS ON CARDIOVASCULAR DISEASE RISK

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Significance While smoking elevates the risk for cardiovascular disease (CVD) among atrial fibrillation (AF) patients, whether smoking cessation after AF diagnosis actually leads to reduced CVD risk is unclear. **Methods** The study population consisted of 2,372 newly diagnosed AF male patients during 2003-2012 from the Korean National Health Insurance Service database. Self-reported smoking status within 2 years before and after diagnosis date were determined, after which the participants were divided into continual smokers, quitters, sustained-ex smokers, and never smokers. Participants were followed up from 2 years after AF diagnosis until 31 December 2015 for CVD. Cox proportional hazards regression was used to determine the adjusted hazard ratios (aHRs) and 95% confidence interval (CIs) for CVD according to the change in smoking habits before and after AF diagnosis. **Results** Quitters had reduced risk for CVD (aHR 0.65, 95% CI 0.44-0.97) compared to continual smokers. Similarly, compared to continual smokers, smoking cessation was associated with reduced risk for total stroke (aHR 0.59, 95% CI 0.35-0.99) and ischemic stroke (aHR 0.50, 95% CI 0.27-0.94). The risk-reducing effect of quitting on CVD risk tended to be preserved regardless of aspirin or warfarin use. **Conclusion** Smoking cessation after AF diagnosis was associated with reduced CVD, total stroke, and ischemic stroke risk. AF patients who quit smoking may benefit from reduced risk of CVD.

POS2-16

ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS) USE AND CIGARETTE SMOKING AMONG US YOUTH: FINDINGS FROM WAVES 1 AND 2 OF THE PATH STUDY, 2013- 2015

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Background: Evidence is accumulating that youth who try ENDS (e-cigarettes) may go on to try cigarettes, yet little is known about how frequency of ENDS use may impact frequency of subsequent cigarette use. This analysis examines the bidirectional patterns of ENDS and cigarette use among US youth over one year. Propensity score matching (PSM) is used to match on baseline risk factors in longitudinal models that explore the



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impact of frequency of ENDS use on changes in cigarette smoking. **Methods:** Wave 1 (W1; 2013-14) data from US youth aged 12-17 years (n=13,651) were followed approximately one year later at Wave 2 (W2; 2014-15; n=12,172) in the longitudinal Population Assessment of Tobacco and Health (PATH) Study. Analyses examined 11,996 participants with data at both waves using PSM models. **Results:** In weighted analyses, most cigarette smokers exhibited past-30-day use (P30D) at both waves; less than a third of W1 P30D ENDS users were using ENDS at W2. W1 cigarette-naïve ever ENDS users were more than four times more likely to exhibit new ever cigarette smoking at W2 compared to ENDS-naïve youth at W1 (19.2% vs 4.0%). Similarly, among W1 ENDS-naïve youth, cigarette smokers were more than four times more likely to exhibit new ever ENDS use at W2 compared to cigarette-naïve youth at W1 (39.0% vs 8.2%). Unweighted PSM models in which youth were matched on W1 covariates indicated: 1) among W1 never cigarette smokers, W1 ENDS use was associated with W2 ever cigarette smoking (n=676; aOR 3.21; p<0.0001); 2) among W1 youth who had ever smoked cigarettes, W1 ever ENDS use did not affect W2 cigarette frequency (n=1020); 3) among W1 ever cigarette smokers, 1-5 days ENDS use compared to ever, no P30D ENDS use was associated with a decrease of 2.64 smoking days in P30D smoking at W2 (p=0.03). W1 6+ day ENDS users did not show a decrease in frequency of cigarette smoking. **Conclusions:** Ever ENDS use was found to predict future cigarette smoking experimentation and frequency of ENDS use had a differential impact on subsequent cigarette smoking. These results suggest that both cigarettes and ENDS should be targeted in early tobacco prevention efforts with youth.

FUNDING: Federal

POS2-17

ESTIMATING THE HUMAN HEALTH RISKS INDUCED BY HARMFUL CHEMICAL EXPOSURES FROM FOUR TYPES OF ELECTRONIC CIGARETTES

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INTRODUCTION: Electronic cigarettes (e-cigarettes) provide a less harmful alternative to conventional cigarettes but e-cigarette use is not risk free. E-cigarettes are known to emit harmful chemicals, mostly formaldehyde, acetaldehyde, and acrolein. Estimation of health risks associated with e-cigarette use is hampered by a wide variability of e-cigarette structures and use patterns (vaping topography), the effects of which have not yet been fully understood in previous e-cigarette studies. **METHODS:** Aerosols from four types of e-cigarettes (i.e., cig-a-like, top-coil, bottom-coil, and JUUL pods) were generated at different puff durations and flow rates based on the reported vaping topographies from current e-cigarette users. Formaldehyde, acetaldehyde and acrolein were collected using DNPH cartridges and analyzed using an high performance liquid chromatography (HPLC/UV) instrument. Daily and life-time exposure values were estimated after generating random distributions of puff durations and flow rates using the Monte-Carlo method within the reported ranges of these parameters. Using the calculated exposures, hazard indexes and life-time cancer risks were estimated and compared to the risks of current tobacco users. **RESULTS:** Hazard indexes (HI, Median [interquartile ranges]) due to acetaldehyde exposure for cig-a-like and top-coil devices were, respectively, 4.17 (3.32-5.00) and 2.00 (1.03-3.25), indicating increased non-cancer risks. Bottom-coil and JUUL e-cigarettes showed no significant risks based on the HI for acetaldehyde. Estimated HI for acrolein showed that all e-cigarette devices could significantly increase non-cancer risks. Cumulative life-time lung cancer risks for formaldehyde and acetaldehyde (medians) were 3.5E-04, 7.3E-04, 5.9E-05, and 1.4E-05 for cig-a-like, top-coil, bottom-coil, and JUUL e-cigarettes, respectively. Estimated life-time cancer risks for cig-a-like and top-coil devices in this study were higher than the reported risk for whole tobacco smoke exposures (2.0E-04). **CONCLUSIONS:** Our results suggest that e-cigarette users and public health professionals should be aware of health risks associated with different e-cigarette types and vaping patterns.

FUNDING: Academic Institution

POS2-18

DOES EARLY ONSET OF E-CIGARETTE USE PREDICT SUBSEQUENT TOBACCO CRAVING AMONG U.S. ADOLESCENTS? A NATIONAL MULTI-COHORT STUDY

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Significance: There is a lack of research examining whether early onset of e-cigarette use is associated with symptoms of tobacco use disorder. The present study examined the relationships between early onset of e-cigarette use and the development of subsequent tobacco craving among adolescents in the United States. **Methods:** Data were collected via self-administered questionnaires from nationally representative samples of older adolescents aged 16 and 17 years old in the United States (N = 20,571) based on multiple cohorts of the National Youth Tobacco Survey (NYTS). **Results:** Among adolescents who reported e-cigarette use, the age of onset was as follows: 12 years old or younger (4.4%); 13 years old (4.9%); 14 years old (13.9%); 15 years old (31.1%); and 16 to 17 years old (45.6%). A higher percentage of individuals who began using e-cigarettes at or before 12 years of age were found to have developed strong tobacco craving versus those individuals who first began using at 16 or 17 years of age or those who never used e-cigarettes. More than two in every five adolescents (42.9%) who reported early onset of e-cigarette use at or before 12 years of age subsequently developed a strong craving for a tobacco product relative to 16.4% of adolescents who reported later e-cigarette onset at 16 or 17 years old and only 3.4% of adolescents who never used e-cigarettes. Multivariable regression analysis indicated early onset of e-cigarette use was associated with significantly increased odds of current tobacco craving relative to later onset of e-cigarette use. **Conclusions:** Among U.S. adolescents, more than 40% of those who began e-cigarette use at or before 12 years of age went on to develop a strong craving for a tobacco product during older adolescence. Early onset of e-cigarettes is associated with significantly greater risk of developing a strong craving for tobacco relative to later onset of e-cigarettes or no e-cigarette use. More prospective research studies and tobacco use prevention programs are needed among children aged 12 and younger based on the heightened risk of developing tobacco craving and dependence associated with early onset of e-cigarette use. **Funding:** Supported by research grants R01CA203809 and R01DA044157.

FUNDING: Federal

POS2-19

LONGITUDINAL CHANGES IN E-CIGARETTE USE, CIGARETTE SMOKING, OTHER NICOTINE/TOBACCO USE AND TOBACCO USE DISORDER SYMPTOMS

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Significance: The National Academies of Science, Engineering, and Medicine recently concluded that there is substantial evidence that e-cigarette use results in symptoms of tobacco use disorder (TUD). The purpose of this study was to examine the variability of longitudinal nicotine/tobacco use patterns involving past-year e-cigarette use, cigarette smoking, and other nicotine/tobacco use, and how these longitudinal patterns are associated with symptoms of tobacco use disorder (TUD). **Methods:** Longitudinal data from adolescents (ages 12 to 17; n = 13,651) who were surveyed for the Population Assessment of Tobacco and Health (PATH) study at Wave 1 (2013-14) and Wave 2 (2014-15). **Results:** Out of 64 possible longitudinal nicotine/tobacco use patterns, the three most prevalent use patterns were: (1) no use of any nicotine or tobacco products at Wave 1 and other nicotine/tobacco use at Wave 2, (2) no use of any nicotine or tobacco products at Wave 1 and e-cigarette use at Wave 2, and (3) all three types of nicotine/tobacco use (i.e., e-cigarette use, cigarette smoking and other nicotine/tobacco use) at Wave 1 and all three types of nicotine/tobacco use at Wave 2. Adolescents engaged in all three types of nicotine/tobacco use at both waves had the highest mean symptoms count for TUD (M = 4.11, SE = 0.18). Adolescents who did not use of any nicotine or tobacco products at Wave 1 and engaged in all three types of nicotine/tobacco use at Wave 2 had the largest increase in mean symptom count for TUD (M = 2.32, SE = 0.23). **Conclusions:** This study provides valuable epidemiological information regarding the variability in longitudinal patterns of e-cigarette use, cigarette smoking, and other nicotine/tobacco use. The co-occurrence of e-cigarette use with other nicotine/tobacco use was strongly associated with the largest increase in symptoms of TUD and highlight the risks associated with multiple types of nicotine/tobacco use. The findings of this study clearly indicate the need for more long-term prospective studies examining the role that e-cigarette and other nicotine/tobacco use play over time in the development of TUD symptoms among adolescents in the United States. Supported by research grants R01CA203809 and R01DA044157.

FUNDING: Federal



POS2-20

MOVING AWAY FROM SMOKING: PROSPECTIVE TRANSITIONS AMONG DUAL USERS OF E-CIGARETTES AND CIGARETTES

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Significance: A substantial portion of current e-cigarette consumers use combustible cigarettes concurrently (dual users). Prospective studies have shown that the majority of dual users continue cigarette smoking at follow-up. More refined assessments of dual use behavior, including accounting for frequency of use, can provide better insight into the likelihood that dual users will transition away from smoking. **Methods:** Using Population Assessment of Tobacco and Health (PATH) study data, we segmented adult dual users of e-cigarettes and cigarettes (those using each product "every day" or "some days," n=2,300) at Wave 1 (2013-2014) based on the number of days they had used each product in the 30 days prior to the assessment. We developed four segments: Infrequent Duals (use each product on ≤19 days), Vapers who Smoke (vape on ≥20 days, smoke on ≤19 days), Smokers who Vape (smoke on ≥20 days, vape on ≤19 days), and Frequent Duals (use each product on ≥20 days). For each segment, we estimated the likelihood of not smoking (reporting now smoking "not at all") at Wave 2 (2014-2015). **Results:** At Wave 1, most dual users were classified as Smokers who Vape (69%), followed by Infrequent Duals and Frequent Duals (13% each), and Vapers who Smoke (5%). For dual users overall, 13.9% stopped smoking at Wave 2. Differences were observed across segments: Infrequent Duals and Vapers who Smoke had the highest likelihood of not smoking at Wave 2 (35% and 29%, respectively), followed by Frequent Duals (13%). Smokers who Vape, the most common group, had the lowest likelihood of not smoking (9%). Pairwise comparisons showed no robust differences between Infrequent Duals and Vapers who Smoke, and both had significantly higher likelihood of stopping smoking than Frequent Duals and Smokers who Vape. It is noteworthy that Smokers who Vape were less likely to stop smoking compared to Frequent Duals (OR=0.7, 95% CI= 0.5, 0.99). **Conclusions:** There are substantial variations in the likelihood of stopping smoking among dual users, highlighting their heterogeneity. Longitudinal assessments at multiple time points are needed to determine the stability of these transitions.

FUNDING: Tobacco Industry

POS2-21

WHERE'S THE HOOKAH? LEVERAGING GEOGRAPHIC INFORMATION SYSTEMS AND SOCIAL MEDIA TO UNDERSTAND HOOKAH SMOKING IN PUBLIC AREAS

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Significance: Hookah bars have increased in popularity, especially among youth. Hookah bars, which are often exempted from comprehensive state and local smoke free laws, serve not only as points-of-sale for tobacco products, but also places for communal hookah smoking. Most of the existing research on hookah bars has involved measuring air quality in these establishments with results showing highly elevated levels of respirable particulate matter as well as other potentially toxic emissions. This study assessed the density and social characteristics of hookah bars in the 100 most populous U.S. cities based on 2010 Census Data. **Methods:** This study was done during Sep 2017—Mar 2018. Hookah-related data were abstracted from Google Places, Yelp, and Yellow Pages. Parameters assessed included the business address, other services offered; peak times, and average visit duration (Google tracks and reports average time spent in each establishment). Data were analyzed with R and ArcGIS. **Results:** A total of 1004 hookah bars were identified from the 100 largest U.S. cities. The top 10 cities with the most number of hookah bars were: New York (157); Los Angeles (73); Philadelphia (37); Houston (34); Phoenix (32); San Diego (31); Miami (28); Las Vegas (22); Atlanta (22); and Austin (21). By other services provided, 53.2% of Hookah bars assessed also served food while 35.7% also served alcohol. During workdays, number of hours of operation ranged from 5-15, and 77% of hookah bars were open after midnight. During weekends, number of hours of operation ranged from 6-17, and 90% of hookah bars were open after midnight. Overall, median hours spent by patrons at hookah bars ranged from 30 minutes to two hours. **Conclusions:** The majority of hookah bars also operated as restaurants. The long duration of time spent by patrons in hookah bars highlights the potential for secondhand smoke exposure, including among non-smokers. Including hookah prohibitions within comprehensive smoke-free policies, and raising the minimum age of buying tobacco products or accessing tobacco establishments (e.g., hookah bars) to 21, could reduce hookah use and benefit public health.

FUNDING: Unfunded

POS2-22

THE NEW "COOL" IN SCHOOL: A QUALITATIVE MEDIA-CONTENT ANALYSIS OF JUUL USE IN U.S. HIGH SCHOOLS

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Significance: Use of USB-shaped e-cigarettes by students on school grounds is a rapidly emerging public health concern. These small, inconspicuous devices, such as JUUL, the leading e-cigarette brand in the US, can discretely deliver high concentrations of nicotine, which is addictive and can harm adolescent brain development. To better understand this public health threat, we performed a media content analysis in relation to JUUL and related USB-shaped e-cigarette devices. **Methods:** We searched Google News for all media articles published in the one-year period between Sept 2017 and Sept 2018. Specific search terms were "JUUL" AND "high school" AND "confiscate". Articles selected were those that involved an interview with a school principal or their designate (i.e., not an opinion piece) and specifically described a JUUL device reportedly confiscated from a student. We analyzed emerging themes qualitatively, describing perceived burden of the problem and characteristics of the confiscated items. **Results:** A total of 186 news articles were identified that met the search criteria, covering most U.S. states and D.C. The burden of the problem was described by principals/designates in varying ways, including: rate of confiscation of JUUL devices (e.g., 2 devices/week—a principal in NY); cumulative devices confiscated to date (e.g., 40 devices—a principal in PA), or the record number of confiscations observed in a week (e.g., 8 devices—another principal in PA). In at least one instance, the school official who handled the confiscated items reportedly had acute symptoms of nicotine toxicity from spilled liquid. Frequent places JUUL was reportedly used included bathrooms and classrooms; detection of JUUL use by students was done by review of security video in one instance. Common flavors used to describe JUUL flavors included "fruity", "sweet", "candy", "gummy bears", "bubble gum", "mint", and "mango". **Conclusions:** Issues related to JUUL in schools has been the focus of extensive media coverage in the US. Enhanced surveillance of this emerging public health issue, including through media articles, could inform programs, policy, and public health practice.

POS2-24

STATE-SPECIFIC LAWS REGARDING INDOOR PUBLIC USE, RETAIL SALES, AND PRICES OF ELECTRONIC CIGARETTES — UNITED STATES

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Significance: While e-cigarettes have the potential to benefit adult smokers if used as a complete substitute for combustible cigarettes, e-cigarettes are not safe for youth. Population-based policies can help minimize the risks of e-cigarettes for vulnerable populations, including youth. At the national level, the Food and Drug Administration prohibits e-cigarette sales to minors, free samples, and vending machine sales, except in adult-only facilities. However, states and communities can adopt additional or more stringent restrictions. This study assessed the current landscape of statewide e-cigarette laws in the U.S. as of June 2018. **Methods:** State-specific laws regarding indoor public use, retail licensure, self-service displays, minimum age of sale, and prices of e-cigarettes were obtained from the CDC State Tobacco Activities Tracking and Evaluation (STATE) System for the 50 states and the District of Columbia (DC) as of June 30, 2018. Legislation information is collected quarterly from the Westlaw online legal research database and is analyzed, coded, and entered into STATE by CDC. State laws and regulations prohibiting self-service displays of e-cigarettes were obtained from the Tobacco Control Legal Consortium. **Results:** As of June 30, 2018, nine states and DC prohibited indoor e-cigarette use and conventional tobacco smoking in worksites, restaurants, and bars; 16 states and DC required a retail license to sell e-cigarettes; 26 states prohibited e-cigarette self-service displays; five states and DC established 21 as the minimum age for purchase of all tobacco products, including e-cigarettes; and eight states and DC taxed e-cigarettes. **Conclusions:** State laws to address e-cigarettes continue to increase, but coverage varies across states. Approaches also vary widely, including the strength of provisions prohibiting self-service displays and tax rates. Sub-national strategies to reduce youths' initiation of e-cigarettes and population exposure to e-cigarette aerosol, coupled with federal regulation of tobacco products, could help reduce the risks of e-cigarettes on population health, especially among young persons.

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POS2-25**ASSOCIATION BETWEEN E-CIGARETTE USE AND FUTURE COMBUSTIBLE CIGARETTE USE: EVIDENCE FROM A PROSPECTIVE COHORT OF YOUTH AND YOUNG ADULTS 2014-2017**

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A surge in popularity of e-cigarettes prompts concern given the association between e-cigarette use and future cigarette use. However, much of the evidence for this association is limited by small samples or short follow up periods. The goal of this study was to examine the relationship between e-cigarette use and subsequent smoking initiation using a nationally-representative longitudinal cohort over 36 months. Participants in this study included members of a probability-based, longitudinal panel of youth and young adults, ages 15-21 years who reported never trying a combustible tobacco product at baseline ($n=4,012$). Data were collected online from 2014 to 2017 at 6-month intervals. Logistic regression analyses assessed associations between participants' self-reported ever e-cigarette use at baseline and ever and current cigarette use 24 and 36 months later, after controlling for demographic and psychosocial variables. Compared with those who had never used an e-cigarette, those who reported ever e-cigarette use at baseline had significantly higher odds of initiating ever cigarette use within 24 or 36 months ($OR=7.92$ & 5.53 respectively, $p<.01$). Baseline ever e-cigarette users also had significantly higher odds of current cigarette use at 24 months and 36 months ($OR=3.41$ & 3.54 respectively, $p<.05$). The significant positive association between e-cigarette use and future current cigarette use suggests that e-cigarette use prompts initiation of a dangerous combustible product. Strong regulation of all nicotine products, including e-cigarettes, is needed to prevent the trajectory of ENDS to cigarette use among youth and young adults.

FUNDING: Unfunded; Nonprofit grant funding entity

POS2-26**CONTRIBUTION OF E-CIGARETTE USE TO THE UPTAKE OF TOBACCO CIGARETTES IN THE YOUTH POPULATION: RESULTS FROM THE PATH STUDY, 2013-2016**

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Importance: Prior study designs may underestimate the catalyst effects of e-cigarette use on cigarette initiation by restricting the sample to youth who were cigarette naïve at baseline, adjusting for potential confounders concurrently with exposure, and limiting follow-up to 6-12 months. **Objective:** To evaluate the association of e-cigarette use with subsequent cigarette smoking across 24 months of follow up while addressing potential for selection bias and model over-adjustment. **Design:** Prospective cohort study using Waves 1-3 (2013-2106) of the Population Assessment of Tobacco and Health (PATH) Study Participants: Youth ages 12-15 who were tobacco naïve at baseline. **Exposure:** Youth whose first tobacco product was an e-cigarette were considered e-cigarette exposed. **Results:** Among the sample of tobacco naïve youth at Wave 1 ($n=6,129$), respondents were 49.43% female, 54.17% non-Hispanic white, and 13.40 years old on average. 8.59% reported e-cigarettes as their first tobacco product and were considered e-cigarette exposed. Cigarette use at Wave 3 was higher among youth with e-cigarette exposed youth compared to unexposed youth (4.89% vs 20.45% for ever use; 1.78% vs 5.93% for current cigarette use). E-cigarette exposure was associated with more than a three-fold increased risk of progression to ever use of cigarettes ($aOR= 3.30$; 95% CI= 2.43, 4.47) and more than a two-fold increased risk of progression to current use of cigarettes ($aOR= 2.32$; 95% CI= 1.40, 3.87) over two years of follow up. In stratified analyses by baseline cigarette susceptibility and risk-taking behaviors/traits, we found that the associations were especially pronounced in low-risk adolescents. We estimated that 19.67% of new cigarette ever use and 13.58% of cigarette current use in the US adolescent population may be attributable to the catalyst effects of e-cigarette use. **Conclusion:** This study provides additional support for the conclusion that e-cigarettes represent a strong catalyst for experimentation with and progression to current use of cigarettes. Furthermore, at the population level, we estimate a sizable contribution of e-cigarettes to cigarette ever and current use.

POS2-27**ASSOCIATIONS OF ELECTRONIC CIGARETTE DEPENDENCE WITH SUBSEQUENT VAPING AND SMOKING AMONG ADOLESCENTS**

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SIGNIFICANCE: There is little data on the prevalence of e-cigarette dependence symptoms in youth, and it is unknown whether existing measures of dependence are valid and are associated with subsequent persistent or increased e-cigarette use (vaping). **METHODS:** 12th grade students in Los Angeles, CA completed surveys in Fall 2016 (baseline) and Spring 2017 (6-month follow-up). Participants who reported ever-vaping ($N=965$) completed The Hooked on Vaping Checklist, a measure of 10 symptoms of e-cigarette dependence. Polytomous regression models assessed associations between e-cigarette dependence symptoms (0 vs. 1+ symptoms) at baseline and frequency of past 30-day vaping and smoking (0days, 1-2days [infrequent], = 3days [frequent]) at follow-up. Linear regression models assessed the association of e-cigarette dependence symptoms with daily intensity of vaping (number of vaping episodes per day and number of puffs per vaping episode on vaping days) and smoking (number of cigarettes smoked per day on smoking days) at follow-up. Models were adjusted for sociodemographics, intrapersonal risk factors for tobacco product use, and baseline frequency or intensity of smoking and vaping, respectively. **RESULTS:** The prevalence of reporting 1+ dependence symptoms was 7.5% in the sample. Participants with any baseline e-cigarette dependence symptoms (vs. none) had greater odds of frequent (vs. no) current vaping ($OR[95\% CI]= 2.38[1.09, 5.21]$) and infrequent (vs. no) current smoking ($OR[95\% CI]=4.21[1.68, 10.53]$) at follow-up, but not infrequent vaping or frequent smoking. Participants with any baseline e-cigarette dependence symptoms also reported a significantly greater number of vaping episodes per day ($RR[95\% CI]= 3.83[1.35, 10.86]$) and puffs per vaping episode ($RR[95\% CI]= 3.85[1.16, 12.78]$) at follow-up, but not smoking intensity. **CONCLUSION:** E-cigarette dependence symptoms were reported by a relatively small proportion of youth in this sample, and were prospectively associated with certain patterns of increased frequency and intensity of vaping and smoking among adolescents. E-cigarette dependence may be a clinically-relevant construct that merits further validation.

FUNDING: Federal

POS2-28**TOBACCO MARKETING EXPOSURE AND CURRENT TOBACCO PRODUCT USE DISPARITIES AMONG AMERICAN INDIANS AND ALASKA NATIVES**

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Non-Hispanic American Indians and Alaska Natives (NH AI/AN) have the highest prevalence of commercial tobacco use (CTU) among U.S. racial/ethnic groups. Tobacco industry marketing is causally linked with CTU. However, no epidemiologic evidence exists to examine whether there is higher prevalence of tobacco marketing aimed at NH AI/AN. We determined prevalence of tobacco industry marketing exposures and correlates of CTU among NH AI/AN, NH Whites, and other U.S. racial/ethnic groups. Data were from wave 1 (2013-2014; $N=32,320$) of the adult Population Assessment of Tobacco and Health (PATH) Study. Self-reported exposure to tobacco ads on store windows/inside stores, tobacco packages displayed inside/outside stores, and direct mail and email marketing were examined across racial/ethnic groups. Correlates of current established CTU were identified and interactions between racial/ethnic groups and tobacco marketing were assessed. Survey procedures and weights were used so that estimates represented the U.S. adult population. NH AI/AN ($n=955$) had a higher prevalence of exposure to tobacco ads (64.5% vs 59.3%; $p<0.05$), mail (20.2% vs. 14.3%; $p<0.001$) and email (17.0% vs. 10.6%; $p<0.001$) marketing than NH Whites ($n=19,297$). Adjusting for tobacco-related risk factors, exposure to email marketing remained higher among NH AI/AN than NH Whites (adjusted odds ratios (aOR): 1.36; 95% confidence interval (CI): 1.11, 1.66). Interactions between racial/ethnic groups and tobacco marketing exposures on CTU were non-significant. CTU was higher among NH AI/AN than NH Whites (aOR : 1.35, CI: 1.07, 1.69) and among adults who reported exposure to tobacco ads (aOR : 1.10, CI: 1.03, 1.17), mail (aOR : 2.93, CI: 2.61, 3.28) and email (aOR : 1.37, CI: 1.22, 1.55) marketing. NH AI/AN have higher exposure to tobacco industry marketing tactics in stores and via direct mail and email than NH Whites. This



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study also demonstrated that tobacco marketing is likely a similarly effective driver of CTU across U.S. racial/ethnic groups. Culturally-relevant public health strategies that counter-act tobacco industry marketing aimed at NH AI/AN are urgently needed to help reduce CTU disparities in this population.

FUNDING: Federal

POS2-29

SEX-SPECIFIC EFFECTS OF ADOLESCENT NICOTINE AND CANNABINOID EXPOSURE ON NICOTINE INTAKE AND AFFECTIVE BEHAVIORS DURING ADULTHOOD IN MICE

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During adolescence, exposure to nicotine or cannabinoids has been shown to independently induce negative effects on neuromaturation and later cognitive function. However, the potential effect of both drugs together under co-use conditions has become of increasing concern given the emerging prevalence of e-cigarettes and legalization of cannabis. The main psychoactive component in tobacco and e-cigarettes, nicotine, acts in the brain on neuronal nicotinic acetylcholine receptors, and the main psychoactive component in cannabis, THC, acts on cannabinoid receptors. In this session, I will discuss our recent findings regarding the effects of exposure to a cannabinoid receptor agonist (WIN55-212-2) and/or nicotine over a discrete time period in mid-adolescence on later cognitive, affective, and volitional drug-taking behaviors in adult male and female mice. Specifically, our findings reveal sex-dependent effects of adolescent drug exposure on later anxiety-associated behavior, reward-seeking behaviors and intravenous nicotine self-administration, whereas significant differences were not found in operant learning, generalized locomotor/exploratory behaviors or depression-associated behaviors. Together, these data provide evidence that adolescent co-exposure to nicotine and cannabinoids can alter later affective behaviors and nicotine dependence in a sex-dependent manner during adulthood. Supported by the Tobacco and Related Disease Research Program (TRDRP) award 26IP-0043 to Christie D. Fowler and the UC Smoke and Tobacco Free Fellowship to Anna Pushkin.

FUNDING: State; Academic Institution

POS2-30

DUAL USE OF TOBACCO AND CANNABIS PRODUCTS IN YOUTUBE VIDEOS: A COMPARATIVE ETHNOGRAPHIC APPROACH

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Background: Use and acceptability of tobacco products have declined among young people, while use and acceptability of cannabis products have risen. Cannabis and tobacco use may be mutually reinforcing, particularly when cannabis is smoked in "blunts," thus blunts use may support tobacco use among cannabis users. At the same time, young people are increasingly engaging with information and each other through new digital/social media. We investigated the risks for youths being exposed to messages promoting cannabis and tobacco dual use in YouTube, a popular digital media platform for interacting with videos. **Methods:** Using a word search protocol to identify videos with cannabis and tobacco content, we collected from YouTube a sample of 51 videos, stratified by genre and sorted by view count; and analyzed these qualitatively for tobacco and cannabis norms, noting age restrictions. We recruited 40 youth and young adult frequent cannabis users for in-person interviews, obtaining data on their cannabis and tobacco use; use of digital and social media, including YouTube; and asked them to sort, rank, and comment on the videos in our sample. We compared results of our social media content analysis and interviews. **Results:** Discounting and tolerance of tobacco product use were observed both in interviews and videos. Respondents reported less extreme use practices than we observed in videos. Respondents noted accessing YouTube videos primarily for entertainment and only secondarily for information. Search results are user- and context-dependent, thus exposures to dual use content may vary by users and by search algorithms, which are proprietary. Very few respondents supported restrictions on YouTube content. **Conclusion:** Cannabis user norms may support continued tobacco use. YouTube is an important social environment for youths and young adults, however their exposure to dual use messaging may depend on their YouTube

use. YouTube is an adaptive environment, providing content to users in response to their data in a manner that cannot easily be reproduced for study. As such, analyses of YouTube videos may not adequately represent dual use risks.

FUNDING: State

POS2-31

KNOWLEDGE ON ELECTRONIC CIGARETTE AND WILLINGNESS TO SWITCH TOWARDS ALTERNATIVE NICOTINE DELIVERY SYSTEM AMONG SLUM DWELLERS IN DHAKA, BANGLADESH

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BACKGROUND: Every year, more than 161200 people are killed by tobacco-related diseases in Bangladesh. Prevalence of smoking in Bangladesh is 47% out of which 64% are slum dwellers. Among smokers, 48% of them have willingness to quit smoking. Despite of willing to quit many smokers have been unable to quit due to unavailability of gradual switching options. Different studies elucidate that E-cigarette causes 95% less harm than that of combustible cigarettes being consumed. The aim of the study is to identify the possibilities of establishing their interest in E-cigarette and possible commitment to switch smoking towards it. And also, identifies the behavior, culture, and cost of existing smoking activities among the people. **METHODS:** A descriptive, cross sectional study was conducted using the qualitative (5 focus group discussions and 15 Key in-depth Interview) and quantitative methods (N=50 participants) among slum dwellers of Dhaka. Participant's aged between 18 and 65 years were selected based on the pattern of smoking consumption (at least 1 cigarette per day) and the willingness to switch or shift to less harmful products. **RESULTS:** 28% of the slum dwellers have knowledge of E-cigarette. Interestingly, all of the participants were interested in learning more. Similarly, findings from KII and FGD shows that none of them were familiar to E-cigarette. They were willing to quit smoking if E-cigarette is less harmful and easily available in the low cost. They mentioned that individuals, families, society and the government should take an initiation for a harm reduction mechanism to save thousands of lives. **CONCLUSIONS:** These findings can guide the government of Bangladesh to initiate an effort for easy accessibility of E-cigarette in the market with adequate tax reduction so that smokers willing to switch can afford it. Future research should develop and test interventions that make use of this information to improve the effectiveness of E-cigarette in a developing country.

FUNDING: Unfunded; Nonprofit grant funding entity

POS2-32

THE TALK OF TWITTER: A QUALITATIVE ANALYSIS OF TWEETS AMONG YOUTH ABOUT JUUL

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Significance: The e-cigarette landscape has recently evolved to include "pod mods." An increasingly popular pod mod among youth is JUUL, which has been the most commonly sold e-cigarette in the US since December 2017. JUUL contains high levels of nicotine, and widespread use among youth has been reported, including in schools. This study examined Tweets from users predicted to be youth to gauge perceptions, attitudes, and beliefs about JUUL. **Methods:** Using Crimson Hexagon, a social media monitoring tool, a random sample of tweets about JUUL was downloaded for the period January 1-July 17, 2018. Using the Twitter application programming interface, public information was gathered, and an age prediction algorithm was used to classify accounts belonging to youth (13-17 years old). Tweets (n=800, 799 unique authors) were then coded to examine constructs of interest, including flavor and nicotine content, access and use locations, general attitudes and perceptions, and use as a cessation device. **Results:** When positive sentiment was expressed, authors frequently referenced peer use of JUUL and commonly stated that JUUL was cool or fun to use. Positive sentiment also was associated with flavors and the pod refills, with mango and mint flavors being the most common. While positive sentiment about nicotine in JUUL was uncommon, when expressed, it was associated with a "head rush" from nicotine. JUUL was most commonly referenced as being used at home, in school, in cars, in bathrooms, and at parties or social events. While many youth perceived JUUL as being cool, many expressed that while their peers thought it was cool, they personally thought it was uncool. Negative sentiment was also associated with nicotine addiction and harm perceptions. Tweets from youth rarely contained links about how to purchase the product, its design, or its



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use as a quitting aid. **Conclusions:** When youth expressed positive sentiment about JUUL, it commonly focused on peer use, flavors, and the perception that JUUL was cool. Continued monitoring of social media could help inform efforts to better understand and prevent youth use of all types of e-cigarettes, including pod mods such as JUUL.

FUNDING: Federal

POS2-33

COLLEGE STUDENT ELECTRONIC CIGARETTE USERS MORE LIKELY TO BE MULTIPLE-DRUG USERS

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Significance: The rapid increase of electronic cigarette (e-cigarette) use among adolescents is a major public health concern. E-cigarettes are not approved by the FDA, are not safe, and as a cessation aid are not currently evidence-based. College students, being of age to purchase these products with limited regulations on their sales, are of special interest, and research on college student e-cigarette use is lacking. The purpose of this study is to investigate the prevalence of e-cigarette use, and the relationship of use to other tobacco and drug use (alcohol, cigarettes, snuff, marijuana, prescription medication, barbiturates, inhalants, cocaine, LSD, hallucinogens, amphetamines, ecstasy) among college students. **Methods:** A sample of 3,683 students from a mid-sized public mid-western University in the U.S. participated in the online self-report survey. **Results:** One in ten students (n = 384) reported e-cigarette use in the past two weeks. Recent drug use was significantly higher ($p < 0.05$) among e-cigarette users compared to non-users. Specifically, in the past two weeks, e-cigarette users report consuming alcohol more often than non-users. In addition, they report consuming more alcohol on a typical drinking occasion than non-users. Further, a higher percentage of e-cigarette users than non-users recently used cigarettes (35.4% and 5.5%, respectively); marijuana (45.3% and 8.7%, respectively); prescription medications (20.8% and 3.2%, respectively); and cocaine (14.1% and 1.8%, respectively). Moreover, e-cigarette users report more problems with marijuana and alcohol than non-users. **Conclusions:** E-cigarette use continues to rise among college students, and its association with use of other drugs is alarming. Knowledge of high rates of drug use among e-cigarette users is important to be aware of among college student counselors and prevention coordinators.

FUNDING: Academic Institution

POS2-34

ELECTRONIC CIGARETTE USE AND CONVENTIONAL CIGARETTE SMOKING INITIATION AMONG YOUTH, UNITED STATES, 2015-2016

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Significance: Electronic cigarettes (e-cigarettes) are the most commonly used tobacco product among U.S. youth. We used cross-sectional, nationally representative data of U.S. middle and high school students to examine the association between e-cigarette use and cigarette smoking initiation. **Methods:** Data were from the 2015 and 2016 National Youth Tobacco Surveys, a school-based survey of U.S. 6th-12th graders (pooled N=38,386). Questions on current age and age at initiation of different tobacco products were used to assess temporality. The study included 35,775 students who had never smoked conventional cigarettes five years before the survey (i.e., baseline), including never-smokers and those who first smoked less than 5 years ago. Baseline never smokers were classified by e-cigarette use status into: (1) those who ever used e-cigarettes on/before or without ever smoking cigarettes; or (2) those who had never used e-cigarettes, or started only after initiating cigarette smoking. The outcome variables were cigarette smoking at pre-determined periods: any time within the past 5 years; past 1 year; past 6 months; past 30 days; and past 7 days. Adjusted odds ratios (AOR) were calculated using multivariable logistic regression. The models controlled for socio-demographic characteristics and use of smokeless tobacco, cigars, and hookah on/before cigarette smoking initiation. Statistical significance was at the 5% alpha level. **Results:** Among baseline never cigarette smokers, 17.4% used e-cigarettes, and 16.7% initiated cigarette smoking within the past 5 years. Those who used e-cigarettes on/before ever smoking cigarettes had higher odds of smoking cigarettes than those who did not at all periods assessed: any time within the past 5 years (AOR=2.61); past 1 year (AOR=3.18), past 6 months (AOR=2.59), past 30 days (AOR=1.75), and past 7 days (AOR=1.38).

Conclusions: These cross-sectional findings reveal that e-cigarette use was associated with conventional cigarette smoking initiation among U.S. youth. Comprehensive efforts are important to prevent and reduce all forms of youth tobacco product use.

FUNDING: Unfunded

POS2-35

CIGARETTE SMOKING AMONG ASIAN AMERICANS LIVING IN NEW YORK CITY: THE ASSOCIATION OF ACCULTURATION INDICATORS AND FOOD INSECURITY

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Significance: The prevalence of cigarette smoking among Asian Americans is lower than the general US population, but there are significant differences by Asian subgroup. This study explores current cigarette smoking among Asian Americans in New York City (NYC) and the association with sociodemographic characteristics, acculturation, and food insecurity.

Methods: Participants were recruited using community-based sampling from 15 Asian communities in NYC from 2013 to 2015. Descriptive statistics examined factors associated with current cigarette smoking, while stratifying by Asian subgroup (East Asian, South Asian, and Southeast Asian) and sex. Multivariable logistic regression models further examined these associations, while adjusting for other model covariates.

Results: Current smoking varied by Asian subgroup and sex. Among males, current smokers were 14.1% for East Asians, 18.7% for South Asians, and 32.8% for Southeast Asians; and among females, current smokers were 2.8%, 2.3% and 9.1%, respectively. In logistic regression among men, Southeast Asians were 3.7 times more likely than East Asians to smoke ($p<0.001$), individuals age 18-34 were 3.0 times more likely than those age 55 and older to smoke ($p<0.01$), employed individuals were 2.0 times more likely than unemployed individuals to smoke ($p<0.05$), and individuals living in the US for greater than 20 years were 3.3 times more likely than US-born individuals to smoke ($p<0.05$). Among both men and women, those reporting higher food insecurity were significantly more likely to smoke compared to those reporting rarely/none (men: OR=2.2, $p<0.05$; women: OR=4.4, $p<0.01$).

Conclusion: Current smoking among Asian males is high, especially among the South and Southeast Asian subgroup. Several disparities exist among Asian American communities and are associated with cigarette smoking. Further research is needed to inform targeted, culturally appropriate interventions. Community-level interventions that integrate a focus on economic disparities among Asian communities could be of benefit in tackling cigarette smoking prevalence among Asian Americans.

FUNDING: Federal

POS2-36

RECRUITING SMOKERS FROM THE SOCIAL NETWORKS OF CANCER PATIENTS WHO SMOKE TO A NOVEL ONLINE CESSATION INTERVENTION; A FEASIBILITY STUDY

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Significance: Growing research supports the use of social networks to spread smoking cessation across peer groups, but there is little evidence concerning this strategy's effectiveness in recruiting smokers among cancer patients and their networks. Several studies have demonstrated the effectiveness of "if-then planning" in promoting smoking cessation. We report results from a single-arm feasibility study for recruiting cancer patients and their smoking peers to a novel online cessation intervention based on if-then planning.

Methods: Fifteen patients of the North Carolina Cancer Center (NCCH) who smoke and present with a head/neck or lung cancer diagnosis are each asked to enroll 5 peers who smoke from their social network (total of n=90). The if-then planning intervention invites participants to (a) identify the three situations that most tempt them to smoke, (b) select a response to each situation that would be effective in managing the temptation, and (c) form a plan using the format, IF (situation)-THEN (response). Participants also complete a 1-month follow-up smoking status assessment. The intervention and follow up is delivered through an online health behavior assessment tool developed by UNC researchers (the Carolina Health Assessment and Resource Tool or CHART). **Results:** We report results for enrollment and completion of treatment among patients and peers. Enrollment success is defined as 100% of patients receive the link to the intervention and 40% of peers (i.e., 2 peers) receive the link. Successful completion of treatment is defined as 100% of patients and 50% of peers undertake



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the if-then planning intervention. **Conclusions:** Online interventions can be a useful tool in providing tobacco treatment to a population of cancer patients. Recruiting social networks to the same brief intervention allows patients to involve smoking peers in their cessation efforts, helps to reduce smoking in social networks, and provides a mechanism for mutual support. CHART enables online tracking of how many patients and their peers participate and communicate with one another about cessation and assists in tracking quit attempts and cessation rates over time.

FUNDING: Federal; Academic Institution

POS2-37

DISPARITIES IN TOBACCO USE, ENVIRONMENT, AND CESSATION IN CALIFORNIA

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Significance. California's efforts to decrease tobacco use and prevent tobacco-related diseases have reduced adult smoking rates in California to one of the lowest in the nation (12.4% California vs. 15.5% U.S.); yet tobacco-related disparities persist. Methods. The California Tobacco Control Program (CTCP) analyzed data from the 2015-2016 California Health Interview Survey, 2016 Healthy Stores for a Health Community Survey, Policy Evaluation Tracking System, California Smoker's Helpline, and tobacco retail licenses to examine differences in tobacco use, tobacco environment, and quitting behaviors among disparate populations in California. Results. Smoking rates among adults who identify as having mental health challenges (MHC) (29.8%), American Indian (AI) (24.2%), African American/Black (AA/B) (20.7%), lesbian, gay, or bisexual (18.5%), low income (LI) (16.9%), or living in rural areas (R) (15.1%) are higher than the State average (12.4%). In some California communities, tobacco products are less expensive (AA/B, Hispanic (H), LI, R); more stores sell flavored and menthol tobacco products (AA/B, AI, Asian/Pacific Islander); there is more pro-tobacco advertising (AA/B, LI); there is a higher density of tobacco retailers (H, LI); there is less protection by smoke-free multi-unit housing laws (H, AI); there is less protection from strong tobacco retail licensing laws (AI, R); or there are fewer smoke-free homes (AI) compared to the general population. For some groups, quit attempts in the past year (AI, R, MHC), proportion of California Smoker's Helpline enrollees (H), and doctor advice to quit smoking (H) are less prevalent compared to the general population. Conclusion. Interventions that address tobacco-related disparities in California are needed. CTCP is funding an initiative to promote the adoption and implementation of tobacco control policies that disproportionately affect select populations in California. Through this initiative, CTCP seeks to accelerate declines in tobacco use among populations experiencing the greatest tobacco-related disparities including American Indian, Black/African American, Hispanic, Asian/Pacific Islander, LGBTQ, Rural, Behavioral Health, and low-income populations.

FUNDING: State

POS2-38

DECREASING MOTIVATION TO QUIT IN COMMUNITY RECRUITED SMOKERS IN THE QUIT-TO-WIN CONTEST (2009-2016) IN HONG KONG

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Background: The Quit-to-Win Contest (QTW) organized by the Hong Kong Council on Smoking and Health during 2009-2016 (7 rounds, except 2011) provided lottery grand prizes and social support to promote quitting. We examined the trends in socio-demographic characteristics and smoking behaviors of QTW participants. Methods: Smokers (N=7559) were recruited in communities and followed for 6 months. They also participated in randomized control trials built in the QTW testing different quitting interventions (self-help booklet, telephone/on-site face-to-face counseling, short mobile phone messages, uninformed cash incentives, cut-down-to-quit strategy or active referral to cessation services). At baseline, the Heaviness of Smoking Index (HSI) was calculated from daily cigarette consumption and time to 1st cigarette after waking up. Lifetime cessation attempt, planned abstinence day, perceived importance, difficulty and confidence of quitting (measured by a score from 0 to 10) and socio-demographic characteristics were recorded. The non-parametric trend test examined trends socio-demographic

characteristics and smoking behaviors. Results: About 20% of participants were female. In 2016, participants being aged 18-29 (30.3%), single (42.6%) and having no children (53.4%), college or above education (23.4%), monthly household income HKD \$20,000 or above (43.7%) were more common than previous years (all Ps<0.001). Participants who smoked no more than 10 cigarettes daily and scored 3 or below on HSI increased from 42.4% and 67.2% (2009) to 50.5% and 72.1% (2016), respectively (both Ps<0.001). Meanwhile, participants who had lifetime cessation attempt and planned to quit in 30 days halved from 71.0% and 87.3% to 36.4% and 43.4% (both Ps<0.001). Perceived importance and confidence of quitting dropped from 7.9 ± 2.3 (standard deviation) and 6.2 ± 2.6 (2009) to 6.6 ± 2.2 and 5.1 ± 2.2 (2016), respectively (both Ps<0.05). Conclusions: Participants in recent QTW were younger and less addictive to nicotine, but less had ever tried to quit or were motivated to quit. Future intervention should target these young adult smokers with a low level of addiction but little motivation to quit.

FUNDING: Nonprofit grant funding entity

POS2-39

LESBIAN, GAY, BISEXUAL, AND TRANSGENDER YOUNG ADULT MEDIA USE AND ITS ASSOCIATION WITH CIGARETTE SMOKING

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SIGNIFICANCE: Higher rates of media use have been associated with increased likelihood of smoking and other risky behaviors in general population studies. Few studies have investigated media use patterns among gender and sexual minority groups or the relationship between media use behaviors and cigarette smoking among these groups. Such information could have important implications for campaign development and implementation. OBJECTIVE: To describe media use among a diverse LGBT young adult population and estimate the associations between media use and cigarette smoking. METHODS: Analyses use data from LGBT 18-24-year-olds who completed the baseline survey for an evaluation study of the FDA's *This Free Life* tobacco public education campaign (N= 3,841). Descriptive analyses were used to estimate media use frequency for 6 LGBT subgroups. Multivariate logistic regression was used to estimate associations between the frequency of use of specific media sources and past-30-day cigarette smoking. RESULTS: 67.6% of respondents reported using Facebook "several times a day," cisgender gay and lesbian females reported significantly lower rates of Facebook use than other LGBT subgroups. Snapchat (58.6%) and Instagram (49.6%) were the next most frequently used media sources; for both, gender minorities reported significantly lower rates of use. Gender minorities were significantly more likely than other LGBT subgroups to report using Tumblr. The use of several media sources by cisgender gay and lesbian females (Facebook, Instagram, Snapchat) and cisgender gay males (streaming radio, Twitter, Tumblr, Snapchat) was associated with higher odds of current cigarette smoking. For gender minorities, the use of Tumblr and YouTube was associated with lower odds of smoking. CONCLUSION: Young adult LGBT subgroups in this sample differ in media preferences and use, and important differences in the relationship between media use and cigarette smoking are apparent. Campaigns seeking to reach specific gender and sexual minorities may maximize reach by identifying media channels that are most popular and are associated with smoking for that subgroup.

FUNDING: Federal

POS2-41

THE RELATIONSHIPS BETWEEN CIGARETTE CONSUMPTION LEVEL AND PERCEIVED HEALTH AND ADDICTION RISK OF CIGARETTES AND IQOS

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Background Perceived health risk of tobacco products is known to be lower among smokers than nonsmokers. However, there are few data on the relationship between level of cigarette consumption and risk perceptions of tobacco products. It might be expected that heavier smokers have lower perceived health risk of tobacco products than lighter smokers. It might also be expected that heavier smokers have higher perceived addiction risk to tobacco products than lighter smokers, as heavier smokers have higher levels of addiction. Methods Perceived Health Risk and Perceived Addiction Risk were assessed for cigarettes and IQOS®, using the Perceived Risk Instrument - Personal. A total of 2,848 U.S. adult smokers were included, comprised of 1,426 adult Smokers with No Intention to Quit cigarettes (SNITQ), and 1,422 adult Smokers with the Intention to Quit cigarettes (SITQ). The two groups were significantly different in terms of consumption of cigarettes per day (CPD) and Perceived Addiction Risk; therefore,



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the groups were analysed separately. Exploratory Spearman correlation coefficients were computed for cigarettes and IQOS, between i) CPD and Perceived Health Risk score and ii) CPD and Perceived Addiction Risk score. **Results** Within SNITQ and SITQ, there were moderate positive correlations between CPD and Perceived Addiction Risk for cigarettes ($r=0.28$ and $r=0.22$ respectively; $p<0.0001$). All other correlations were very weak ($r<0.1$), although some were $p<0.05$. **Conclusions** Within smokers (both with and without the intention to quit), there was a positive relationship between Perceived Addiction Risk of cigarettes and CPD. This is consistent with the view that heavier smokers are more addicted to cigarettes and are therefore likely to be more aware of their addictive nature. These relationships were not present for IQOS, consistent with the data having been collected in subjects with no personal experience of IQOS (which was not commercialized in the U.S. at the time of data collection). The difference in results for Perceived Addiction Risk and Perceived Health Risk requires further investigation.

FUNDING: Tobacco Industry

POS2-42

SERVICE AND BLUE COLLAR WORKERS ARE LESS LIKELY TO USE ELECTRONIC CIGARETTES COMPARED TO OTHER TOBACCO PRODUCTS

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Significance While there is a large literature showing that blue collar workers are more likely to smoke conventional cigarettes and less likely to quit than white collar workers, little is known about their risk of vaping electronic cigarettes (e-cigarettes). We test whether or not blue collar or service workers were less likely to smoke e-cigarettes than other tobacco products, and whether or not they were less likely to smoke e-cigarettes than conventional cigarettes. **Methods** We combined the National Health Interview Survey (NHIS) 2015 sample adult and cancer supplement files and the 2016 sample adult files to look at tobacco users ($n=14,029$), and individuals who smoked either traditional or conventional cigarettes ($n=11,555$). Our independent variable was occupational group. Individuals were classified as working in a white collar occupation, blue collar occupation, service occupation, or as not being in the labor force. Due to their small number individuals working in farm and forestry occupations who reported using a tobacco product ($n=166$) they were combined with blue collar workers. We ran a series of binary logistic regressions to test if blue collar and service occupations used e-cigarettes less often as compared to white collar workers among tobacco users and within the smoking population. **Results** Among tobacco users individuals who were service workers ($OR=0.82$, $p=.027$) blue collar ($OR=0.81$, $p=.030$), and individuals who were not in the labor force ($OR=.64$, $p=.032$) had lower odds of using an e-cigarette compared to other tobacco products. Among individuals who smoked, service workers ($OR=0.80$, $p=.028$), blue collar workers ($OR=0.79$, $p=.022$), but not individuals who were not in the labor force ($OR=0.67$, $p=.058$) had lower odds of using e-cigarettes than white collar workers. **Conclusion** If e-cigarettes are an effective harm reduction tool, then blue collar workers and individuals who are not in the labor force are not currently benefitting. However, if e-cigarettes do pose significant health risks or risk when used with traditional cigarettes, blue collar workers and services workers are being protected from the harms of e-cigarette use.

FUNDING: Unfunded

POS2-43

THE POTENTIAL OF USING SOCIAL MEDIA TO DELIVER SMOKING CESSATION TREATMENT AMONG CHINESE IMMIGRANT SMOKERS: FINDINGS FROM A MIXED METHODS PILOT STUDY

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Objectives: Smoking rates remain high among Chinese immigrant males, which is largely due to the low quit intention and underutilization of existing smoking cessation resources. This study aimed to explore Chinese immigrant smokers' barriers to accessing and utilizing available smoking cessation resources, and their social media use patterns. **Methods:** In 2018, 30 Chinese immigrant smokers living in New York City participated in an in-depth interview, and 49 completed a survey. **Results:** Most participants (27/49; 55%) were in precontemplation stage. Among 22 smokers who had tried to quit in the past 12 months, 3 visited a cessation clinic and none called a quitline. Smokers expressed their barriers to using cessation services, including a low awareness of the services,

skepticism about their effectiveness, concerns about English proficiency, and time constraints. To optimize the engagement in cessation treatment, smokers suggested that cessation services be convenient to use at any time, be free of charge, and require minimal amount of time. WeChat was the most popular social media platform. Of 49 participants, 94% reported WeChat use (Facebook: 22%; WhatsApp: 20%; Twitter: 6%), and 90% reported daily use of WeChat. WeChat (5.6, SD=2.08; range 1-7) was used more frequently than mobile phone short message service (2.3, SD=1.64), Facebook (2.1, SD=1.58), WhatsApp (1.8, SD=1.32) and Twitter (1.3, SD=0.58). **Conclusions:** Chinese immigrant smokers experienced various barriers to accessing and using smoking cessation resources. WeChat represents an opportunity to overcome the outreach and access barriers, and has the potential to increase Chinese immigrant smokers' engagement in cessation treatment services.

FUNDING: Federal

POS2-44

USING A MULTI THEORY MODEL APPROACH TO PREDICT INITIATION AND SUSTENANCE OF SMOKING CESSATION BEHAVIOR AMONG NEPALESE SMOKERS

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Background: Smoking cessation (SC) offers numerous health benefits to both recent and long-term smokers. However, many smokers do not adequately participate in smoking cessation interventions due to a variety of reasons. The objective of this study was to apply multi-theory model (MTM) to predict initiation and sustenance of SC behavior change in a sample of Nepalese smokers. **Methods:** Using community-based cross-sectional study, a total of 132 adult smokers residing in Kathmandu district, Nepal completed a 38-item valid (face, content and construct) and reliable structured questionnaire based MTM between February and May 2018. The internal consistency of the subscales was found to be acceptable (Cronbach's alphas: 0.73-0.96). Step-wise multiple regression was performed to predict SC practice. **Results:** The median age of respondents was 30 years (IQR: 25-33 years). Majority of them were males (79%) and 67% of them belonged to the upper castes. The median number of cigarettes smoked per day was five. The result of regression analysis revealed that 48% of the variation in the initiation of SC behavior change was explained by MTM constructs of behavioral confidence and changes in the physical environment ($F(2, 129) = 61$, $P<0.001$). Similarly, about 54.4% of the variation in the sustenance of SC behavior change was described by the emotional transformation ($F(1, 130) = 157$, $p<0.001$) constructs of behavioral confidence. **Conclusion:** Our finding shows that MTM is a potent theoretical model for predicting smoking cessation behavior change. The potential smoking cessation interventions need to be focused on MTM for better smoking cessation efforts among smokers in Nepal.

FUNDING: Unfunded

POS2-45

ALCOHOL ABUSE, DEPRESSION AND HIV/AIDS AMONG HOSPITALIZED SMOKERS IN BRAZIL

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Significance: Brazil is a world leader in comprehensive tobacco control and has achieved a dramatic decline in smoking rates. Regardless, Brazil still has 21.9 million tobacco users and is listed among the top ten countries with the largest number of total smokers. It's important to understand comorbidities associated with smoking to support the development of treatments and policies locally. **Aim:** To measure the concurrent use of alcohol and tobacco among hospitalized patients with a specific focus on the subgroup of HIV patients as well as to measure the prevalence of depression among smokers. **Method:** a Cross-sectional study that took place in a singular hospital in Brazil. We used a structured survey to evaluate tobacco consumption, AUDIT C to measure alcohol use and PHQ-2 to screening depression. The data analyses were done using descriptive analysis and chi-square test. **Results:** 972 patients were interviewed, 20.3 percent were alcohol abusers and 14.9 percent tobacco users. Almost half of the



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smokers (47.6 percent) were alcohol abusers, while 15.5 percent of nonsmokers had abusive consumption of alcohol (chi-square equal 78.7, df equal 1, a p-value less than 0.001). A high percentage of hospitalized smokers (37.2 percent) reported depression symptoms. The percentage of tobacco users was higher among patients with HIV/AIDS (32.1 percent) when compared with patients that did not have an HIV/AIDS diagnosis (14.4 percent), (Chi-square equal 6.74, df equal 1, p-value equal 0.009). The alcohol use was also higher in the HIV/AIDS group but the difference was not significant (32.1 percent versus 19.9 percent no HIV diagnosis). **Conclusions:** Our findings showed a high prevalence of alcohol abuse and depression among hospitalized smokers in Brazil. Patients with HIV/AIDS smoke more than patients with other diagnoses. These results can be used to design more effective hospital-based interventions for smoking cessation in our country.

FUNDING: Federal

POS2-46

ELECTRONIC CIGARETTE INTERVENTION AMONG SLUM DWELLERS OF DHAKA: A PRE POST EXPERIMENTAL STUDY

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BACKGROUND: Electronic cigarette (E-cigarette) has been known for its reduced harmfulness in comparison to other combustible cigarettes. Trend of consuming E-cigarette has been increased in developed countries and increasing in developing countries. 40% more men smoke in Bangladesh in comparison to other medium human development index countries leading to 26% more deaths occurring in men. A study conducted among slum dwellers in Dhaka shows that people are eager to switch towards less harmful product and are equipped with knowledge of E-cigarette to some extent but are unfamiliar with it. Therefore, objective of this study is to assess the influence of intervention on knowledge of E-cigarette and readiness to switch towards it. **METHODS:** We enrolled 50 participants residing in slum who were interested to switch towards less harmful products for 3 weeks. On the first day, data were collected regarding knowledge about E-cigarette and motivation to switch towards it. Then, E-cigarette was intervened among those 50 pre-tested participants. Follow up was done twice a day (morning and evening) for 3 weeks to ensure appropriate use of E-cigarette among the participants. On 22nd Day, post-test was done. **RESULTS:** Only 34% of the participants had knowledge about E-cigarette during pre-test, whereas all of them were equipped with knowledge during post-test (Paired difference = 1.68±1.30; p < 0.001). 24% of them felt safe to use E-cigarette during pre-test, whereas 90% felt safe to use after intervention which was statistically significant. Also, 26% of them mentioned it as a helpful aid to reduce harm of smoking and increased to 90% after an intervention (p< 0.001). Therefore, 95% of them showed readiness to switch towards E-cigarette after the intervention. **CONCLUSIONS:** Most of them felt E-cigarette can be a better option to switch for harm reduction if available in affordable price as they gained knowledge about it and knew its benefit over combustible cigarette. Hence, large scale multi centric studies should be carried out. At the same time, studies on the cost-effectiveness of the E-cigarette intervention should be taken up in the future.

FUNDING: Nonprofit grant funding entity

POS2-47

DISPARITIES IN KNOWLEDGE AND USE OF TOBACCO TREATMENT AMONG SPANISH SPEAKING LIGHT SMOKERS IN CALIFORNIA FOLLOWING HEALTH CARE REFORM

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Significance: The Affordable Care Act (ACA) provided opportunities to reduce tobacco-related disparities by expanding healthcare coverage and mandating comprehensive coverage for tobacco treatment in 2014. However, little is known about whether disparities persist in patient knowledge and use of these benefits following the implementation of the ACA provisions. **Methods:** Data were gathered via phone interviews in 2016 with a stratified random sample of smokers newly enrolled in Kaiser Permanente Northern California (KPNC) integrated healthcare delivery system in 2014 (N=491; 50% male; 47% white). We tested whether sociodemographic factors, coverage type, 2016 smoking

status (heavy=5+ cigarettes everyday), and comorbidities were associated with provider advice to quit smoking, knowledge, and receipt of cessation interventions using modified Poisson regression with robust standard errors. **Results:** Overall, 80% of patients reported that their provider advised them to quit smoking, 84% knew that KPNC offers cessation counseling, 54% knew that tobacco cessation pharmacotherapy (TCP) is free through the KPNC pharmacy, 6% used counseling services, and 54% used TCP. In multivariate models, Spanish-speaking (vs. English) patients were less likely to report that their provider advised quitting (RR=.76, p=.006), know that TCP is free (RR=.41, p<.001), and use TCP (RR=.48, p=.003). Light (vs heavy) smokers were less likely to report that their provider advised quitting (RR=.87, p=.046), know about cessation counseling (RR=.87, p=.02), and use TCP (RR=.60, p<.001). Black (vs. white) patients were more likely to report that their provider advised them to quit (RR=1.15, p=.046), and those with a substance use disorder were more likely to know about cessation counseling (RR=1.15, p=.01). Finally, patients aged 35-45 (RR=1.71, p=.047) and 45-55 (RR=1.78, p=.03) were more likely to use TCP than those aged 21-25. **Conclusion:** We found significant disparities in provider advice to quit, patient knowledge, and use of cessation interventions in the post-ACA era among Spanish-speaking patients and light smokers, highlighting the need to promote smoking cessation for these groups.

FUNDING: State; Academic Institution

POS2-48

DEVELOPING AN EVIDENCE-BASED PROGRAM SUSTAINABILITY TRAINING CURRICULUM: A GROUP RANDOMIZED, MULTI-PHASE APPROACH

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The Program Sustainability Assessment Tool (PSAT) was developed as an instrument for assessing the capacity for program sustainability among various programs. In its initial reliability study, the PSAT was used by 252 public health programs to rate their capacity for sustainability. Confirmatory factor analysis showed good fit of program data with the 8 sustainability domains within the PSAT. Additionally, the subscales showed excellent internal consistency with the average Cronbach's alpha of 0.88. Preliminary validation analysis suggests that the PSAT scores were related to important program and organizational characteristics. Since its inception, over 1000 programs in the fields of public health, social services, and clinical care have utilized the PSAT. Most recently, the PSAT was administered to stakeholders from public health departments in 50 US states, DC, and Puerto Rico involved in the implementation of coordinated chronic disease programs. Qualitative data were also collected via phone interviews. The PSAT results highlighted the process through which states approached the sustainability of coordinated chronic disease initiatives. The study proved PSAT results and qualitative interviews offer insight into the capacity for sustainability for programs transitioning from traditional siloed programs into coordinated chronic disease programs. While the PSAT has been widely tested for its reliability, the present study seeks to validate the PSAT by refining the evidence-based Program Sustainability Action Planning Model and Training Curricula and delivering to 12 state tobacco control programs. Apart from PSAT scores, the study team will gather programmatic and organizational measures associated with sustainability and institutionalization at 3 time points and compare these measures between intervention and comparison. While institutionalization is the main outcome measure, a goal of the study is to find consistencies over time between PSAT scores and conventional measures of sustainability with the intention of validating the assessment tool in its ability to predict a program's capacity for sustainability.

FUNDING: Federal

POS2-49

AN EXAMINATION OF MEASURES OF ACCULTURATION IN RELATION TO SECONDHAND SMOKE EXPOSURE AMONG VIETNAMESE IMMIGRANTS IN ATLANTA

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Significance: In Vietnam, 54% of nonsmokers experience secondhand smoke exposure (SHSe) in the home. Moreover, in the U.S., Vietnamese immigrants have been shown to have higher SHSe compared to other Asian groups as well as nationwide SHSe prevalence. This study used a socioecologic perspective and Berry's



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Acculturation Model to examine the association between acculturation and SHSe among Vietnamese-Americans, specifically in the Southeastern region of the U.S. Methods: Data from surveys of 96 Vietnamese nonsmoking adults attending health fairs or programs hosted by two community-based partner organizations serving immigrants and refugees in metropolitan Atlanta (collected in Fall/Winter 2017-2018) were analyzed. Acculturation-related predictors included Vietnamese and American acculturation scores (measured through the Vancouver Acculturation Index), the percentage of lifetime in the U.S., zip-code level percentages of Asians, and Vietnamese and English fluency. Additional sociodemographic variables included individual-level (age, sex, and household income) and community-level (zip-code level poverty rates) factors. A multiple logistic regression was conducted to examine the association between sociodemographic and acculturation-related predictors and the outcome of past 30-day SHSe in the home. Results: Overall, the average age of the sample (n=96) was 37.5 years, 65% were female, 56% reported an annual household income <\$50,000, and the average number of years living in the U.S. was 18.2. Past 30-day SHSe was reported by 21%. In adjusted multiple logistic regressions, the number of years living in the U.S. was associated with the outcome (OR=0.91, CI=[0.85-0.99], p=0.02), indicating that, when holding other predictors constant, participants' odds of SHSe in the home decrease by 9% with each year of living in the U.S. Discussion: Newly-immigrated Vietnamese may have increased risk for SHSe. Education about the harmful effects of SHSe and implementing smoke-free policies may benefit this population, particularly among Vietnamese-Americans who have more recently immigrated.

FUNDING: Academic Institution

POS2-50

PREVALENCE AND CORRELATED OF SEPARATE, COMBINED, AND SIMULTANEOUS TOBACCO AND CANNABIS USE IN CALIFORNIA

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Significance: There is limited information on combined and simultaneous use of tobacco products, including electronic nicotine delivery systems, or ENDS, and cannabis. This study sought to present detailed information about the prevalence and correlates of separate, combined, and simultaneous tobacco and cannabis use in California, the first state to allow medical marijuana in the US. Methods: Participants in the 2016 California Adult Tobacco Survey, N=3,058; age range 18-64 years, completed online surveys between February and March 2016 that assessed tobacco and cannabis use in the past 30 days. Results: Participants' use of tobacco at 15% was higher than use of ENDS at 6% or cannabis at 10%. The overall rate of combined use was 6%. Correlates of tobacco use included lower levels of education and income. Correlates of simultaneous tobacco and cannabis use included being unemployed or disabled. Conclusion: Cigarette smoking rates are higher than rates of ENDS or cannabis use. However the combined use rates of these products exceed current smoking rates in California, 15 years after decriminalization of medical marijuana but prior to the legalization of recreational cannabis. Individuals who are unemployed or disabled are at higher risk for simultaneous use of tobacco and cannabis.

FUNDING: State

POS2-51

EXPOSURE TO SECOND-HAND SMOKE IN PREGNANCY: AN ANALYSIS BASED ON THE DEMOGRAPHIC AND HEALTH SURVEY DATA FROM 30 LOW-INCOME AND MIDDLE-INCOME COUNTRIES

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Exposure to second-hand smoke (SHS) during pregnancy increases the risk of infant stillbirth, congenital malformations, low birth-weight, and respiratory illnesses. Whilst national prevalence estimates are available for active smoking during pregnancy for many low- and middle-income countries, such data are not available to describe the prevalence of second-hand smoking during pregnancy. Our objective was to assess the prevalence of SHS exposure in pregnant women in low- and middle-income countries (LMICs). For this, we used Demographic and Health Survey data collected between 2008 and 2013 from 30 LMICs. We estimated weighted country-specific prevalence of

SHS exposure among 37,427 pregnant women. We accounted for sampling weights, clustering, and stratification in the sampling methods. We also explored associations between socio-demographic variables and SHS exposure in pregnant women using pairwise multinomial regression model. We found that the prevalence of daily SHS exposure during pregnancy ranged from 6% [95% CI 5%, 7%] (Nigeria) to 73% [95% CI 62%, 81%] (Armenia); it was also greater than active tobacco use in pregnancy across all countries studied. Being wealthier, maternal employment, higher education, and urban households were associated with lower SHS exposure in full regression models. SHS exposure in pregnant women closely mirrors WHO GATS male active smoking patterns. Daily SHS exposure accounted for a greater population attributable fraction of stillbirths than active smoking, ranging from 1% of stillbirths (Nigeria) to 14% (Indonesia). Ours was the first study, which provides national estimates for 30 LMICs on second-hand smoke exposure in pregnancy and shows that these estimates are much higher than active smoking during pregnancy. For these countries, the estimated population attributable risk due to second-hand smoke exposure during pregnancy could be higher than that due to active smoking. Our findings suggest that SHS exposure during pregnancy may account for more stillbirths than active smoking. Protecting pregnant women from SHS exposure should be a key strategy to improve maternal and child health.

FUNDING: Nonprofit grant funding entity

POS2-52

MUSLIMS FOR BETTER HEALTH: MEASURING INDOOR AIR QUALITY IN HOMES IN DHAKA, BANGLADESH AS PART OF A SMOKE-FREE HOMES INTERVENTION STUDY

Kamran Siddiqi¹, Sean Semple, PhD², Rumana Huque³, Tarana Ferdous³, Noreen Mdege⁴. ¹University of York, York, AE, USA, ²University of Stirling, ³ARK Foundation, ⁴University of York.

Exposure to Second-hand Smoke (SHS) is a major public health problem and a priority for policy making in Bangladesh. Working with the Islamic Foundation in Bangladesh this project aims to develop and test a community-based intervention called 'Muslims for better Health' (M4bH) designed to reduce exposure to SHS in homes in Dhaka. The study gathered baseline air quality data (fine particulate matter less than 2.5 microns—PM2.5 – a marker of SHS concentrations) from 1800 homes in Dhaka between April and July 2018. PM2.5 data were collected using Dylós DC1700 air quality monitors positioned in the main living area of each home for a full 24h period. The instruments measure and log concentrations each minute and these data form part of the intervention through a personalised educational feedback of the effect of smoking on household air quality. In themselves these data (more than 2.5 million minutes of PM2.5 concentration measurement) represent one of the biggest campaigns of measurement of air quality in homes in Bangladesh. Preliminary analysis of data from the first 600 homes indicates that the mean (and standard deviation (SD)) 24h PM2.5 concentrations measured in smokers' homes was 56 (43) micrograms/m³. This is over twice the WHO guidance value for 24h PM2.5 concentrations. More than 1 in 5 homes exceeded the WHO guidance value by more than three times (more than 75 micrograms/m³). The average peak concentrations experienced in these homes was 429 micrograms/m³ showing that very high levels of SHS were common. As PM2.5 is not specific to SHS we compared these household measurements with outdoor air PM2.5 concentrations reported by the US Embassy in Dhaka for the measurement period of this sub-sample (April-July). Average 24h outdoor concentrations were 44 (24) micrograms/m³ suggesting that smoking homes typically had air quality about 27% worse than ambient air. The presentation will update these results from the remaining 1200 homes where data has been collected and provide examples of the feedback provided to homes as part of the M4bH intervention. Data exploring the temporal changes in household air quality will also be presented.

FUNDING: Nonprofit grant funding entity

POS2-53

CHILDREN LEARNING ABOUT SECOND-HAND SMOKING (CLASS II): A PILOT CLUSTER RANDOMISED CONTROLLED-TRIAL IN BANGLADESH

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Children exposed to second-hand smoke (SHS) are at increased risk of respiratory illnesses. We conducted a pilot cluster randomised controlled-trial in Bangladesh to test the Smoke Free Intervention (SFI) among primary school children. Children Learning About Second-hand Smoke (CLASS II) is a large pilot cluster randomised controlled-trial



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conducted in primary schools in Dhaka, Bangladesh among year-5 children, mean (SD) age 10.8 (1.2) years. Eligible schools were randomly allocated to either usual education (control arm) or to SFI (intervention arm). We used the minimisation method of allocation based on two criteria: school's public/private status and the ratio of boys to girls. We could not mask the children, schoolteachers, and researchers from the treatment allocation. Delivered by schoolteachers, SFI consisted of two 45-minute and four 15-minute educational sessions. Our primary outcome was SHS exposure at two months post-allocation, verified by children's salivary cotinine. Our primary analysis was based on intention-to-treat. The trial is registered at ISRCTN.com and the number ISRCTN68690577. Between April 1, 2015 and June 30, 2015, we approached 25 schools and recruited 12 of them. Out of 576 children in year-5, 484 were present on the day of trial recruitment; 481 consented. Six schools (245 children) were allocated to SFI arm and six schools (236 children) to usual education (n=236). 450 children (SFI = 229; control = 221) who had cotinine levels indicative of SHS exposure were followed-up. All schools were retained, 89.9% children (206/229) in SFI and 88.9% (192/221) in the control arm completed primary outcome assessment. Their mean cotinine at the cluster level was 0.53ng/ml (SD 0.36) in SFI and 1.84ng/ml (SD 1.49) in the control arm – a mean difference of -1.31 ng/ml (95%CI -2.86, 0.24). It was feasible to recruit, randomise and retain primary schools and children in our trial. CLASS II trial found that a school-based intervention (SFI) has the potential to reduce children's exposure to SHS – an approach that has been rarely used, but has considerable merit in school-based contexts.

FUNDING: Nonprofit grant funding entity

POS2-54

MUSLIMS FOR BETTER HEALTH: DEVELOPING A SMOKE FREE HOME INTERVENTION FOR DELIVERY IN MOSQUES

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Second-hand smoke (SHS) contains more than 4,000 toxic chemicals and is a serious health hazard to non-smokers. Every year, an estimated 890,000 people die and 10-9 million disability-adjusted life years are lost due to SHS exposure, worldwide. Although private homes and cars are also important sources of SHS, effective non-legislative interventions targeting SHS exposure within these settings are lacking. The aim of this presentation is to present the development of a smoke-free homes (SFH) intervention for delivery by Imams and Khatibs within mosques in Bangladesh. The methods were underpinned by user testing methodology, and a typology for adapting health promotion interventions to meet the needs of ethnic minority groups. There were 5 steps: 1. Interviews with 6 men and 2 women to explore knowledge, smoking behaviours at home, strategies used to stop smoking at home and views on the delivery of the SFH intervention in mosques. 2. Development of the logic model for the SFH intervention, drawing on the interview data, existing literature and stakeholder input. 3. Selection of Ayahs for the constructs in the logic model (understanding, acceptance, motivation, action), linking to behaviour change techniques and development of corresponding messages. 4. Interviews with 5 men and 1 woman to user test the selected Ayahs and corresponding messages. 5. Focus group discussions with 13 Imams to explore views on Islam and health, delivering health messages in mosques; and to user test the selected Ayahs and corresponding messages and seek feedback on draft resources. This work was conducted May to December 2017. A SFH intervention "Muslims for Better Health" (M4BH) was developed and is currently being tested in a cluster randomised controlled trial. This presentation will discuss the above steps of intervention development, their challenges and the strengths/limitations of this approach.

FUNDING: Nonprofit grant funding entity

POS2-55

RESILIENCE AND RISK FOR TOBACCO USE IN A NATIONAL, PROBABILITY SAMPLE OF SEXUAL AND GENDER MINORITY ADULTS

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BACKGROUND: There are substantial and well-documented inequalities in tobacco use between sexual and gender minority (SGM, e.g., lesbian, gay, bisexual, transgender, queer [LGBTQ]) and straight and cisgender people. SGM-specific (e.g., stigma) and non-specific risk factors (e.g., mental health) have been implicated as drivers of these disparities and research suggests that certain protective factors (e.g., identity centrality)

may mitigate the impact of these factors. However, there is no research available to date that examines these factors in comparison to each other or between SGM groups to assess their relative impact. Thus, we sought to examine associations for risk and resilience with tobacco use and compare these effects between SGM subgroups. **METHODS:** In 2017 we conducted a cross-sectional survey with a national, probability-based sample of SGM adults (N=453). We assessed the following theory-informed constructs of risk: adverse childhood events, stigma, discrimination, LGBTQ social environment, social isolation, identity concealment, and mental illness. For resiliencies, we assessed advertising skepticism, identity centrality, social support, and participation in the LGBTQ community. We present effect sizes representing the strength of the association between these factors and for multiple tobacco use outcomes. We stratified analyses by age, sexual orientation, and gender identity. **RESULTS:** Patterns of risk and resilience differ by age, sexual orientation identity, and gender identity. Additionally, although much of the literature has focused on the role of stress from stigma and discrimination, less well characterized protective factors may be important in LGBT-targeted interventions. For example, having people to talk to about being LGBTQ was significantly associated with being a nonsmoker (aOR=1.67) but the effect was substantially larger for young adults (aOR=3.85). **DISCUSSION:** Risk and resilience are not uniform across SGM groups. Patterns of risk and resilience can inform interventions that target specific segments of LGBTQ communities. Further work on the etiology of these differences is needed.

FUNDING: Federal

POS2-56

GENDER MINORITY YOUNG ADULTS' REACTIONS TO TAILORED TOBACCO CONTROL MESSAGING

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Background: Tobacco control messaging tailored to the lesbian, gay, bisexual, and transgender (LGBT) community is scarce in public health. A few campaigns have focused on the LGBT community as a whole; to date there have been no campaigns that exclusively focus on tobacco control messaging for gender minority (GM) young adults (whose gender identity and biological sex do not match). Gauging GM young adults' receptivity to LGBT-tailored messaging will help future campaigns develop inclusive and effective content that address unique aspects of GM young adults' lives. **Methods:** Twenty five tobacco-using GM young adults ranging from 18 to 29 years old (mean=23.2, 64.0% non-Hispanic White) participated in 1-hour, one-on-one semi-structured interviews in Austin, TX. Interviews focused on participant tobacco use behaviors and reactions to online LGBT-tailored tobacco video content from the Food and Drug Administration's This Free Life, the first large-scale campaign designed to reduce LGBT young adult smoking. Interviews were audio recorded, transcribed and thematically coded by independent raters. **Results:** Participants had positive reactions to visible queer representation and depictions of gender non-conformity in the videos, as well as to positive and affirming messages that did not shame smoking behaviors. Participants with negative reactions perceived an over-emphasis on bar culture that they view as primarily reserved for cisgender SM audiences. A few participants viewed occasional or social smoking as a valuable social connection tool and a less harmful behavior that may take the place of more serious behaviors like illicit drug use. These participants felt the focus on deterring light smoking might eliminate a coping mechanism for stressors that some GM young adults face. **Conclusions:** Messages with clear depictions of gender non-conformity and transgender inclusion were well-received. Future tobacco control messaging should explore the less visible social contexts of some GM young adults' tobacco use (such as house parties) while acknowledging that some GM young adults may smoke cigarettes to make connections to their community and as an alternative to drug use.

FUNDING: Federal

POS2-57

INTERSECTION OF SEX, SEXUAL IDENTITY AND RACE/ETHNICITY AMONG SEXUAL MINORITIES: DIFFERENCES IN TOBACCO USE BEHAVIORS

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INTRODUCTION: The framework of intersectionality posits that the combination of social identities, such as race and sexual identity, has a unique effect on health behavior.



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OBJECTIVE: To examine differences in tobacco use behaviors by sex, sexual identity and race/ethnicity among a sample of sexual minorities. **METHODS:** Data are from the baseline assessment of This Free Life, a large-scale public education campaign from the U.S. Food and Drug Administration (FDA) designed to prevent and reduce tobacco use among lesbian, gay, bisexual and transgender young adults, ages 18 to 24. This analysis was restricted to cisgender individuals who identified as bisexual or gay/lesbian (G/L) (n=3,559). Race/ethnicity was dichotomized; non-Hispanic, white vs. non-white race and/or Hispanic ethnicity (referred to as white and non-white). Means and proportions were used to examine differences in past 30-day tobacco use by sex, sexual identity and race/ethnicity. **RESULTS:** A total of 60.2% of the sample had used any tobacco product; prevalence was highest among white and non-white G/L females (68.0% and 64.9%). White G/L females reported the highest prevalence of cigarette use (53.5%) and e-cigarette use (32.9%). Use of cigars and hookah was highest among non-white G/L females (31.4% and 27.0%) and non-white, bisexual females (26.6% and 29.1%). For cigar use, prevalence among gay males was higher for non-white (22.1%) compared to white (18.8%) respondents; among bisexual males, prevalence was higher among white (22.7%) compared to non-white respondents (18.8%). **CONCLUSION:** Tobacco use risk profiles differed by sex, sexual identity and race/ethnicity across all products examined. To address tobacco-related health disparities, it could be useful for tobacco public education efforts to consider multiple social identities in identifying high-risk groups for targeted content and campaign efforts.

FUNDING: Federal

POS2-58

THOSE WHO BELIEVE THEY CAN, DO: THE RELATIONSHIP BETWEEN SELF-EFFICACY, SMOKING OUTCOME EXPECTANCIES, AND BEHAVIOR IN AN LGBT SAMPLE

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SIGNIFICANCE: Self-efficacy, the belief one can do or avoid a behavior, and smoking outcome expectancies (e.g., expected health consequences of smoking) have been found to be associated with cessation behavior, smoking behavior, and smoking initiation. Tobacco control research has found that reinforcing negative smoking outcome expectancies can influence smoking behavior. The current study, using baseline data from the evaluation of This Free Life, the first large-scale public education campaign in the U.S. to focus on reducing tobacco use among LGBT young adults aged 18-24, explored the attenuating effects of self-efficacy on the relationship between smoking outcome expectancies and behavior. **METHODS:** In 2016, 4,057 LGBT young adults aged 18-24 completed the evaluation baseline survey. This analysis uses the following measures: (1) negative smoking outcome expectancies (e.g., smoking cigarettes will shorten my life) (1-5 Likert scale); (2) self-efficacy to avoid smoking in various situations (1-5 Likert scale), and (3) smoking behavior. Regression and Binary Logistic Regression analyses assessed the relationship between smoking outcome expectancies and smoking behavior and the moderating effects of self-efficacy. **RESULTS:** Smoking outcome expectancies were negatively associated with smoking such that those who strongly agreed that negative smoking outcomes would occur were less likely to smoke ($p < .05$). Self-efficacy moderated this relationship such that the negative relationship between outcome expectancies and smoking was stronger for those who believed that they could avoid smoking in various situations ($p < .05$). **CONCLUSIONS:** Evidence suggests that the relationship between negative smoking outcome expectancies and smoking can be bolstered if one's beliefs about their ability to avoid smoking are strong. These results suggest that building self-efficacy may bolster the effects of campaign messaging for tobacco public education campaigns.

FUNDING: Federal

POS2-59

UPTAKE AND PATTERNS OF SMOKING AND E-CIGARETTE USE AMONG YOUTH IN THE UNITED STATES, CANADA, AND ENGLAND

David Hammond, PhD¹, Jessica L. Reid¹, Geoffrey T. Fong¹, K. Michael Cummings², Ann McNeill³, Sara Hitchman³, David Levy⁴, Maansi Bansal-Travers⁵, James F. Thrasher⁶, Richard J. O'Connor⁵, Maciej Goniewicz⁵, Ron Borland⁷, Christine M. White¹
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Significance: E-cigarette and tobacco regulations in the US, Canada, and England aim to discourage youth uptake and use; however, regulations differ between countries, and have been more restrictive in Canada. To date, no studies have examined the impact of different levels of regulatory restrictions on vaping among youth. **Methods:** Data was analyzed from two waves of the ITC Youth Tobacco and E-cigarette Survey, an online survey first conducted in July-Aug 2017 with youth aged 16-19 recruited from consumer panels (n=13,468) in the US, Canada, and England, and repeated in August 2018, with replenishment of respondents lost to follow-up. Logistic regression and generalized estimating equations modeling were used to examine differences in vaping and cigarette smoking between countries and over time, adjusting for socio-demographics. **Results:** In 2017, across the three countries, 32.6% of youth surveyed had ever vaped, while 10.7% had vaped in the past 30 days. Prevalence of cigarette smoking was similar to vaping 'ever' (33.0%), but higher for 30-day smoking (16.8%). Prevalence of both vaping and smoking differed by country, with Canadians significantly less likely to use e-cigarettes or smoke than youth in England and the US ($p < .001$). In contrast to prevalence, the frequency and intensity of vaping and of smoking were similar across countries. Preliminary (unweighted) analyses of 2018 data indicate that overall prevalence was similar to 2017 estimates, with approximately one-third of respondents reporting "ever" vaping, and just over 10% reporting vaping in the past 30 days. Overall prevalence of cigarette smoking was also similar in 2018, with over one-third of respondents reporting ever smoking, and approximately 15% reporting smoking in the past 30 days. Longitudinal analysis of uptake between waves will be presented, with a focus on different trajectories and predictors of uptake across the three countries. **Conclusions:** Both vaping and smoking among youth were lower in Canada at baseline, possibly due to more stringent regulations around e-cigarettes and tobacco. Overall prevalence of vaping and of smoking did not change substantially between 2017 and 2018.

FUNDING: Federal

POS2-60

YOUTH AND YOUNG ADULT NOTICING OF AND EXPOSURE TO E-CIGARETTE PRODUCT WARNINGS IN THE UNITED STATES, CANADA, AND ENGLAND

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Significance: Noticing warnings is a necessary first step to informing users of potential product risks. Little is known about young people's exposure to warnings on e-cigarettes, despite the popularity of these products with youth. This study examines young people's reports of noticing e-cigarette warnings in three countries (Canada, England, and the United States). **Methods:** Data were collected under Wave 1 of the ITC Youth Tobacco and E-cigarette Survey, conducted in Canada, England, and the US. Online surveys were completed by 16 to 19 year-olds in July/August 2017 (n = 12,064), a time when e-cigarette warnings were either newly required by regulations (England) or not yet legally required (US, Canada), though carried by some manufacturers voluntarily. The prevalence and correlates of noticing e-cigarette warnings were analyzed. Those who noticed warnings were also asked to recall their content. In addition, we examined the associations between noticing warnings and perceptions of e-cigarettes, adjusting for country, sex, age, race/ethnicity, and cigarette/e-cigarette use. **Results:** Overall, 12% of respondents reported noticing health warnings on e-cigarette packaging in the past 30 days. Noticing e-cigarette warnings was significantly more likely among youth in England (AOR=1.3, $p < .001$) and the US (AOR=1.3, $p < .001$) compared to Canada, and among dual e-cigarette and cigarette users (AOR=4.69, $p < .001$) versus non-users. Among those who noticed warnings, unaided recall of the word "nicotine" was low (7.5%). However, among ever e-cigarette users, those who noticed health warnings had higher odds of knowing whether their e-cigarettes contained nicotine (AOR=2.26, $p < .001$). Youth who noticed e-cigarette warnings also had higher odds of believing e-cigarettes cause at least some harm to users (AOR=1.12, $p = .007$), are as harmful as cigarettes (AOR=1.45, $p < .001$), and can be addictive (AOR=1.43, $p < .001$). **Conclusions:** Youth's noticing of e-cigarette warnings (and recall of nicotine-related messages) is low. Research should track exposure changes over time as new warning requirements are fully implemented across different countries.

FUNDING: Federal



POS2-61

USE AND PERCEPTIONS OF JUUL AMONG YOUTH IN THE UNITED STATES, CANADA, AND ENGLAND

Jessica L. Reid, MSc¹, David Hammond¹, Olivia A. Wackowski², Richard J. O'Conor³. ¹University of Waterloo, ²Rutgers School of Public Health, ³Roswell Park Cancer Institute.

Significance: JUUL has emerged as the leading vaping brand in the United States (US), and was recently introduced in both England (July 2018) and Canada (September 2018). The current study examined national estimates of JUUL use and uptake among youth in the US, Canada, and England, including patterns of use compared to other vaping brands. **Methods:** Data was analyzed from two waves of the ITC Youth Tobacco and E-cigarette Survey, an online survey conducted in July/August 2017 with youth aged 16-19 recruited from consumer panels (n=12,064 retained) in the US, Canada, and England, and repeated in August 2018, with replenishment for respondents lost to follow-up. Measures included detailed items on e-cigarettes, including patterns of use and brands. Respondents were also asked specifically about JUUL, including their awareness, use, likelihood of trying if offered, and perceptions of harm and addiction. **Results:** Preliminary estimates for 2018 indicate that approximately half of US youth are aware of JUUL, with substantially lower awareness in Canada and England. Use of JUUL was also more prevalent in the US, with approximately 15% of all US respondents reporting ever use. In 2018, nearly one third of past-30-day vapers in the US reported JUUL as their usual brand, compared to 9.7% in 2017. JUUL also emerged as a usual brand among vapers in Canada and England in 2018, while none reported it in 2017. Given the choice of Marlboro, blu, JUUL or IQOS, youth in the US were more likely than those in Canada and England to select JUUL as the product 'most likely to be used with friends', and 'most likely to be used to quit smoking'. Country differences in perceptions of JUUL, including harm and addictiveness, will be presented. Differences in frequency and intensity of use between JUUL and other brands will also be examined. **Conclusions:** JUUL use has increased substantially among US youth, with emerging use observed in both Canada and England as the product becomes available.

FUNDING: Federal

POS2-62

DISCRETE CHOICE EXPERIMENT ANALYSIS OF PRODUCT ATTRIBUTES AMONG YOUTH IN THE UNITED STATES, CANADA, AND ENGLAND

James F. Thrasher, PhD¹, Vicki Rynard², David Hammond², Jordan Louviere³, Christine M. White², Jessica L. Reid². ¹University of South Carolina, ²University of Waterloo, ³University of South Australia.

Significance: The extent to which different nicotine products and product characteristics appeal to youth can inform regulatory strategies. The current study used a discrete choice experiment (DCE) to examine the effects of various product attributes for cigarettes, e-cigarettes, and heated tobacco products (HTP) among youth in Canada, England, and the US. **Methods:** A DCE was conducted with 4,069 randomly selected respondents from the ITC Youth Tobacco and E-cigarette Survey, an online survey conducted in July/Aug 2017 with youth aged 16-19 in Canada, England, and the US. The DCE examined 5 product attributes: product type, nicotine level, flavor, brand, and price. An alternative-specific orthogonal design with 27 choice sets was used, each of which contained 4 products: a cigarette, an e-cigarette, a HTP, and a "constant" product (tobacco-flavored e-cigarette with a medium nicotine level, branded as "Horizon", and at market price). Non-constant products varied on 4 attributes: flavor (tobacco, menthol, or cherry), nicotine level (zero, medium, or high), brand (Marlboro, Blu, or Freedom), and price (market -25%, market, or market +25%). Respondents were randomized to view 9 of the 27 choice sets and asked which product they would be most and least likely to try in each set. **Results:** In all countries, e-cigarettes were most often selected by youth as 'most likely to try', while cigarettes were selected as 'least likely to try'. Youth were most likely to prefer products without nicotine and at lower prices, whereas the effect of flavor and branding differed by product type: cherry flavor was preferred most often for e-cigarettes and HTPs, with no significant flavor differences for cigarettes. Marlboro branding was preferred least for e-cigarettes (compared to Blu and Freedom), but there was no significant brand effect for cigarettes or HTPs. The effect of product attributes also differed by country and smoking status, which will be discussed. **Conclusions:** The findings highlight the greater appeal of non-combustible products among youth, as well as a general desire for lower nicotine, flavored products. Branding preferences may be specific to product category.

FUNDING: Federal

POS2-63

FORMATIVE RESEARCH TO INFORM TO THE FIRST LARGE-SCALE LGBT TOBACCO PUBLIC EDUCATION CAMPAIGN

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Significance: Tobacco use remains the leading preventable cause of death in the U.S. Lesbian, Gay, Bisexual, and Transgender (LGBT) young adults are nearly twice as likely to use tobacco as their non-LGBT peers. In 2016, the FDA launched the first large-scale public education campaign on tobacco use among LGBT young adults to address this disparity. The following study represents qualitative formative research conducted to inform campaign development. **Methods:** In April 2015, 34 focus groups were conducted among 140 18-24 LGBT, non-daily smokers in 7 U.S. cities. Participants, recruited at LGBT social venues, viewed storyboard concepts and a moderator probed on various elements of the ads such as believability of the tobacco message, character depictions, and relevance to the lives of LGBT young adults. Two trained, independent coders reviewed transcripts and determined key themes associated with each storyboard. Common themes across storyboards were also identified to understand overall reactions to conceptual elements such as preferred tone, health messaging approach, and depictions of LGBT young adults and environments across all concepts. **Results:** The sample was diverse by age, gender and sexual identity, and race/ethnicity. Key overarching focus group findings for storyboards included: 1) Positive messaging was preferred over messaging perceived to promote guilt or shame. 2) Short-term consequences of tobacco use, such as damage to physical appearance, were more memorable than long-term consequences, such as lung cancer. 3) The impact of tobacco use on relationships was believable and motivating. 4) Realistic and relatable settings that reflect personal experiences were crucial to authentic messaging. 5) Participants valued diverse depictions of the LGBT community. **Conclusions:** Qualitative formative research underscored the importance of a positive and motivational tone, realistic settings, and diverse depictions to encourage LGBT young adults to live tobacco-free. These elements became important tenets of the campaign, reflected in both the creative and campaign voice.

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POS2-64

RESEARCH FINDINGS AND STRATEGIES USED TO DEVELOP THE FIRST LARGE-SCALE LGBT TOBACCO PUBLIC EDUCATION CAMPAIGN

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Significance: Tobacco use remains the leading preventable cause of death in the U.S. Lesbian, Gay, Bisexual, and Transgender (LGBT) young adults are nearly 2 times as likely to use tobacco as their non-LGBT peers. In 2016, the FDA launched This Free Life (TFL), the first large-scale public education campaign on tobacco use among LGBT young adults. The campaign aims to increase perceived risk of tobacco use while shifting perceptions of tobacco norms by aligning tobacco-free benefits with the values of LGBT young adults. **Overview:** To increase message processing and importance to a hard-to-reach young adult audience, TFL uses "active engagement" strategies where audience is participating with the campaign and backing content with comments, retweets, etc. TFL used insights from literature reviews and formative research to develop two creative packages conducive to active engagement: • In Our Story, LGBT influencers tell the community that we've come too far to be held back by tobacco. o Insights: LGBT young adults take pride in their identity and share a difficult past. • In Flawless, drag queens discuss the damage tobacco can do to one's appearance. o Insights: LGBT young adults take pride in their identity and respond positively to messaging about physical appearance. **Results:** Our Story videos received 12.9MM+ video completions at an 85% completion rate (above industry benchmarks) and 570K+ social media engagements (likes, clicks, etc.)—including 80K+ active engagements (shares, comments, etc.). In total, Our Story content was seen 300MM+ times across channels and markets. Flawless videos received 3.8MM+ video completions (65% completion rate) and 680K+ social media engagements. An interactive web experience boosted active engagement 20% over Our Story. Overall, Flawless content was seen 240MM+ times across all channels and markets. For both creative packages, social media comments and quotes from participants at live events demonstrate TFL's ability to engage LGBT young adults. **Conclusions:** Both creative packages have leveraged key insights to spark active engagement with LGBT young adults around living a tobacco-free LGBT lifestyle.

FUNDING: Federal



SRNT

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POS2-65

LGBT YOUNG ADULT AWARENESS OF AND RECEPΤIVITY TO THIS FREE LIFE TOBACCO PUBLIC EDUCATION CAMPAIGN

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INTRODUCTION: FDA's Center for Tobacco Products launched This Free Life, a primarily digital tobacco public education campaign among LGBT young adults, as they are at higher risk for smoking than non-LGBT peers. This Free Life seeks to change tobacco-related knowledge, attitudes, and beliefs. **OBJECTIVE:** To measure awareness of and receptivity to This Free Life one-year post-campaign launch. **METHODS:** This Free Life has a treatment-control evaluation design, with 12 campaign-targeted treatment markets and 12 minimum-exposure control markets. Analyses use data from LGBT 18-24-year-olds who completed surveys approximately 6 months and 1 year after campaign launch (follow-up 1 N= 2,788; follow-up 2 N= 3,548). Descriptive and bivariate analyses were used to compare brand (yes/no) and video ad awareness (maximum frequency of "never" or "rarely" = low, "sometimes" = medium, "often" or "very often" = high) and perceived effectiveness of ads (1-5 scale) between treatment and control. **RESULTS:** Compared to control, young adults in treatment were more likely to be brand aware at follow-up 1 (25% vs. 7%) and 2 (50% vs. 20%) (ps< .001). At follow-up 1, compared to control, young adults in treatment markets were more likely to report high (15% vs. 7%) and medium (16% vs. 9%) and less likely to report low (69% vs. 84%) awareness of video ads. Similarly, at follow-up 2, young adults in treatment (vs. control) were more likely to report high (27% vs. 6%) and medium (20% vs. 14%) and less likely to report low (53% vs. 80%) awareness of video ads (ps< .001). Perceived effectiveness of ads was high at follow-up 1 (mean scores for individual ads ranged from 3.65-3.82) and 2 (mean score: 3.79 (only 1 ad shown)). **CONCLUSION:** This Free Life achieved higher brand and video ad awareness in campaign-targeted treatment than control markets 1 year after campaign launch. Perceived effectiveness (i.e., receptivity) of This Free Life ads was also high among LGBT young adults.

FUNDING: Federal

POS2-66

DEMOGRAPHIC DIFFERENCES IN LESBIAN, GAY, BISEXUAL, AND TRANSGENDER YOUNG ADULT AWARENESS OF AND RECEPΤIVITY TO THIS FREE LIFE TOBACCO PUBLIC EDUCATION CAMPAIGN

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INTRODUCTION: FDA's Center for Tobacco Products launched This Free Life (TFL), a tobacco public education campaign among LGBT young adults in May 2016. It is the first large-scale campaign aimed at changing tobacco-related attitudes and beliefs among LGBT young adults in the United States. **OBJECTIVE:** To measure demographic differences in awareness of and receptivity to This Free Life one-year post-campaign launch. **METHODS:** Analyses used data from LGBT 18-24 year-olds who lived in campaign-targeted markets one year after campaign launch (N= 1,809). Descriptive and bivariate analyses were used to compare rates of self-reported TFL brand and video ad awareness, and brand and ad receptivity by sex, sexual and gender identity; smoking status; age; and race/ethnicity. **RESULTS:** TFL brand awareness ranged from 32% of cisgender bisexual males to 63% of gender minorities. Brand awareness was highest for gender minorities, followed by cisgender gay males and was lowest for cisgender male and female bisexuals. Cisgender gay males and gender minorities reported the highest levels of ad awareness and cisgender bisexual males and cisgender lesbian and bisexual females reported the lowest. Respondents aged 18 to 20 reported higher brand and ad awareness than those aged 21-24. Never smokers, ever-non-current smokers, and current smokers reported similar levels of brand and video ad awareness. Non-Hispanic African Americans reported lower brand and video ad awareness than other race/ethnicity groups. Cisgender gay males reported the highest levels of brand and ad receptivity; cisgender bisexual males and gender minorities reported the lowest levels of ad receptivity. **CONCLUSION:** At one-year post campaign launch, This Free Life has reached a broad LGBT audience, with highest levels of awareness reported by gender minorities and cisgender gay males. Generally high brand and ad receptivity measures suggest the campaign is resonating across LGBT sub-populations, though gender minorities report lower levels of receptivity than other groups. Findings may inform future campaign planning with LGBT young adults.

FUNDING: Federal

POS2-67

PENETRATION OF POD MODS INTO THE VAPE SHOP CONTEXT IN SOUTHERN CALIFORNIA

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Generations of e-cigarettes evolved from cig-a-likes (mid-2000s), then becoming tubular, tank style, and rechargeable/larger products (second generation), then leading to development of box mods (shaped like a box) that could be programmed on voltage and wattage, to vary the amount of vapor exuded, and now to pod mod devices which are smaller, look like a USB drive, and are more concealable and economical (fourth generation, beginning June 1, 2015 with JUUL at Pax Labs). JUULing involves liquid nicotine salt pods that contain e-juice has .7ML of e-liquid at 50mg of nicotine. Pod mods account 40-60% of all e-cigarette sales now, a majority being JUUL but with much competition occurring to meet some consumers' desires for open systems, regulation of PG/VG ratio, and regulation of voltage and wattage. Approximately 10% of teens have tried a pod mod in the last 30 days. In unpublished data (Sussman and colleagues, 2018 in southern California), of 77 baseline vape shops (in 2014), 61 were open one year later (in 2015), and 43 were open 2.5 years after baseline (in 2018). At baseline, no shop had a pod mod. At one-year follow-up, two of the open shops carried a pod mod, and at 2.5 years follow-up 35 of 42 shops that could be followed up carried pod mods or at least pods (in two shops). Of 89 total shops surveyed in 2018, 77 carry pod mods or at least pods (in two shops). Existence of pod mods failed to vary systematically by ethnic location (African American, Hispanic, White non-Hispanic, Korean/Asian, though slightly more presence at Korean/Asian shops). This presentation will provide detailed information on the types of pod mods offered at the shops and examine predictors of pod mod availability (i.e., why 12 shops don't carry pod mods). Anecdotal reports collected from vape shop personnel will be mentioned as well (e.g., pod mods as an example of a perceived healthier alternative to smoking cigarettes, ability to conceal the device, possible increasing disinterest in chasing clouds).

FUNDING: Federal; State

POS2-68

AN ANALYSIS OF JUUL ADVERTISING STRATEGY COMPARED TO VUSE

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Background: As of 2018, JUUL has rapidly gained the largest share of the ENDS market. Research indicates that exposure to e-cigarette advertising is a risk factor for e-cigarette use, but little is known about JUUL's marketing strategy. We examined and compared JUUL's advertising tactics to those of VUSE, which previously held the largest share of the ENDS market. **Methods:** We obtained ENDS ads between 2015-2017 from two market research agencies, which track a variety of media channels (e.g., magazines, radio, online). Ads were coded for claims, features, and appeals by one primary coder and reviewed by a second coder (Krippendorff's alpha=0.86, 93% agreement). **Results:** We identified 20 unique JUUL and 284 unique VUSE ads. No JUUL ads conveyed flavor explicitly, but 30% (n=6) displayed colored pods, 10% (n=2) mentioned flavor and 10% (n=2) described the nicotine in the product ("nicotine salts"). JUUL ads made claims about technological innovation (30%, n=6), compared the product to smoking (75%, n=15), and featured young people (30%, n=6) and bright colors (90%, n=18). These ads were placed primarily in online media, and magazines targeting retailers. Most VUSE ads (89%, n=252) explicitly advertised the product's flavor, featuring clear flavor labels and color coding and were placed in traditional media targeting consumers. Flavors were reinforced by complementary colors and imagery. **Conclusions:** VUSE engaged in traditional advertising regarding the appeal of their flavors, while the few JUUL ads we found focused on technological/design innovation over flavor and advertised more prominently online and in business-to-business magazines. JUUL has increased its market share significantly despite an apparent lack of consumer advertising in the sample of ads examined in this study. The contrasting strategies between JUUL and VUSE, may illustrate how different products are positioned in the market. Additional research



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on the venues outside of mainstream print and digital media targeted at consumers, where JUUL is advertising, can provide insight into how claims, colors, and imagery are being used to promote JUUL products.

FUNDING: Federal

POS2-69

CURRENT JUUL ELECTRONIC CIGARETTE USE PATTERNS AMONG EVER USERS: RESULTS FROM A CONVENIENCE SAMPLE

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Introduction: Electronic cigarettes (e-cigarettes) continue to evolve, as does the population of e-cigarette consumers in the U.S. JUUL, an e-cigarette from PAX Labs, increased its share of the e-cigarette market from 25% in Spring 2017 to almost 70% in Spring 2018. The current study examines JUUL use patterns and reasons for initiation in a large convenience sample of U.S. adults. **Methods:** Respondents were 979 U.S. adults registered on Amazon Mechanical Turk (MTurk) who reported ever using JUUL. Items included frequency and quantity of JUUL use, reasons for trying JUUL, flavor preferences, and use of other tobacco products. **Results:** The majority of the ever JUUL users reported only trying JUUL once or twice (59.5%); 29.2% reported regular nondaily use and 10.3% reported daily use. For 6.4% of participants, JUUL was the first nicotine/tobacco product ever tried. The average quantity of JUUL pod use was low in the overall sample (4 pods per month). Daily users reported using ~10 pods per month and engaging in 4-9 separate vaping sessions per day. Cool Mint was the most frequently used JUUL pod flavor (30.5%). The most frequently reported reasons for JUUL use were "because friends were using it" (26.5%), "curiosity/just to try it" (20.5%), and "gives a similar hit to a cigarette" (7.7%). Approximately 26% of current JUUL users reported current exclusive JUUL use, while 56% reported current use of JUUL and another e-cigarette and 43% reported current use of JUUL and combustible cigarettes. **Conclusions:** This is the first study to examine patterns and reasons for use of the most popular e-cigarette on the market. Findings suggest high levels of daily/non-daily use of JUUL among those who try it, which may indicate significant addiction potential. Interestingly, most did not report smoking cessation as a primary reason for use and quantity of pod use was low, even among daily and exclusive daily users.

FUNDING: State

POS2-70

USE OF E-CIGARETTES AND CONVENTIONAL CIGARETTES IN 14-15 YEAR OLDS IN NEW ZEALAND: RESULTS FROM REPEATED CROSS-SECTIONAL STUDIES, 2014 - 2017

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Significance: New Zealand (NZ) has implemented strong tobacco control policy. Until June 2018, it has been illegal in NZ to advertise or sell e-cigarettes/e-liquid that contained nicotine (or to make a cessation claim about e-cigarettes), although nicotine-free e-cigarettes have been legally available for sale to adults =18 years since about 2010. Within this context little is known about youth uptake of e-cigarettes, relative to uptake of smoking. To investigate youth uptake of e-cigarettes and conventional cigarettes in NZ between 2014 and 2017. **Method:** The NZ ASH Year 10 Snapshot is an annual cross-sectional survey of tobacco use in students aged 14-15 years. In 2014 a question was added to the survey on whether students had ever tried an e-cigarette (even a single puff or vape). Subsequent surveys included a question on current e-cigarette use, with responses grouped as daily use or regular use (at least daily, weekly or monthly). E-cigarette and smoking data were compared by survey year, age, gender, ethnicity, school decile, and smoking status. **Results:** From 2014-2017 between 36% (n=21,234) and 51% (n=30,443) of all 14-15 year olds in NZ participated in the survey. During this period, ever-tired, regular use, and daily use of e-cigarettes increased, particularly in Maori, males, and students in low decile schools. At the same time there was a continual decline in similar measures of tobacco use, irrespective of ethnicity, gender or decile. In 2017, few students were regular (6.6%) or daily (2.0%) e-cigarette users, or smoked

conventional cigarettes on a regular (4.9%) or daily (2.1%) basis. Dual use of e-cigarettes and tobacco cigarettes on a daily basis was 0.4%. Other patterns of product use will be discussed in the presentation. **Conclusion:** The proportion of year 10 students in NZ trying/using e-cigarettes now exceeds or matches the proportion trying/using conventional cigarettes. Maori students, male students and students from low decile schools have traditionally had the highest smoking prevalence (and are therefore exposed to the greatest harm), but may be switching to less harmful alternatives.

FUNDING: Federal

POS2-71

SUPPORT AMONG SMOKERS AND RECENT QUITTERS FOR MEASURES INCLUDED IN A PLAN TO ACHIEVE SMOKEFREE 2025: FINDINGS FROM THE ITC NEW ZEALAND (NZ) SURVEY

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Significance: NZ has an endgame goal – Smokefree Aotearoa 2025. In the face of evidence that the goal will not be achieved with current prevalence trends and absence of a Government strategy for achieving the goal, the NZ tobacco control sector developed the Achieving a Smokefree Aotearoa Action Plan (ASAP). This recommends endgame measures to reduce the availability, affordability and appeal of smoked tobacco products such as substantial reductions in retail tobacco supply and mandated denicotinised cigarettes as well as intensification of existing strategies. We explored support among smokers and recent quitters for measures included in the ASAP plan. **Method:** Data came from the first wave (Aug 2016-April 2017) of the International Tobacco Control (ITC) New Zealand Survey. The sample comprised 1082 smokers and recent quitters, including 361 who identified as Maori (indigenous peoples of NZ). Data were collected through CATI interviews and included questions assessing support for most of the main recommended measures in the ASAP plan. **Results:** Around half participants supported reducing the number of places selling tobacco products, and removing all additives from cigarettes. There was strong (80%) support for removing the nicotine from smoked tobacco products if alternative products to deliver nicotine were available. Only 32% supported large tax increases, but 69% supported tax increases if revenue was dedicated to help smokers quit. There was substantial support for most other ASAP measures. Support was generally stronger among recent quitters and among smokers planning to quit, and was similar by ethnicity except Maori and Pacific were more likely than non-Maori non-Pacific participants to support measures to reduce the availability of tobacco products. **Conclusions:** We found substantial support for most of the measures proposed in the ASAP report, with particularly strong support for reducing nicotine in cigarettes. Support among the overall population is likely to be much higher. These findings suggest that introducing a comprehensive range of measures to achieve the Smokefree 2025 goal is feasible from the perspective of smokers and ex-smokers.

FUNDING: Federal

POS2-72

BETEL NUT SURVEY AND INTERVENTION RESEARCH

Thaddeus Herzog, PhD. University of Hawaii Cancer Centre.

Significance: Betel nut (aka betel quid, areca nut) is the fourth most commonly consumed psychoactive substance in the world, following only alcohol, nicotine, and caffeine. Its use is concentrated in South Asia, Southeast Asia, and Pacific islands. Betel nut is classified as a Group 1 carcinogen by IARC and has been associated with oral and oropharyngeal cancer. This presentation will summarize a research collaboration between the University of Guam and the University of Hawaii Cancer Center. **Methods:** Betel quid dependence. Researchers in Taiwan developed and validated the Betel Quid Dependence Scale (BQDS) in 2012. The scale consists of 16 items and comprises three factors. We employed the BQDS with a sample of betel quid chewers in Guam (N=300). The original factor structure of the BQDS was replicated in the Guam sample. We also developed the RBCS to assess the reasons people have for chewing betel nut. Three factors were revealed. Employing samples from Hawaii (cigarette smokers) and Guam (betel nut chewers), we compared cigarette smokers and betel nut chewers for: a) motivation to quit their respective addictive behaviors, and b) past quit attempts. **Results:** Betel quid dependence was positively associated with adding tobacco to the betel quid, number of chews per day, and other variables. The primary reason for chewing betel nut was the stimulative effect of the drug. We found substantial similarities between smokers and chewers. Majorities of both smokers and chewers wanted to quit, but lacked specific plans for how and when to quit. Majorities of both smokers and chewers also had made several previous quit attempts. **Conclusions:** These findings led us to hypothesize



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that betel nut chewing cessation programs could be modeled after smoking cessation programs. BENIT is the first known randomized trial of betel nut cessation. Participants are betel nut chewers in Guam and Saipan who are willing to attempt to quit chewing.

FUNDING: Federal

POS2-73

USING FACEBOOK FOR SMOKE FREE MESSAGES: POSTS FROM FRIENDS AND POSTS FROM HEALTH SERVICES

David Thomas, PhD, Marita Hefler, Vicki Kerrigan. Menzies School of Health Research.

Significance: Facebook offers enormous opportunities for tobacco control, however evidence for how to effectively use it to influence behaviour is limited, particularly in relation to its potential for stimulating interpersonal influence. **Methods:** Community-based Aboriginal peer researchers who were active Facebook users were recruited to share tobacco control content on their personal Facebook page. Peer researchers were given three options each week, and asked to share at least one post every week. Aboriginal community controlled health services were asked to share tobacco control content on their organisational Facebook pages at least once per week. We interviewed peer researchers and health service staff to understand the decision-making processes for what content to share, and contacts from within their Facebook networks to understand the impact of the posts. Data was inductively analysed using grounded theory. **Results:** People were less likely to see posts published by health services than personal friends. Posts which gained the widest reach and stimulated the most interaction included those with a child-focused message, localised and Aboriginal-specific content, and practical, useful information. Indirect or obscure messages were the least likely to be shared. For peer researchers, the relatability of posts was an important influence on decision-making. Health services were more willing than peer researchers to post content with potential for strong negative emotional arousal. Factors which influenced how people responded to messages included the closeness of the personal relationship, knowledge of the person's smoking habits, and how the message was framed. Visible online interactions were not a reliable indicator of real-world impact; several participants who had not interacted with posts online were directly impacted, including making the decision to quit smoking. **Conclusions:** The popularity of a Facebook post, as measured by likes, shares and comments, does not necessarily equate with its real world impact. Strong personal ties with the person posting the content appears to predict stronger real-world impact than posts by organisations.

FUNDING: Federal

POS2-74

PERCEPTIONS OF TOBACCO IMAGERY IN VIDEO GAMES AMONG ADULT GAMERS

Jessica M. Rath, PhD. Truth Initiative.

Prior research has illustrated the power of popular culture in influencing behavior; 90% of teenagers and 60% of young adults report playing video games, so it is crucial to examine the role tobacco imagery plays in video games. Four separate rounds of data were collected via Amazon Mechanical Turk, resulting in a total sample of 300 video game players aged 18 and over. In rounds one and two, participants were asked to (1) select video games from a list containing games known to display tobacco imagery and (2) submit a video clip containing tobacco use from that game. In rounds three and four, participants were asked to submit a video game that included tobacco, excluding the games collected in the first two rounds. All 300 participants completed a survey about their playing time (days/week; "1-2", "3-4", "5-6", "everyday") health (excellent to poor), smoking status, and "how tobacco/nicotine was portrayed in this game" ("very positive" to "very negative", and "neither positive nor negative"). Among 36% of players who indicated they played video games "every day", 40% of current smokers reported that tobacco was portrayed "positively" in the clip they submitted, compared to 24% of non-smokers. Differences also existed by health status. Among current smokers in "excellent" health: 48% reported viewing the portrayal of tobacco in the clip they submitted as "positive," compared to 37% of non-smokers. More than 2/3 of both smoking and non-smoking participants in "fair" or "poor" health perceived that the tobacco in the games they submitted was portrayed "neither positively nor negatively." Most participants, regardless of their smoking status, health status, or frequency of game play, indicated that the tobacco-using characters did not benefit from the tobacco use or enhance the character's success. The majority (78%) of participants indicated there was no consequence for tobacco use in the video clip they submitted. Differences exist

in how smokers versus non-smokers view the portrayal of tobacco in video games, with health status playing a role in this perception. Further research is needed to understand what role context plays in perception of tobacco portrayal.

FUNDING: Nonprofit grant funding entity

POS2-75

DIFFERENCES IN RECALL OF TOBACCO IN POPULAR TV AND ONLINE STREAMING SHOWS BETWEEN RURAL AND URBAN YOUTH

Elizabeth C. Hair, Ph.D. Truth Initiative.

Significant tobacco use disparities exist between young people living in urban and rural areas. While factors such as fewer tobacco control policies have been posited to be the cause, researchers have acknowledged that the reasons for this disparity are not well understood. As exposure to tobacco in on-screen entertainment media is known to be related to smoking initiation, the objective of the current study is to assess differences in recall of tobacco in Netflix and TV shows between urban and rural youth and young adults. Content analyses of top Netflix and broadcast/cable TV shows were performed by two trained coders to identify shows that included tobacco. A sample of 15-24-year-olds (N=1,000) was surveyed online and asked to report which of the top Netflix and broadcast/cable TV shows they had watched, as well as whether they recall seeing tobacco in the show. Participants' zip codes were used to determine their rural/urban status based on rural-urban continuum codes (RUCC). Based on the sample distribution, RUCC codes were categorized as: 0=metro, pop. >=1 million; 1=metro, pop. <1 million; 2= non-metro. Logistic regression models predicted correct recall of tobacco in the shows each participant watched based on their rural/urban designation, controlling for age, gender, race/ethnicity, perceived financial situation, cigarette use, perceived prevalence of smoking, and household smoking. Those living in non-metro areas (OR=0.56, p<.05) or metro areas with a population of <1 million (OR=0.50, p<.05) had significantly lower odds of correctly recalling tobacco in shows, compared with those living in metro areas. Exposure to tobacco in on-screen media has been found to be related to smoking initiation among young people, and rural and urban youth have similar access to such media. Perhaps youth in rural areas where smoking is more prevalent notice the smoking less in TV than youth that are not around smoking as much in their everyday lives. Future research should account for youth's environment in order to determine the importance of exposure to smoking in on-screen media, as well as the importance of conscious recall of smoking behavior in these shows.

FUNDING: Nonprofit grant funding entity

POS2-76

EXPOSURE TO TOBACCO IN VIDEO GAMES AND YOUTH SMOKING: A LONGITUDINAL STUDY AMONG MEXICAN MIDDLE-SCHOOL STUDENTS

Rosaura Perez-Hernández, MS. National Institute of Public Health.

BACKGROUND: Studies have consistently found that exposure to tobacco portrayals in movies is associated with youth smoking initiation. Although many youth play videogames that contain smoking, little research has assessed its potential influence on smoking. This is the first longitudinal study to examine the topic. **METHODS:** Data were analyzed from a representative cohort of 4,897 Mexican middle-school students who reported that they had not used any tobacco products at baseline and who were followed up 20 months later. Students were asked how often they played videogames and to list three games they played most often. Tobacco content in videogames was assessed using validated methods, with videogame tobacco exposure (VGE) derived by: scoring their top three videogames for tobacco content (range=0-3); multiplying this score by the hours played per day; and using results to group students (i.e., does not play games; plays games, no VGE (ref); low VGE; high VGE). Separate multilevel models regressed having tried smoking by followup and having smoked in the past 30 days at followup on VGE and baseline covariates (i.e., sociodemographics; parenting; sensation seeking; and smoking amongst parents, siblings and friends). Sensitivity analyses re-estimated models after eliminating students who did not play videogames and considering alternate VGE definitions. **RESULTS:** Most students (57%) played videogames. Of the videogames played, 41% contained tobacco, the most popular of which was Grand Theft Auto. In crude and adjusted models, high baseline VGE was associated with higher risk of smoking trial by followup (RR=1.42, 95%CI=1.22,1.64; ARR=1.26, 95%CI=1.08-1.46). Higher VGE at baseline was unassociated with being a current smoker at followup. Sensitivity analyses produced the same pattern of results.



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CONCLUSIONS: Youth exposure to tobacco in videogames appears associated with smoking initiation, as found for smoking exposure through movies. Videogames, which provide an immersive experience that, in some games, allows players to smoke, should be subject to the policies the World Health Organization recommends for movies (e.g., adult rating if it contains tobacco).

FUNDING: Federal

POS2-77

PREVALENCE OF TOBACCO CONTENT IN UK MEDIA

Jo Cranwell, PhD. University of Bath.

It is well established that there is a causal link between exposure to depictions of tobacco in media and the uptake of smoking in adolescents. Whilst these depictions may not be as a result of direct tobacco industry interference the media in which they are portrayed is a powerful means to renormalise smoking, particularly for adolescents who are might turn to some forms of media to learn how to behave and how to use smoking to satisfy their psychological needs. Here we bring together and discuss the prevalence of tobacco content in a range of media including music videos, video games, and television, with tobacco content found in 22%, 26%, and 33% of media samples which were coded for the presence or absence of tobacco content. Further we discuss internet-based tobacco advertising and branding evidenced by research from Australia and discuss the implications of this for fresh approaches to tobacco regulation, especially in new, cross-border media.

FUNDING: Academic Institution; Nonprofit grant funding entity

POS2-78

SCHOOL-BASED RETAIL ENVIRONMENT EXPOSURES AND YOUTH CIGARETTE, CIGAR, AND E-CIGARETTE USE

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Associations between retail tobacco availability and tobacco use have been mixed. This study examined associations between school-based retail environment exposures and current use of cigarettes, cigar products, and e-cigarettes among middle school youth in Cleveland, OH. Retail outlets (n=1,834) were identified using the Cleveland Food Retail database, which were ground-truthed and audited from June, 2016 through August, 2016. Sale of cigarettes, cigar products, and e-cigarettes was documented for each store. Youth data was drawn from the 2016 Cleveland Youth Risk Behavior Survey, which was administered to all 7th and 8th grade students across Cleveland Metropolitan School District K-8 schools. A total of 3,778 students completed the survey (Response Rate=83.0%). Past 30 day cigarette use, cigar product use, and e-cigarette use was assessed. For each school, retail outlet density (ROD) and proximity to the nearest retail outlet were calculated for each product. Student-level factors included demographics, the number of days youth walk to or from school each week, and the number of times youth stopped at a retail store on the way to or from school each week. Multiple regression analysis assessed the associations between school-based retail environment exposures and youth tobacco product use. Across all schools (n=65), 3.9% currently use cigarettes, 10.2% currently use cigar products, and 15.2% currently use e-cigarettes. School-based ROD and proximity were not associated with current use of cigarettes or e-cigarettes; the association between cigar product use and ROD approached significance ($p=.054$). In all models, frequency of walking to school and stopping at a retail store were most strongly associated with current tobacco use. Retail density and proximity relative to schools are not significantly associated with tobacco product use among youth in Cleveland. However, youth who report regularly walking to/ from school or who report stopping at a retail store before/after school are significantly more likely to be a current tobacco product user. This may be due to the increased exposure to both point-of-sale marketing as they navigate through their environment.

FUNDING: Federal

POS2-79

RESIDENTIAL DENSITY OF TOBACCO RETAIL OUTLETS AS A PREDICTOR OF SMOKING CESSATION AMONG AFRICAN AMERICAN AND WHITE SMOKERS

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Smoking cessation trials and population studies indicate that African Americans (AAs) have lower quit rates than Whites (Ws). Tobacco retail environments may influence quit rates by increasing exposure to cues and advertising. Our aim was to examine if tobacco outlet density and proximity predicted smoking cessation beyond individual-level predictors using data from a smoking cessation cohort intervention of varenicline and counseling for AA and W smokers. **METHODS:** Participants were 224 AA and 225 W smokers stratified on age and gender, who met eligibility criteria including income < 400% federal poverty level, enrolled in the Quit2Live trial in Kansas City. Tobacco retail outlet addresses were obtained from state agencies, and geocoded using ArcGIS. Proximity to the nearest outlet using road network distance from participants' residences and density (number of outlets) within 3.5 km (2.2 miles) were computed. Baseline and treatment-related predictors of cotinine-verified abstinence at 26 weeks were identified using best subsets logistic regression. We estimated mixed-effects logistic regression models including census tracts as a random effect. **RESULTS:** Median proximities to the nearest outlet were 620m for AAs and 882m for Ws. Median densities within 3.5km were 41 outlets for AAs and 25 for Ws. Ws were more likely to be abstinent than AAs (24% vs 14%, $p<0.01$). Predictors of abstinence were home ownership, household income/person, baseline serum cotinine, perceived neighborhood problems and study visits completed (including smoking cessation counseling). Adjusting for these predictors and race, proximity was not associated with abstinence in the mixed-effects logistic regression. Outlet density within 3.5km was negatively associated with cessation in an adjusted model ($OR= 0.98$, 95% CI 0.97 – 0.99, $p = 0.04$). **CONCLUSIONS:** Disparities in quit rates among AAs and Ws engaged in a smoking cessation intervention appear to be influenced by both treatment and socioeconomic factors. Density of outlets within a 3.5km radius further contributes to explaining differences in quitting, highlighting the unique role of residential tobacco retail environments.

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POS2-80

THE AVAILABILITY OF RETAIL TOBACCO NEAR TOBACCO-FREE SETTINGS IN NEW YORK STATE

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Policies establishing tobacco-free schools and health care environments help prevent youth tobacco use and support adults trying to quit; however, increased availability of retail tobacco around these settings can undermine these policies. This study examined the availability of retail tobacco (density of and proximity to tobacco retailers) surrounding three tobacco-free policy settings in New York State (NYS). Federally qualified health centers and look-a-like facilities (FQHCs) from 2018 (n=706), primary and secondary public schools (PS) from 2015-2016 (n=4,872), and substance abuse treatment centers run by the NYS Office of Alcoholism and Substance Abuse Services (OASAS) from 2018 (n=953) were downloaded for NYS from state and federal repositories and geocoded. A statewide density surface using static-bandwidth kernel density estimation was constructed from geocoded tobacco retailers (n=21,314) identified by the NYS Department of Health. Density (outlets/sq. mile), was extracted for every FQHC, OASAS, and PS location. Proximity was calculated in walkable miles along a street network dataset from each FQHC, OASAS, and PS location to the nearest tobacco retailer. FQHCs on average had higher density than PS (Mean = 17.96 vs. 10.54, $p < 0.0001$) and OASAS centers (Mean = 17.96 vs. 11.01, $p < 0.0001$). Similarly, FQHCs were on average closer to a retailer than PS (Mean = 0.23 vs. 0.50, $p < 0.0001$) and OASAS centers (Mean = 0.23 vs. 0.34, $p = 0.0008$). Likewise, OASAS centers were on average closer to a retailer than PS (Mean = 0.34 vs. 0.50, $p < 0.0001$). Among OASAS centers, opioid treatment programs had higher density (Mean = 20.42 vs. 9.81, $p < 0.0001$) and were on average closer to a retailer (Mean = 0.14 vs. 0.36, $p < 0.0001$) than other OASAS programs. Among FQHCs, school-based FQHCs had higher density than all other FQHC clinic types (Mean = 20.82 vs. 17.04, $p = 0.0042$). The increased availability of retail tobacco



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around these tobacco-free settings may undermine their policies and could result in increased and/or sustained use among vulnerable populations visiting these facilities. Further density reduction policies may be warranted in NYS.

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POS2-81

POOR NEONATAL HEALTH OUTCOMES AND CORPORATE TOBACCO SALES POLICIES BY CVS AND DOLLAR STORE CHAINS

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Preterm birth (PTB) and low-weight births (LBW) are among the leading causes of infant mortality and morbidity. Rates of both PTB, birth before 37 weeks, and LBW, newborn <2,500 grams, have recently been rising after a decade of decline. Disparities in PTB and LBW have persisted among vulnerable populations, including higher rates for women of higher social vulnerability. Smoking during pregnancy (SDP) contributes to PTB and LBW births. In the US tobacco retail density (TRD) significantly increased in 2013 after Family Dollar and Dollar General, the two largest dollar-store chains, began selling tobacco; TRD decreased in 2014 when CVS, the largest pharmacy chain, discontinued tobacco sales. However, these changes are not distributed equally among neighborhoods of high and low social vulnerability (SVI). We determined the most appropriate method to calculate TRD at the census tract for birth outcomes studies. We then examined the relationship between changes in TRD and changes in PTB and LBW (birth counts obtained from FL state health department) before and after the corporate policy changes in census tracts with high and low SVI. Birth outcomes for census tracts with higher SVI correlated moderately ($r = .203$, $p < .0001$) with TRD when calculated as stores within an 800m buffer per 10,000 adults. TRD increased for 58.3% of tracts with high SVI and only 21.5% for tracts with low SVI. For high SVI areas, TRD increase is significantly associated with a PTB and LBW change of 3.0% and 4.5% in the two years since policy change, while TRD decrease is associated with PTB and LBW change of 2.1% and -3.5% (ANOVA, $p < .001$). For low SVI areas, TRD increase is associated with a PTB and LBW change of 2.6% and 6.2% in the two years since policy change, while TRD decrease is associated with PTB and LBW change of -2.9% and -4.5%. Throughout Florida, communities with TRD increases experienced an increase in poor birth outcomes over the observation period. TRD increase at the census tract, which occurred between 2012 and 2014 due to corporate policy decisions, is associated with increases in PTB and LBW in areas of higher and lower social vulnerable.

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POS2-83

RE-IMAGINING SMOKING CESSATION EDUCATION IN DENTAL EDUCATIONAL CURRICULA IN THE US

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Significance: Oral health providers in dental/allied academic institutions can help tobacco smokers quit, as well as train the next generation of providers to help smokers. Systems change, including curriculum changes, could help meet or exceed the Healthy People 2020 goal of increasing the percentage of general dentists regularly engaging in cessation counseling to 39.3%. This study surveyed dental providers in U.S. dental/allied programs to determine: (1) practices, and self-efficacy towards assisting smokers to quit; and (2) perceived degree of preparedness of recent graduates in relation to cessation practices. Methods: Data were from the 2018 Tobacco Survey of Personnel in Dental and Allied Academic programs, a web-based survey of faculty/staff in U.S. pre-doctoral, post-doctoral, dental hygiene, and dental assisting programs ($n=3,034$; response rate =20%). Data were weighted to adjust for non-response bias, and analyzed descriptively. Results: In total, 65.8% of personnel in dental academic programs saw patients. Of these, 71.9% thought that cessation counseling from a dental professional was effective (compared to that from a physician, 81.0%). Most academic dental providers regularly engaged in (90%) and felt confident (93.6%) asking about patients' smoking status; however, fewer regularly engaged in (26.5%) or felt confident (35.0%) offering cessation medications to patients who smoked. Overall, 9% had ever recommended e-cigarettes to a smoker for cessation. Consistent with results above, 89.2% were confident recent graduates could screen for smoking status, while only 30.2% were confident recent graduates could prescribe cessation medication. Conclusion: Many dental professionals believe cessation counseling is effective, but few regularly provide

comprehensive cessation counseling. Enhanced, early-career training may increase self-efficacy of dental providers in helping smokers quit. Foundational dental courses may include modules on pharmacologic and non-pharmacologic treatment of tobacco dependence, emphasizing clinically relevant information such as cessation counseling, providing nicotine replacement therapy, and patient instructions for use.

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POS2-84

A SNAPSHOT OF NATIONAL HEALTH WARNING LABELING POLICIES ACROSS THE GLOBE: FINDINGS FROM 95 COUNTRIES

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Significance: Tobacco packs provide critical real estate to convey information on harms and health effects of tobacco products. The WHO Framework Convention on Tobacco Control (FCTC) Article 11 provides evidence-based guidelines on elements of effective health warnings including on type of warning (text and pictorial), size (not less than 30%), location (on principal display areas i.e. front and back) and rotation (new warnings every 36 months). As the tobacco industry continues to combat efforts by countries to strengthen pack warnings, it is important to monitor the status of these policies. Further, it is pertinent to assess how country policies measure up to FCTC guidelines. Accordingly, this study examined country-level health warning labeling (HWL) policies for combustible tobacco products across the FCTC Article 11 parameters mentioned above. Methods: The study examined HWL policies for sovereign nations with policies available on the Campaign for Tobacco Free Kids website, www.tobaccocontrollaws.org, (N=95). HWL policy data collected included warning type, location, size, and rotation. Descriptive analysis on policies was conducted. Results: A majority of countries (n=88) display warnings on front and back of packaging. Canada, Nepal, Timor-Leste also require warnings on the tobacco product itself in addition to the packaging. Over two-thirds (n=67) of the countries in the study used a combination of pictorial and text messages. Warnings for Guatemala, South Africa and Algeria were below the 30% minimum, while warning size was unclear for Congo, Lebanon and Tanzania. Most countries (n=78) require rotation; however, fewer (n=56) comply with the minimum period for warnings (36 months). Conclusion: Most countries in the study were in compliance with Article 11 recommendations regarding warning type, location, size and rotation. Three countries also require warnings on the tobacco product itself. Countries should take steps to ensure stronger health warnings as effective pack warnings are a critical component of tobacco control efforts.

FUNDING: Unfunded

POS2-85

POTENTIAL PUBLIC HEALTH IMPACT OF MARKETING LOW NICOTINE CIGARETTES (LNCs) AND THE IMPORTANCE OF PUBLIC EDUCATION: A STUDY OF THE EFFECT OF LNC DESCRIPTORS ON HARM PERCEPTIONS

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Significance: Studies suggest that low nicotine cigarettes (LNCs) may be perceived as less harmful. However, it is unknown whether nicotine level descriptors interact with package color to further influence perceived harm. We used an experiment to study the interactive effect of labelled nicotine levels and package color on harm perceptions. Methods: A 2*2 factorial design was used; $n=4,088$ US adult participants aged 18 years and older in the GfK's Internet KnowledgePanel® were randomized into one of 4 intervention arms (pictures) comprising different combinations of cigarette pack color (red and green), and nicotine descriptor ("low nicotine" and "regular nicotine"). Perceived harm was defined as a response of "Harmful", or "Very harmful" to the question "How harmful to your health is the pack of cigarettes shown in the picture below if smoked every day?" Group differences were assessed with chi-squared tests and logistic regression. Results: There was no significant difference in demographic characteristics across arms. Compared to those exposed to the red-colored, "regular nicotine" pack, odds of harm perception were significantly lower in the red-colored, "low nicotine" group ($OR=0.62$; $95\%CI=0.45-0.83$), and the green-colored, "low nicotine" group ($OR=0.62$; $95\%CI=0.46-0.83$), but did not differ significantly from the green-colored, "regular nicotine" group. Across cigarette pack colors, there was no significant difference in harm perception between those exposed to the green- vs. red-colored packs. However, across nicotine levels, the odds of harm perception were significantly lower in the "low nicotine" group compared to the "regular nicotine" group ($OR=0.57$; $95\%CI=0.45-0.70$). Conclusion: Among a sample of US adults, harm perceptions were influenced by nicotine level



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descriptors, but not by package color. These findings could help inform efforts to evaluate the potential public health impact of marketing LNCs, including potential unintended consequences such as experimentation among non-smokers or continued use among current smokers. Educating the public on the health impact of LNCs may be beneficial.

FUNDING: Unfunded

POS2-86

FINDING THE SWEET SPOT BETWEEN THE MEDIUM, THE MESSAGE, AND THE MASSES IN A DYNAMIC ERA: THE EVOLUTION OF CDC'S "TIPS" CAMPAIGN

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Significance: CDC's Tips from Former Smokers® (Tips®) national tobacco education campaign, which has aired annually since 2012, features real people suffering from the effects of smoking-related diseases. The campaign motivates smokers to quit by showing them the difficulties of living with the negative health consequences of tobacco use. We describe how the campaign has remained impactful and relevant in a dynamic societal, media, and tobacco control landscape. **Methods:** Drawing on formative research, stakeholder input, and the direction of the tobacco control landscape, the Tips campaign has continuously adapted three parameters for impact: 1) The message medium, including innovative media vehicles to share Tips ads through digital media (e.g., display, video, and social), thus complementing more conventional vehicles such as TV, print, and radio in reach and impact; 2) the message content, including the variety of smoking-attributable diseases featured, such as well-known conditions (e.g., lung cancer and heart disease) and lesser-known conditions (e.g., Buerger's disease and macular degeneration); and 3) the masses or target populations, such as smokers of low socio-economic status (SES), African American and Hispanic smokers, and smokers with mental health conditions. **Results:** The Tips campaign was associated with significant increases in knowledge of several conditions caused by smoking. During 2016, Tips awareness among US adults overall was 83%. Evaluation results revealed high perceived effectiveness of the Tips ads among several population subgroups that received tailored messages, including low-SES smokers, African American smokers, Hispanic smokers, and smokers with mental health conditions. The Tips campaign was associated with an estimated 9.15 million total quit attempts in 2016 and 522,000 sustained quits during 2012–2015. **Conclusion:** During 2012–2017, the impact of the Tips campaign remained strong by strategically evolving in a dynamic landscape, including educating a diversity of populations about myriad smoking-related harms through traditional and novel media.

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POS2-87

SMOKELESS TOBACCO AND SMOKING RELATIVE HARM: BELIEFS AND THE ASSOCIATION BETWEEN RISK PERCEPTION AND TOBACCO USE TRANSITIONS

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Despite epidemiological evidence suggesting that using smokeless tobacco (ST) is less harmful than smoking cigarettes, many adult smokers (AS) perceive ST as equally or more harmful than cigarettes. We analyzed longitudinal PATH data to determine the changes in risk perception of ST relative to cigarettes among AS and the association between risk perception and transition from cigarettes to ST from Wave 1 (W1) to Wave 2 (W2). We estimated the risk perception in AS (≥ 18 years of age, tobacco poly use possible, $n=7918$) across W1 and W2 using an item assessing the relative risk of ST use compared to smoking cigarettes. AS indicating that ST use is "about the same" or "more harmful" than smoking cigarettes were considered to have a risk misperception and those indicating "less harmful" were considered as without misperception. We also estimated the percent of AS who transitioned from cigarettes (W1) to exclusive use of ST (W2) stratified by risk misperception. Last, we calculated the odds of transitioning from cigarettes (W1) to exclusive ST use (W2) between those with and without risk misperception of ST adjusting for age, education, and cigarette use. The vast majority of AS exhibited risk misperception of ST at W1 (91.5%), a rate which increased modestly at W2 (92.5%), $p=0.002$. Significantly higher proportion of AS without misperception (2.1%) transitioned from cigarettes (W1) to ST use (W2) relative to those with misperception (0.4%), $p<0.001$. Odds of transitioning from cigarettes (W1) to exclusive ST use (W2) was 4.5 times greater for those without the misperception relative to those with misperception of ST, $p<.001$. AS more likely to switch to exclusive ST use were <35 years of age and smoked fewer cigarettes. Our findings confirm that a significant proportion

of AS continue to have misperception that ST use is about the same or more harmful than smoking, a belief inconsistent with the epidemiological evidence. AS without such misperception were more likely to switch to exclusive ST. Our analyses highlight the importance of providing AS with truthful and accurate information about relative risks of ST compared to cigarettes to advance tobacco harm reduction.

FUNDING: Tobacco Industry

POS2-88

CIGARETTE SMOKING BEHAVIOR AMONG ADULT CIGARETTE SMOKERS USING VERVE® DISCS OR CHEWS DURING 6-WEEKS OF AT-HOME USE

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Significance: FDA in its Draft Guidance for new product applications suggests that manufacturers include information regarding "...the frequency with which consumers use the product, and the trends by which consumers use the product over time" as well as "effects on... switching behavior... and dual use." VERVE® Discs and Chews are oral, tobacco-derived nicotine products that users chew and discard. **Method:** To characterize VERVE® Discs or Chews use behavior and its influence on other tobacco use behavior, including switching and dual use, we conducted a 6-week, 2-phase, at-home use study in 517 adult cigarette smokers not planning to quit. Participants expressed interest in trying VERVE® products prior to enrollment in Phase 1 during which they tried two flavors (Blue Mint or Green Mint; 1 per day) of VERVE® Discs ($n=256$) or VERVE® Chews ($n=261$). During Phase 2, participants had open access to both flavors of either VERVE® Discs or Chews and chose the amount to take home and use over 6 weeks. Daily surveys captured number of cigarettes, number of Discs or Chews (by variety), and amount of other tobacco products (e.g. cigars, e-vapor, pipes etc.) used per day. An end-of-study survey captured current tobacco use status and quitting intentions. **Results:** By Week 6 of Phase 2, 23.2% of smokers switched to VERVE® (e.g. reported zero cigarettes), 59% reported a 20% or greater decrease from baseline in cigarettes smoked per day, 11.4% remained the same, and 6.4% increased smoking. **Conclusion:** A large portion of study participants dual used VERVE® with cigarettes; however, the majority either reduced smoking or switched completely after they started using VERVE® under these open access conditions. This is an interesting result given that participants had no intentions to quit smoking at screening. These results suggest that use of VERVE® can coincide with reductions in cigarette smoking, and possibly complete switching among adult cigarette smokers who express initial interest in trying and using the product.

FUNDING: Tobacco Industry

POS2-90

DOES REDUCING CIGARETTE CONSUMPTION REDUCE RISK OF PREMATURE DEATH? IMPLICATIONS OF A MODEL

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SIGNIFICANCE: This methodology may allow more accurate assessment of public health effects of tobacco products. **BACKGROUND:** The US FDA encourages the use of statistical models to project health effects of tobacco products on a population. Of various models being developed for this purpose, ours has been unique in adjusting smokers' relative risk (RR) of death based on average cigarettes smoked per day (CPD), for both cigarette-only smokers and dual users who may reduce CPD after taking up a reduced-risk product. While there is good evidence for lower RR among lifelong lower-CPD smokers (in a concave CPD-RR relationship), evidence for lower RR among those who reduce CPD is mixed, perhaps due to less and lower-quality data. RR for CPD reducers may depend on duration of smoking at both higher and lower CPD levels and consistency of CPD in both periods, which are hard to capture accurately in surveys. **METHODS:** We used a population simulation model to explore impacts on mortality of tobacco product use. A product use history generator simulated transitions among product use and deaths. The model then aggregated results over a large random sample. After each transition, RR was assumed to approach its new equilibrium gradually, based on rates of RR decline after quitting. We tested whether samples from various subpopulations would show a significant RR reduction after various levels of CPD reduction. **RESULTS:** CPD reductions to lower levels than identified in past studies and/or larger sample sizes typically would be required to demonstrate a significant RR reduction. **CONCLUSIONS:** It is plausible that differences in RR for CPD reducers that were not



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significant in some studies would have become significant with: (a) better resolution of CPD categories (e.g., intervals of <10 CPD), (b) greater CPD reductions, to reach the steepest RR effects near 0 CPD, (c) longer-term follow-up to capture very gradual RR transitions, and (d) higher data quality (e.g., >2-3 CPD checks). The hypothesis that the concave CPD-RR relationship for consistent-CPD smokers applies equally to reducers, with gradual RR reduction, is thus plausible.

FUNDING: Tobacco Industry

POS2-91

USING DISCRETE CHOICE EXPERIMENTS TO ASSESS THE EFFECTIVENESS OF NOVEL HEALTH WARNING LABEL CHARACTERISTICS IN AUSTRALIA

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Significance: The effectiveness of pictorial health warning labels (HWLs) decrease over time; however, updating HWL characteristics might help sustain or improve their effectiveness. This study used discrete choice experiments (DCEs) to assess novel HWL characteristics in Australia. **Methods:** An online panel of 802 Australian smokers completed two DCEs. In DCE 1, participants assessed 10 choice sets of 4 front-of-pack HWLs that systematically manipulated certainty of language (i.e., smoking causes vs may cause vs may cause you [disease]); and topic (4 new and 4 old topics, with matched imagery types). In DCE 2, participants evaluated eight pairs of back-of-pack HWLs that systematically manipulated order of warning elements (i.e., relative location of picture, explanatory text, and resource information), color scheme of explanatory text and resource information, and topic. For each DCE 1 set, participants selected the HWL that most and least made them worry about smoking risks and motivated them to quit. For DCE 2 pairs, participants selected the HWL that most captured their attention and motivated them to quit. Linear mixed models regressed selections on HWL characteristics. **Results:** In DCE 1, old familiar topics were generally selected as more worrisome compared to new topics (e.g., gangrene vs diabetes: OR=3.17, p<0.001), with similar results found for motivation to quit. Compared to HWLs with causal certainty language, HWLs with causal uncertainty were selected as less worrisome (e.g., smoking may cause vs. smoking causes: OR= 0.83, p<0.001), with similar results found for motivation. For DCE 2, changing both the ordering and color schemes of HWL elements increased motivation to quit, but only the latter was associated with increased attention (e.g., contrasting yellow background and black text boxes vs all black background: OR= 2.85, p<0.00). **Conclusions:** Updating some HWL features, especially design elements around the arrangement of text and color scheme, might improve HWL effectiveness. However, the use of causal language and familiar warning topics seem more effective than more uncertain language and novel health effects that are less well known.

FUNDING: Federal

POS2-92

GENDER DISPARITIES IN SMOKING CESSATION ASSISTANCE AMONG WHITE PATIENTS IN FEDERALLY QUALIFIED HEALTH CENTERS

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Significance: HealthyHearts NYC, a cooperative part of AHRQ's EvidenceNOW initiative, measured the prevalence of smoking cessation assistance—counseling or pharmacotherapy—by gender among white patients in 19 Federally Qualified Health Centers (FQHCs) across NYC. Rates of lifetime tobacco use are in higher men, but little research has studied gender disparities in receiving cessation services. **Methods:** We used random-effects meta-analysis to estimate the pooled prevalence of cessation assistance (past 24 months) among white male and female patients who smoked (N=1288), a pooled odds ratio to describe gender disparities, and estimates of heterogeneity to understand distributions of both prevalence and disparity across FQHCs. Distributions of cessation assistance prevalence by gender

and gender disparities across FQHCs were visualized in forest and density plots.

Results: 58% of male and 60% of female patients who smoked received cessation assistance. The odds of receiving cessation assistance were similar for male and female patients who smoked (OR=0.90; 95% CI: 0.60-1.37). We found significant heterogeneity across FQHCs in the prevalence of assistance for female (Q(18) = 117.25, p = 0; I² = 86%) and male patients (Q(18) = 128.07, p = 0; I² = 82%). There was also significant heterogeneity in the magnitude and direction of the gender disparity across FQHCs (Q(18) = 39.29, p = 0.0026; I² = 47%). **Conclusions:** Although male and female patients who smoked were equally likely to receive cessation assistance on average, disparities between female and male patients varied across sites. Sites were not the same in their ability to provide cessation counseling, suggesting that where patients who smoke receive care may affect the odds of cessation assistance.

FUNDING: Federal

POS2-93

TOBACCO AND NICOTINE PRODUCT USE AMONG CANCER SURVIVORS IN THE UNITED STATES: POPULATION ASSESSMENT OF HEALTH AND TOBACCO STUDY, 2013-2014

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Significance: Limited data exist on tobacco use patterns across multiple tobacco products for cancer survivors. The Population Assessment of Tobacco and Health (PATH) Study is a prospective longitudinal assessment of tobacco use patterns including patients with comorbid medical conditions. The purpose of this study is to compare tobacco use patterns between cancer survivors and the general population using the PATH Study data. **Methods:** Sociodemographic data and tobacco product use were analyzed in 32,320 adult respondents from Wave 1 (2013-2014) of the PATH Study. Multinomial logistic regression models examined the correlates of current and former cigarette smoking by cancer status. **Results:** Cancer survivors (n=1,527) were commonly diagnosed with a tobacco-related cancer (28.6%) and as compared with non-cancer respondents (n=30,717), were a median of approximately 20 years older, had a higher proportion of females (58.2% vs. 51.4%), and had a higher Caucasian proportion (85.4% vs. 64.6%). Overall, 48.2% of cancer survivors reported ever using tobacco as compared with 42.2% without a history of cancer. In cancer survivors, current and former cigarette use was reported in 15.1% and 33.1%, as compared with 23.1% and 19.1% in non-cancer adults. Current e-cigarette use was reported by 4.3% of cancer survivors as compared with 6.8% of non-cancer respondents. All other forms of current tobacco use were individually reported by less than 5% of respondents. Sociodemographic correlates of current and former cigarette smoking were similar in cancer survivors compared with adults without a cancer history. Survivors with a tobacco-related cancer diagnosis were approximately twice as likely to report current cigarette smoking (OR=2.18) and former cigarette smoking (OR=1.70). **Conclusions:** This study provides benchmark estimates of the prevalence of multiple tobacco and products among U.S. cancer survivors. Additional work is needed to determine if differences in current tobacco use can be attributed to age, potential cessation after a cancer diagnosis, or increased mortality associated with current tobacco use by cancer survivors.

FUNDING: Unfunded

POS2-94

TOBACCO SMOKE EXPOSURE AND EMERGENCY DEPARTMENT/URGENT CARE UTILIZATION AMONG ADOLESCENTS: PATH STUDY WAVE 2 FINDINGS

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Significance: Tobacco smoke exposure (TSE) may contribute to increased emergency department (ED) and urgent care (UC) utilization among adolescents. Adolescents are high utilizers of ED and UC settings for nonurgent and semiurgent complaints including preventive primary care, but little is known on the association between TSE and ED/UC utilization among adolescents. The study aim was to examine the relationship between TSE and ED/UC utilization among nonsmoking US adolescents without asthma. **Methods:** We performed a secondary analysis of wave 2 data from the Population Assessment of Tobacco and Health (PATH) Study including 7,389 adolescents nationwide.



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We conducted multivariable logistic regression analyses to examine the association between three TSE measures (i.e., living with a smoker, home TSE, and being around TSE for ≥ 1 hour in the past seven days) and whether adolescents visited an ED/UC for a health problem in the past 12 months, while adjusting for covariates (i.e., sex, age, race, ethnicity, and parent education level). We conducted Poisson regression analyses to examine the relationship between TSE and number of visits to an ED/UC for a health problem. Results: One-fourth (24.7%) of adolescents lived with a smoker, 17.7% had home TSE, and 35.3% had ≥ 1 hour of TSE. Participants who lived with a smoker (adjusted odds ratio [aOR]=1.29, 95% confidence interval [CI]=1.15-1.43, $p<.001$) and were around others who were smoking for ≥ 1 hour (aOR=1.33, 95%CI=1.21-1.47, $p<.001$) were significantly more likely to have had an ED/UC visit for a health problem. Participants who lived with a smoker (adjusted relative risk [aRR]=1.09, 95%CI=1.00-1.17, $p<.05$), had home TSE (aRR=1.11, 95%CI=1.01-1.21, $p<.05$), or were around others who were smoking for ≥ 1 hour (aRR=1.10, 95%CI=1.02-1.18, $p<.05$) were at increased risk of having a higher number of ED/UC visits compared to unexposed participants. Conclusion: EDs and UCs are high-volume settings in which interventions to reduce TSE can be offered to adolescents and their families. They should be educated on the importance of TSE elimination, especially since adolescents may not be receiving preventive care elsewhere.

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POS2-95

EXPOSURE TO MULTIMEDIA TOBACCO MARKETING AND PRODUCT USE AMONG YOUTH: A LONGITUDINAL ANALYSIS

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Significance: Tobacco companies successfully reach youth through direct-to-consumer marketing. Previous studies showed that youth exposure to tobacco coupons and online tobacco marketing were associated with overall tobacco use. We examine how exposure to these two types of marketing activities influence product-specific use behaviors. **Methods:** We analyzed data from 10,081 youth (aged 12-18) who participated in both Wave 1 (2013-2014) and Wave 2 (2014-2015) of the Population Assessment of Tobacco and Health Study. Participants reported past-6-month receipt of tobacco coupons, and engagement with online tobacco marketing. They also reported ever and current use of cigarette, e-cigarettes, cigars, smokeless tobacco, and hookah. Weighted multivariable logistic regression was used to examine Wave 1 predictors of receiving tobacco coupons at Wave 2, and associations between coupon receipt, online engagement, and past-30-day use of different tobacco products. **Results:** At Waves 1 and 2, 7.5% and 4.7% of youth reported receiving tobacco coupons, respectively. Receiving tobacco coupons and engaging with tobacco online marketing at Wave 1 both predicted receipt of coupons at Wave 2 among Wave 1 susceptible never tobacco users, ever but not current tobacco users, and current tobacco users ($p<.05$). Exposure to these marketing activities at Wave 1 was positively associated with past-30-day use of cigarettes, e-cigarettes, cigars, smokeless tobacco, and hookah at Wave 2 ($p<.05$). The relationships were stronger for those who received coupons at both waves or engaged with more sources of online marketing. For example, compared to never received coupons, AORs of using cigarettes were 2.22 (95% CI=1.58-3.11) for youth who received tobacco coupons at Wave 1 and was 3.35 (95% CI=1.93-5.81) for youth who received coupons at both waves. **Conclusions:** Tobacco direct-to-consumer marketing activities reach high-risk youth for initiating and continuing tobacco use. Repeatedly exposed to these marketing activities within and across media appears to promote use of different tobacco products. There is a dire need for strong regulation to protect youth from these marketing activities.

FUNDING: Federal; Nonprofit grant funding entity

POS2-97

WHO IS STILL SMOKING IN CANADA?

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Significance: In 2017, 16% (5 million) of the Canadian population aged 12 years and older were current cigarette smokers. While the prevalence of cigarette smoking is decreasing in Canada, it is important to understand the characteristics of the population who currently smoke in order to inform policy and program decisions. **Methods:** Data were from the 2017 Canadian Community Health Survey (CCHS). The 2017 CCHS covers the population aged 12 years and older living in the ten provinces and provides

socio-demographic information (e.g. age, sex, income, marital status, education), along with smoking status, at the national population level. **Descriptive analyses** were conducted to assess the prevalence of current smoking within select socio-demographic categories, as well as the socio-demographic composition of the smoking population. **Results:** The prevalence of current cigarette smoking is higher among males (19%) than females (13%), and almost two-thirds (58%) of current smokers are male. More than half of current smokers live in Canada's most populous provinces: Ontario (38%) and Quebec (26%). In contrast, the two provinces with the highest prevalence of current cigarette smoking (Newfoundland and Labrador (23%) and Saskatchewan (19%)) together account for only 6% of current smokers. The prevalence of current cigarette smoking was higher in rural areas; however 80% of current cigarette smokers live in urban areas. Prevalence of current cigarette smoking was higher among those with lower educational attainment whereas over half (52%) of current cigarette smokers reported the highest educational attainment. **Conclusions:** Smoking prevalence tells only one side of the story. Policies and programs must balance impacting the greatest number of smokers in order to meet tobacco control targets, while not exacerbating existing health inequities. The Government of Canada has set an aggressive target of less than 5% tobacco use by 2035. Understanding who and where smokers are is of critical importance in order to tailor effective prevention and cessation programs and policies.

FUNDING: Federal

POS2-98

CHARACTERISTICS OF YOUNG ADULT JUUL USERS IN TEXAS

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Significance: Juul has exploded in popularity since it was first introduced in 2015, now accounting for 72% of the U.S. electronic nicotine delivery systems (ENDS) market. This increase in popularity is concerning as Juul delivers a high amount of nicotine, with one "pod" containing a comparable amount of nicotine as up to two packs of cigarettes. This study aims to: 1) compare demographic characteristics, ENDS use behaviors, and other tobacco use behaviors, among usual Juul users ("Juul users") versus usual users of other disposable ENDS products ("non-Juul users"), and 2) examine differences in reasons for use for Juul users versus non-Juul users. **Methods:** Data were drawn from Wave 7 of the Marketing and Promotions across Colleges in Texas Project (Project M-PACT). Participants included college students ($n=4,124$) from the four largest cities in Texas: Austin, San Antonio, Houston, and Dallas/Fort Worth. Chi-Square analyses and oneway ANOVAs were conducted to examine differences between current Juul users and non-Juul users. **Results:** Of the 201 current users of disposable ENDS products, 47.3% ($n=95$) were usual Juul users. A higher proportion of Juul users were male, white non-Hispanic, younger, and higher socioeconomic status as compared to non-Juul users ($p<.05$, all). ENDS use behaviors were similar for Juul users as compared to non-Juul users; Juul users used ENDS products on an average of 12.9 days of the past 30, and almost a third used modifiable devices in addition to Juul (32.6%). A lower proportion of Juul users reported using the product for smoking cessation purposes as compared to non-Juul users (12.6% versus 25.4%, $p<.05$). A higher proportion of Juul users endorsed the following reasons for use: my friends use this brand, I like the way this brand looks, and it is easily refillable/reusable ($p<.05$, all). **Conclusion:** Juul users differ from other disposable ENDS users on numerous demographic characteristics. In addition, contrary to Juul marketing materials, which state that the product is intended as an alternative to conventional cigarettes, only a small percentage of users indicated using Juul as a smoking cessation device.

FUNDING: Federal

POS2-99

EVALUATING THE USE OF THE PROMIS SMOKING EXPECTANCIES SCALES IN YOUNG CIGARILLO USERS

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BACKGROUND: The PROMIS scales offer efficient, standardized assessment of several psychosocial motivations and expectancies associated with smoking. This study examines the performance of the Coping Expectancies (CE), Emotional and Sensory Expectancies (ESE), and Social Motivations (SM) short form scales in a sample of young



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cigarillo smokers. METHODS: 1089 cigarillo smokers aged 14 to 28 were recruited via social media. Participants completed an online survey that included these three expectancies scales. Scale items were modified to be product neutral. Scale scores were generated using the HealthMeasures Scoring Service. Item distributions, scale reliability, and dimensionality were examined. Single-sample t tests were used to compare scale scores for this sample with the PROMIS normative sample. RESULTS: All scale items showed good variability and low skewness and kurtosis. Cronbach alpha internal consistency estimates were very good: .86 (SM), .90 (ESE), .91 (CE). Compared to the PROMIS normative mean (50), this sample scored significantly lower on CE (47.07, $p < .001$), higher on SM (52.96, $p < .001$), and not statistically different on ESE (49.56, $p = .190$). Interestingly, participants who reported the social behavior of sharing cigarillos in a group did not score differently on the SM scale than those who reported only smoking cigarillos alone ($p = .233$). Participants who also smoked cigarettes scored significantly higher on all three scales than those who did not (all p -values $< .001$). An exploratory factor analysis suggested the presence of a single underlying factor comprised of all CE and ESE items, plus two SM items. An informal examination of the content of the two remaining SM items suggested that these items may be measuring the companionship aspect of being part of a smoking group. CONCLUSIONS: Findings from this sample of adolescents and young adults that smoke cigarillos differ from those of the PROMIS normative sample, thus, caution is warranted in interpreting individual scores of these short form scales. Future studies should explore how the full item banks for each of these expectancy measures perform in other samples.

FUNDING: Federal

POS2-100

A MIXED METHODS STUDY OF CANNABIS AND CANNABIS TOBACCO CO-USE MEASURES

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Background: Cannabis legalization has been accompanied by changes in availability, acceptability, and methods of use, which also impact tobacco/nicotine use. Surveillance of cannabis and cannabis-tobacco co-use is important, and survey measures of use need to reflect the cannabis market accurately. **Methods:** We surveyed and interviewed young adult tobacco and cannabis users (age 18-29) in California. We (1) developed a cannabis typology, (2) compared self-reported use patterns from the survey with qualitative interview descriptions of use to identify discrepancies, and (3) coded interview transcripts for emergent themes related to cannabis and tobacco use. **Results:** Cannabis products were classified along four dimensions: delivery method (e.g., inhalation, ingestion, topical), device (used for consumption), cannabis form (e.g., cannabis flower or concentrates), and cannabis variants (presence/concentration of THC and CBD, cannabis strain). Cannabinoids produced significant discrepancies in reporting; some reported CBD-only product use as cannabis use and others did not. In addition, combined products produced discrepancies: blunt users frequently did not consider blunt use to be cannabis and tobacco co-use. Thus, skip logic asking about co-use before blunt use will result in measurement error. Difficulty with recall for past 30 day use was not detected; in fact, more products were reported on the survey than in the interview, which focused on routine use. Emergent coding revealed significant variation in dosage and other use patterns that complicate exposure measurement. **Discussion:** To capture the complexity of cannabis products and minimize survey fatigue, this typology can be used to structure cannabis questions for specific research inquiries. Differentiating between cannabis products, including explicit inclusion or exclusion of CBD-only or CBD-dominant products, can minimize specification error. Higher product counts on the survey suggests that many variations in social cannabis use occur in addition to products used regularly. Future research should continue to develop nuanced understanding of different forms of cannabis and tobacco co-use practices.

FUNDING: Federal

POS2-101

CORRELATES OF REPEAT ENROLLMENT AMONG NICOTINE DEPENDENCE TREATMENT CLIENTS

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Significance: There are many evidence-based approaches to treating nicotine dependence, with treatment frequently comprising one of the core approaches to

tobacco control at the organizational, municipal, state, and federal levels. While some individuals successfully quit tobacco use after participating in a single course of nicotine dependence treatment, many re-enroll in treatment. Since many tobacco users undertake multiple quit attempts before they quit for good, re-enrollment in nicotine dependence treatment is not unexpected. However, little is known about how repeat enrollees differ from those who end treatment after one course. A better understanding of the similarities and differences between these two populations may inform improved intervention approaches. **Methods:** We analyzed baseline and end-of-class data for nicotine dependence treatment clients (N=3,586) who enrolled in treatment provided by Pennsylvania Department of Health-contracted service providers and compared these data to those of clients who only enrolled in one course of treatment. Our core measures included clients' demographic characteristics and tobacco use behaviors at baseline and end-of-class. We conducted chi-square analyses to look at the bivariate relationships between these measures and repeat enrollment. **Results:** Statistically significant differences between one-time and repeat enrollees included: repeat enrollees were more likely to be drawn from the community as opposed to from worksites ($p < .001$); were more likely to have used tobacco some or every day in the past 30 days at intake ($p < .001$); were more likely to be Black as opposed to White ($p < .001$); and were more likely to have ever used cessation products as part of a quit attempt. Also of interest is that repeat enrollees were not statistically significantly different on a number of other measures of interest, including age, insurance coverage, and gender. **Conclusion:** These preliminary findings suggest that repeat enrollees may differ from individuals who only enroll in one course of treatment, with possible implications for appropriate design and delivery of treatment services to these distinct populations.

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POS2-103

DEFINING AND DEVELOPING MEASURES TO ASSESS PROGRAM SUSTAINABILITY

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Special interest lobbying continues to affect public health funding, and in turn, the sustainability of state tobacco control (TC) programs. However, specific indicators of sustainability among TC programs remain unidentified. To meet this need, we determined a comprehensive set of measures that address state TC program sustainability by synthesizing organizational sustainability research with data annually reported by these programs to the Centers for Disease Control and Prevention (CDC). We began this project with a literature review of organizational sustainability research, which included empirical studies, case studies, fieldwork, and commentaries. We also interviewed key academic and practice-oriented professionals in TC to corroborate the literature with contemporary perspectives. From this process, we compiled a list of measures that predict capacity for sustainability. These organizational metrics describe institutional support, organizational structure, and program activity, with consideration for features specific to TC practice (e.g., Master Settlement funds, tobacco control coalitions, smoking rates, etc.). We then acquired annual CDC reports from TC programs across the United States and classified these data according to our list. This produced a record abstraction protocol compatible with these documents, providing a basis for a yearly evaluation of TC program sustainability. This study found that sustainability is primarily indicated by institutionalization, which is mediated by the management of the organization hosting the program, the structure of the program, and program activities. The sustainability metrics identified here further distinguish between programmatic, organizational, and community-level factors, suggesting that future designs for the sustainability of TC programs must account for varying institutional scope. In total, these findings support a multifaceted definition of sustainability. The study concludes by implicating these sustainability metrics as a point of comparison for subjective sustainability measures, and particularly, a validation of the Program Sustainability Assessment Tool (PSAT) currently underway.

FUNDING: Federal

POS2-105

HEALTHCARE PROVIDERS' COMMUNICATION WITH WOMEN ABOUT E-CIGARETTE USE DURING PREGNANCY

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Significance. Nicotine exposure during prenatal development can cause life-long physical and neurodevelopmental abnormalities in infants and children. Despite these findings, some pregnant women and healthcare providers (e.g., obstetricians-gynecologists) report believing electronic cigarettes (e-cigarettes) to be a safer alternative to conventional cigarettes or having no adverse health outcomes. Beyond this study, minimal research has examined women's conversations with their healthcare providers about e-cigarette use during pregnancy. The purpose of our study was to examine if women received different information from their healthcare provider about using conventional cigarettes and e-cigarettes while pregnant. **Methods.** Women (n=295, mean age=32.5 years) who were currently (30.3 years), had been previously (36.4 years), or planned to ever be (25.7 years) pregnant were recruited via internet mediums (e.g., Facebook, reddit) to participate in an online, cross-sectional survey. Participants were asked if their doctor, nurse, or healthcare professional asked them about their use of, advised them not to use, and talked to them about the effects of conventional cigarettes and e-cigarettes. Responses included dichotomous, yes/no options. Chi-square analyses were employed to examine associations between advice about cigarette/e-cigarette use and smoking status and pregnancy status (currently pregnant, formally pregnant, and future pregnancy expected). **Results.** Participants reported that their doctors asked them if they used cigarettes ($p < .05$), advised them to not use cigarettes ($p < .001$), and talked to them about the effects of using cigarettes while pregnant ($p < .001$) significantly more often than they did e-cigarettes. Additionally, there was a significant relationship between pregnancy status and a healthcare professional talking to women about the effects of using cigarettes while pregnant ($p < .001$). No other between group differences were detected. **Conclusion.** Emerging studies suggest that lower perceived harm may cause pregnant women to initiate or increase use of e-cigarettes, due to perceived safety for themselves and their unborn fetus. While more studies are needed to determine where expecting mothers are receiving their information about e-cigarettes, our findings support the need for health education specialists to provide healthcare providers (especially obstetrician-gynecologists) with more information about the harmful effects of fetal exposure to nicotine via e-cigarettes.

POS2-106

EXPANDING THE AVAILABILITY OF TRAINING ON TOBACCO DEPENDENCE TREATMENT THROUGH ADDRESSING THE SHORTAGE OF TRAINERS: THE CASE OF KING HUSSEIN CANCER CENTER IN THE EASTERN MEDITERRANEAN

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Significance: The availability of training on Tobacco Dependence Treatment (TDT) is quite limited in the Eastern Mediterranean Region (EMR), partly due to the shortage of well-equipped trainers. Having succeeded in building a world class TDT training program that has been delivered to more than 2000 participants, King Hussein Cancer Center (KHCC) sought to create additional training capacity in the EMR that is wholly dependent on in-country trainers. **Methods:** KHCC partnered with institutions in Oman, Egypt, Tunisia, and Morocco to carefully select and equip TDT trainers from the pertinent countries. KHCC conducted training of trainers (ToT) addressing TDT technical expertise as well as general training skills, and observed trainers in action in their countries and provided them with constructive feedback. Finally, KHCC availed evidence-based training materials for use by the trainers. **Results:** 84 healthcare providers were engaged and equipped as trainers (all non-smokers and mostly clinicians). Results from three rounds of a semi-annual online engagement survey indicated that on average 33% of all trainers continued to be engaged and respond to the survey. Responding trainers reported (1) high retention of TDT-specific competencies including diagnosing nicotine dependence (99%), applying motivational interviewing techniques (90%), and prescribing medications (85%); (2) continued learning through own reading (58%), online training (27%), and formal workshops (24%); and (3) engaging in delivering TDT training (55%). With the involvement of these trainers the number of TDT training workshops across the region doubled compared to previous years. Barriers reported by those who did not engage in providing training include (1) the need for strengthened experience in the field, (2) financial and administrative barriers, and (3) weak demand for training. **Conclusions:** Equipping carefully selected in-country trainers to offer TDT training was successful in expanding the availability of such training in the EMR. However, to sustain gains, there needs to be a well-developed intervention to address attrition of trainers, and to identify and deal with barriers.

FUNDING: Nonprofit grant funding entity

POS2-107

EMOTIONS THAT MEDIATE THE EFFECTS OF ENHANCED TOBACCO CORRECTIVE MESSAGES ON SMOKERS' INTENTION TO QUIT SMOKING

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Significance: A federal court has ordered tobacco companies to issue corrective messages. In an experimental study, we found that viewing enhanced corrective messages including an industry deception statement and testimonials of people harmed by smoking increased smokers' intention to quit smoking more than the current correctives and enhanced correctives with only an industry deception statement. This analysis examined which emotions may mediate these effects. **Methods:** US adult smokers ($N=803$) were randomly assigned to view either 1) two current tobacco corrective messages (Current), 2) two corrective messages that include an industry deception statement (Industry Deception), or 3) two corrective messages with an industry deception statement and testimonials of smokers harmed by smoking (Industry Deception + Testimonial). Outcomes were pretest-posttest change in intentions to quit smoking. Mediators were the intensity of emotions felt towards tobacco companies: anger, fear, and disgust. Indirect effects through mediators were calculated using the sureg command from Stata and bootstrapped for bias-corrected 95% confidence intervals (CI). **Results:** The effect of viewing Industry Deception + Testimonial correctives (versus Current correctives) on intentions to quit smoking was significantly mediated through disgust towards tobacco companies; unstandardized beta=0.027, 95% CI=0.009, 0.054. The effect of viewing Industry Deception + Testimonial correctives (versus Industry Deception correctives) on intentions to quit smoking was also significantly mediated through disgust towards tobacco companies; unstandardized beta=0.016, 95% CI=0.002, 0.039. Indirect effects through anger and fear were not significant for both effects. **Conclusions:** Disgust towards tobacco companies significantly mediated the effects of viewing Industry Deception + Testimonial corrective messages on intention to quit smoking. Future anti-tobacco messages utilizing tobacco denormalization strategies may benefit from targeting emotions of disgust to ensure increased effects on intentions to quit smoking.

FUNDING: Unfunded

POS2-108

TOBACCO IN NIGERIAN MUSIC VIDEOS: A FOUR YEAR RETROSPECTIVE REVIEW

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Significance: Tobacco advertisement has been banned in mainstream media, however, contents endorsing tobacco use are still accessible to people, mostly adolescents, through uncensored online media platforms. This research aimed at evaluating tobacco content in Nigerian music videos, which have wide acceptance across Africa. **Method:** Top 50 videos of each year from 2014 to 2017 were reviewed independently by four researchers who checked for parameters including antitobacco message, imagery of male, female or group smoking, and imagery of soft core sexual content associated with tobacco use. A total of 200 videos were reviewed. The videos were sourced from YouTube according to ratings by AfricaCharts. AfricaCharts rates videos based on TV and radio airplay, record sales, streaming platforms, social media, song and video downloads from top African entertainment sites, as well as YouTube and Dailymotion views. **Results:** About 22 (11%) and 7 (3.5%) videos, with 322 million combined views had imagery of male and female smoking respectively. Videos containing male smoking imagery increased by 150% between 2014 and 2017. Three (1.5%) videos had imagery of smoking associated with sex appeal while 5 (2.5%) videos contained people smoking in groups. Only 1 video (0.5%) with about 5.6 million views contained antitobacco smoking message. A female artiste featured smoking imagery the most. **Conclusion:** Only a few Nigerian music videos contain tobacco imagery, however, its appearance seems to be on the increase. Given the wide acceptance of Nigerian music among African youths, antitobacco messages may enjoy a wide coverage through music by influential artistes. It may also be necessary to regulate tobacco imagery content of the music videos to contain its influence on the youths.

FUNDING: Unfunded



SRNT

POS2-109

DESIGNING EFFECTIVE SMOKING CESSATION COMMUNICATIONS. WHICH BELIEFS ABOUT TOBACCO HARMS SHOULD BE TARGETED TO MAXIMIZE BEHAVIOR CHANGE

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Significance: Australia's comprehensive tobacco control program includes high tobacco taxes and plain packaging, as well as health warnings and mass media campaigns to increase awareness of tobacco harms and motivate smokers to quit. Applying an established method of comparing the relative promise of potential topics for public health communications, we aimed to identify which harms should be the focus of future efforts to encourage smoking cessation. **Method:** Data were collected via an online survey using a probability-based panel. A representative sample of Australians aged 18-69 were asked whether they believed that smoking increases the risk of each of 23 harms causally associated with smoking. Analyses were restricted to current and former smokers (n=833). Cross-tabulations of each belief (smoking increases risk of the harm: likely vs. not likely/don't know) and smoking status (former vs. current) were used to generate the potential "percentage to gain" for each harm. Percentage to gain indicates the additional proportion of the population expected to become former smokers, if a message was effective at convincing 100% of people to believe the harm; it is influenced by the strength of association between beliefs and behaviour and the size of the population that does not already believe the harm. It allows the relative promise of potential message topics to be easily compared. **Results:** Harms were ranked on percentage to gain. The harm with the highest percentage to gain, and so the greatest potential to encourage cessation, was poor outcomes after surgery: if 100% of the population believed this harm, it is estimated that an additional 6.9% would be former smokers. Other promising harms included peripheral vascular disease, diabetes and stomach cancer. Rheumatoid arthritis and bladder cancer were the least promising. **Conclusion:** This study uses a validated, empirical approach to choose among the multitude of tobacco-related harms that could be the topic of future campaigns or health warnings. Of note, diabetes was first linked with smoking in the 2014 Surgeon General's Report, and this new harm showed particular promise as a message topic to encourage cessation.

FUNDING: Federal

POS2-110

QUANTIFYING AND INVESTIGATING TRENDS IN NORM INFORMATION ABOUT E-CIGARETTE AND OTHER TOBACCO USE IN MEDIA USING AUTOMATED CONTENT ANALYSIS

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Significance: Young people's use of e-cigarettes (ecig) and other tobacco products (tobacco) may be influenced by descriptive norm information they are exposed to through media, including information about ecig or tobacco use by individuals (individual use) or among populations (population norms). Prior to this study, little was known about how the amount of such information has varied over time or across sources. We estimated the prevalence of different types of tobacco and ecig norm mentions in 6 media sources and tested how the prevalence of each changed over 3 years. **Methods:** We utilized several automated coding methods to code a tobacco and ecig-related media corpus of 12,262 YouTube videos, 75,322,911 Tweets and 135,764 texts from 4 long-form mass media sources for the presence of different norm types. We then tested whether the prevalence of such content on Twitter or in long-form sources changed over time. We also examined trends in the number of views of YouTube videos containing tobacco or ecig norms.

Results: Population norms were more common in long-form texts than in YouTube videos or Tweets and were especially common in ecig texts. The proportions of Tweets mentioning either tobacco (33%) or ecig (16%) individual use were similar to the proportions of long-form texts including these norms (34% and 17%). The prevalence of tobacco and ecig individual use was much higher in YouTube videos: 88% and 96%, respectively. In long-form sources and on Twitter, the prevalence of tobacco norms declined over time and the prevalence of ecig norms declined or, in some cases, remained stable. In contrast, views of YouTube videos containing tobacco or ecig individual use increased. **Conclusions:** This study's findings suggest that the amount of norm information young people may be exposed to through media changes over time and differs based on the platforms used. For example, YouTube users are more likely to be exposed to depictions

of individual tobacco or ecig use, perhaps due to the visual, user-generated nature of the platform. These findings warrant investigation into the effects of such media content on young people's tobacco and ecig-related beliefs and behaviors.

FUNDING: Federal; Academic Institution

POS2-111

CONSUMERS' PERCEPTIONS OF DISEASE-SPECIFIC MODIFIED-RISK CLAIMS ARE BEST EVALUATED USING A DISEASE-SPECIFIC APPROACH

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Manufacturers seeking to make modified-risk claims for a tobacco product that presents lower health risks compared to cigarettes must assess consumers' perceptions of the risk reduction for that product. Claims made for the modified-risk product and assessment of perceived risk reduction can be global (e.g., "reduced harm", and assessment of a broad spectrum of risks) or disease-specific (e.g., "reduces oral cancer", and assessment of oral cancer risk). We assessed whether consumers responded to disease-specific modified-risk claims in a disease-specific manner. U.S. adult current, former and never tobacco users (n=9,830) recruited from online research panels viewed advertisements stating that smokers who switch completely to Camel Snus could reduce their risk of lung cancer; a random half of respondents also viewed a claim for reduction of oral cancer risk. Respondents then rated the risk for lung cancer and oral cancer on a 1-7 scale, separately, for Camel Snus and cigarettes, with the difference between the respective tobacco product types indicating perceived risk reduction. Advertisements also included the four government-mandated smokeless tobacco warnings, randomly rotated. We compared those who viewed a warning about mouth cancer with those who viewed a warning about addiction. Our findings indicate that the presence or absence of an oral cancer claim had no effect on perceived risk reduction for lung cancer (both groups, -1.8 ± 0.02). With regard to warnings, respondents who viewed the mouth cancer warning reported no risk reduction for oral cancer (0.0 ± 0.03), whereas those who viewed the addiction warning perceived lower risk for oral cancer (-0.4 ± 0.03), especially if they viewed the reduced-oral-cancer claim (-0.6 ± 0.04). These findings indicate that consumers respond to disease-specific warnings and risk-reduction claims in a disease-specific manner, and suggest the value of evaluating risk perceptions using a disease-specific approach.

FUNDING: Tobacco Industry

POS2-112

MISCONCEPTIONS ABOUT SMOKING-RELATED HEALTH RISKS AMONG YOUTH IN JAKARTA, INDONESIA

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Significance: Despite progress in reducing youth smoking rates, adolescents remain susceptible to tobacco use, particularly in low- and middle-income countries. Perceived harm from tobacco use is strongly associated with smoking behavior. Exposure to pro- and anti-tobacco media as well as tobacco-related norms can alter estimations of risk among youth. This qualitative study examined perceptions of tobacco advertising and tobacco-related harm among youth in Jakarta, Indonesia. **Method:** We conducted a secondary analysis of seven focus group discussions (FGD) with youth ages 13-17 years old in Jakarta, Indonesia. The FGD's were heterogeneous by sex (male, female) and smoking status (non- and current smoker) and homogeneous by socioeconomic status (low, mid, high). Each group was audio-recorded, transcribed in Bahasa, translated into English, and subjected to thematic analysis. **Results:** Participants in the FGD's drawn from mid- and high-SES regions of Jakarta expressed negative views of ads for cigarettes because they promote a "dangerous" product that "causes disease," and felt these ads should carry warning labels, while participants in low-SES groups more readily described both positive and negative elements of the ads. Participants in all groups expressed awareness of a variety of harms associated with smoking, including addiction ("can't stop, big time"), lung damage (e.g., "black, dirty lungs"), and dental injury (e.g., "yellow teeth" and "bad smell"). Despite this awareness, participants in the FGD's drawn from low-SES regions indicated misconceptions about the causes of and ways to mitigate tobacco-related morbidity, citing nicotine as the disease-causing agent (e.g. "It's dangerous [to smoke] because of the nicotine. It causes problems - makes you sick") and believing that intermittent smoking prevents illness (e.g., "It's possible cigarettes can kill but only if you try them very often"). **Discussion:** In conjunction with



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strengthening advertising regulations, efforts to reduce adolescent smoking should communicate accurate health risks of tobacco to young people and counteract related misconceptions.

FUNDING: Nonprofit grant funding entity

POS2-113

TOBACCO POLICY SUPPORT AND PERCEPTIONS OF MENTHOL CIGARETTES IN AN AFRICAN AMERICAN COMMUNITY SAMPLE

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Significance Menthol cigarettes are heavily marketed to African Americans, and African Americans are much more likely to use menthol cigarettes than other racial/ethnic groups. Those who smoke menthol are less likely to quit smoking, which contributes to tobacco-related health disparities. Jurisdictions across the country are working to restrict the sale of menthol tobacco. However, little is known about African Americans' perceptions of menthol and support for tobacco control policy. The current study used a community-based participatory model to address this research gap. Methods Education sessions aimed at increasing knowledge of menthol tobacco harm among African Americans were conducted in 2017. Two waves (pre- and post-test) of cross-sectional data were collected from a convenience sample of U.S.-born African American adults. The combined *N* across both waves was 789. Surveys assessed menthol cigarette use and perceptions, and support for tobacco control policies. Regressions examined differences in menthol perceptions and policy support between menthol smokers and non-smokers, and in the wave 2 sample, between those who did (n=93) and did not attend an education session (n=294). Results Compared to non-smokers, menthol smokers were more aware that: (1) menthol's cooling sensation makes it easier to start smoking, (2) menthol makes it harder to quit smoking, and (3) the tobacco industry targets the African American community. However, a substantial proportion (>46%) of both menthol smokers and non-smokers reported misperceptions or lack of knowledge about the harms of menthol. Support for tobacco control policies was high (>71%) among both groups for all policies (e.g., T21, flavored restrictions, taxes), although menthol smokers were less supportive than were non-smokers. Similarly, those who attended an education session were more aware of the addictive nature of menthol and of industry targeting. Conclusions African American menthol smokers are aware of targeting and the addictive nature of menthol, but a substantial proportion hold misperceptions about the harms associated with menthol cigarettes. Targeted education efforts can help increase knowledge of the addictiveness of menthol tobacco but additional education on the harms of menthol are needed in the African American community.

FUNDING: Federal; State

POS2-114

EVALUATION OF THE TOBACCO PREVENTION TOOLKIT

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Significance: We are assessing the effectiveness of The Tobacco Prevention Toolkit, an online and free theory-based and evidence-informed curriculum aimed at preventing students' use of cigarettes, cigars/cigarillos, chew, hookah, and electronic cigarettes (including JUULs). The Toolkit contains information, slides, worksheets, activities, and fun quizzes on the history and trends in tobacco use, immediate and long-term health risks of tobacco, effects of nicotine and nicotine addiction including its impact on the developing adolescent brain, the appeal of tobacco including marketing and flavors, and ways to resist using tobacco. The Toolkit also includes resources and information on Positive Youth Development, and resources for parents. **Methods:** We are conducting the initial outcomes evaluation of the Toolkit using a pre-post design. The Toolkit is being implemented among adolescents aged 11 - 18 (grades 6-12) in middle and high schools in California and throughout the country. Data collection is ongoing and by Spring 2019 we will have data to present from at least 10 schools and organizations in addition to the data from the five high schools reported below. The ultimate effect of the intervention will be evaluated using random effects generalized linear mixed modeling and difference-in-differences estimation. **Results:** In 2016-17, five high schools completed the pre-program survey (n=375 students), participated in the Toolkit curriculum, and then completed the post-program survey (n=330 students). Preliminary results showed that past 30-day use of cigarettes decreased 7.6% (from 6.5% to 6%); vaping decreased

6.8% (from 19.1% to 17.8%); and snuff/chew decreased 53% (from 5.8% to 2.7%). The proportion reporting perceived risk for harming themselves, physically or in other ways, by using e-cigarettes or other vapor-emitting devices increased by 2.1% and for cigarettes by 2.5%. The percentage of students reporting knowledge of health effects of tobacco use increased by 32.8% (from 50.9% to 67.6%) and knowledge of environmental effects of tobacco use increased by 15% (from 67.2% to 77.3%). **Conclusions:** Preliminary evidence suggests the Toolkit is effective in changing high school students' knowledge of, attitudes towards, and current use of different tobacco products including e-cigarettes. Additional data will provide further information on which aspects of knowledge, attitudes, intentions and behavior are changing. These findings suggest that the Toolkit is an effective curriculum for use in middle and high schools.

FUNDING: State; Academic Institution; Nonprofit grant funding entity

POS2-115

TOBACCO USE INCREASES RISK OF FOOD INSECURITY: AN ANALYSIS OF CONTINUOUS NHANES DATA FROM 1999 TO 2014

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Background: Tobacco use is a major health disparities issue in the United States; it is much more common in less-educated and lower-income groups. These groups also experience higher rates of food insecurity. Previous studies on tobacco use and food insecurity have largely focused on only cigarettes. **Objectives:** We assessed the relationship between food insecurity and use of cigarettes, alternative tobacco products (cigars, electronic cigarettes, or smokeless tobacco), any tobacco product, and multiple tobacco products. **Methods:** Using Continuous National Health and Nutrition Examination Survey data from 1999-2014, we built a multinomial logistic regression model predicting level of food security (i.e., food security, low food security, very low food security) for use of different tobacco product types, any product, and multiple products.

Results: After adjustment for multiple covariates, use of any tobacco product, relative to no use, was significantly associated with low and very low food security. In a separate model, use of only one product, relative to no use, was significantly associated with low food security (odds ratio (OR) = 1.46, 95% confidence interval (CI): 1.30-1.64) and very low food security (OR = 2.18, 95% CI: 1.89-2.51), compared to food security. For use of two or more products, relative to no use, the magnitude of association was higher for both low (OR = 1.65, 95% CI: 1.12-2.45) and very low food security (OR = 3.10, 95% CI: 2.13-4.53). **Conclusion:** The significant associations we identified between tobacco use and food insecurity can inform researchers and policymakers developing interventions. To be effective in reducing either health risk, interventions may need to target both.

FUNDING: Unfunded

POS2-116

MATERNAL SMOKING AND HOSPITAL TREATMENT DURING PREGNANCY

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Significance: Previous research suggests that young maternal age, smoking, hospitalization in previous pregnancy and poor self-rated health could be risk factors for antenatal hospitalization. Pregnant women who smoke have a higher risk for several diseases and are more likely to suffer comorbidities. Our objective was to investigate if maternal smoking is associated with mother's hospital treatment during pregnancy. **Methods:** The study population consists of all singleton pregnancies (n=1449098) between 1999-2015 in Finland. Information on maternal smoking and background factors, e.g. maternal age, parity, marital and socioeconomic status, was received from the Medical Birth Register. It also includes information whether the mother had hospital treatment due any reason, bleeding or elevated blood pressure. Smoking was classified as non-smoking, smoking in the first trimester or continued smoking throughout the pregnancy. Information on all treatment episodes in public and private hospitals and outpatient visits in public hospitals was derived from the Hospital Discharge Register. The data was analyzed according to ICD-10 code groups. Inpatient and outpatient care episodes were studied separately. **Results:** The prevalence of maternal smoking was 15.0 percent and 10.7 percent of women continued to smoke throughout the pregnancy. Women who smoked were more likely admitted to hospital for any reason; adjusted odds ratio (OR) 1.20 (95



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percent confidence interval 1.16 to 1.23) in smoking in the first trimester and 1.21 (1.19-1.24) in continued smoking group compared to non-smokers. Women who smoked had more often outpatient treatment due mental and behavioral disorders (F00-F99); OR in smoking in the first trimester group 2.14 (2.00-2.30) and in continued smoking group 3.88 (3.71-4.06), as well as inpatient treatment 2.66 (2.16-3.27) and 8.54 (7.66-9.51), respectively. Also the risk for outpatient treatment due infectious and parasitic diseases A00-B99 was higher in women who smoked; 1.48 (1.33-1.65) and 2.45 (2.30-2.62), respectively. However, women who continued to smoke were less frequently admitted to hospital due elevated blood pressure 0.79 (0.76-0.83). **Conclusion** Women who smoke during pregnancy need more hospital treatment for various reasons. Smoking was most profoundly associated with mental and behavioral disorders. Relationship between smoking and blood pressure remains unclear. Women who smoke should be encouraged to engage healthy lifestyle.

FUNDING: Academic Institution

POS2-117

INITIATION AND CURRENT USE OF ELECTRONIC CIGARETTES: A LONGITUDINAL STUDY OF SEX DIFFERENCES IN PREDICTORS AMONG ADOLESCENTS IN MEXICO

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SIGNIFICANCE: E-cigarette use among young people has grown substantially, even in countries where e-cigarette sales and marketing are banned like Mexico. This longitudinal study aimed to assess the factors that predict trial and current use of e-cigarettes among middle school adolescents in Mexico, including assessment of differences in these factors by sex. **METHODS:** A school-based longitudinal survey was conducted in 2015 with followup 20 months later. The analytic sample was restricted to students who reported never having used e-cigarettes at baseline (n=3063 girls & n=2891 boys). Generalized Estimating Equation models were stratified by sex and regressed both e-cigarette trial and current use (i.e., use in the last 30 days) at followup on study variables collected at baseline (sociodemographics, sensation seeking, possession of electronic devices, social media use, house internet rules, having a paid job, alcohol and drug use, current smoking, friend smoking, smoking expectancies, parental smoking). **RESULTS:** By followup, 24% of girls and 28% of boys had tried e-cigarettes. Results from adjusted models predicting trial were generally similar for both sexes, with smoking expectancies, parental smoking and alcohol use being independent predictors. However, among boys but not girls, greater sensation seeking (ARR=1.08), electronic device possession (ARR=1.11) and social media use (ARR=1.34) predicted trial, whereas not having internet rules predicted trial for girls (ARR=1.13) but not boys. At followup, 9% of girls and 11% of boys currently used e-cigarettes. Adjusted models for both boys and girls indicated that alcohol use and possession of electronic devices predicted current e-cigarette use. Among boys, drug use (ARR=1.39), current smoking (ARR=1.70), and parental smoking (ARR=1.46) also predicted current use, whereas having a job (ARR=1.64) was a predictor for girls. **CONCLUSION:** E-cigarette trial and use is associated with some risk factors that are shared with regular cigarettes; however, other risk factors related to internet use and possession of electronic devices may be unique to e-cigarette risk, with some differences found between boys and girls.

FUNDING: Federal

POS2-118

TRADITIONAL AND EMERGING TOBACCO PRODUCT USE AND RELATED PROTECTIVE FACTORS AMONG SOMALI YOUTH IN THE UNITED STATES

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Significance: Tobacco use has recently increased among Somali youth in Minnesota, home to the largest Somali diaspora in the United States (U.S.). Additionally, alternative forms of tobacco use (e.g., e-cigarettes and hookah) are rising among U.S. youth generally. Protective influences such as anti-smoking norms and school connectedness are well-established prevention targets, however little research has examined protective factors for cigarette and emerging tobacco product use among Somali youth. Establishing protective factors for tobacco use among Somali youth will

help to inform tailored prevention strategies. This study aimed to examine tobacco use and protective factors in a statewide sample of Somali youth. **Methods:** We used data from the 2016 Minnesota Student Survey, a school-administered statewide survey, to assess past 30-day use of cigarettes, cigars, e-cigarettes, hookah, chewing tobacco, and dual/poly (two or more) tobacco product use. Participants included 8th, 9th, and 11th graders who identified as ethnically Somali (n=2009). Multivariate logistic regression examined tobacco use outcomes with seven types of protective factors including internal developmental assets, anti-smoking norms, college aspirations, parent connectedness, and religious group participation. Multiple imputation was used for missing data as a robustness check. **Results:** E-cigarette use was most prevalent (5.7%), followed by hookah (5.0%) and dual/poly use (4.2%). Cigarette, cigar, and chewing tobacco use were less prevalent (3.4%, 3.4%, and 2.7%, respectively). Internal developmental assets, parental anti-smoking norms, and college aspirations were statistically significant protective factors against all forms of tobacco use after adjusting for key demographic characteristics. **Conclusions:** Preventing adolescent tobacco use can reduce mortality and morbidity. Our analyses indicate that Somali youth use e-cigarettes and hookah at particularly high levels relative to other products. Therefore, prevention efforts among Somali youth should be tailored to these emerging tobacco products as well as protective factors such as internal assets and perceived parental smoking norms.

FUNDING: Federal

POS2-119

REDUCING SOCIOECONOMIC DISPARITIES IN EARLY ORIGINS OF CHILDHOOD OBESITY BY MATERNAL SMOKING CESSATION DURING PREGNANCY

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Significance: US children from low socioeconomic status (SES) families are particularly vulnerable to obesity. Rapid infant weight gain predicts childhood obesity. We aimed to 1) estimate effect size and identify critical timing for intervention-assisted smoking cessation during pregnancy to impact infant weight gain; 2) to examine whether maternal SES moderated the effect of smoking cessation. **Methods:** We analyzed data from the UB Pregnancy and Smoking Cessation Study (N=30; 2015-2018) conducted in Buffalo, NY. Maternal smoking status during pregnancy was verified by urine cotinine testing. Birth weight and length were extracted from birth records. Research staff measured 25 infants' weight and length at 2 weeks and then once a month from 1-12 months of age. Mixed models were used to fit infant trajectories of BMI-for-age z-score (ZBMI). **Results:** The intervention-assisted smoking cessation rate was 63% in our sample, compared to 6% by usual care in a reference population. Our intervention helped mothers with high school or less education to achieve similarly high smoking cessation rate (64% vs 60%) to college-educated mothers. Infants of 17 quitters had lower ZBMI gain from birth to 12 months (mean [SD], 1.13 [1.16]) than infants of 8 persistent smokers (2.34 [1.40]; p=0.035), with Cohen's d effect size being 0.96. The infant ZBMI gain from birth to 12 months was low (0.47 or smaller) if smoking cessation was initiated between 15 and 27 weeks of pregnancy, but started to increase if quitting at 28 weeks (0.65) and accelerated with time (e.g., 3.16 if quitting at 36 weeks). This quitter-smoker difference in infant ZBMI gain was significantly larger among infants of mothers with high school or less education (mean, 2.28), compared to that among infants of mothers with some college or higher education (mean, 0.61; p less than 0.001). **Conclusion:** Maternal smoking cessation during pregnancy may reduce fetal origins of obesity through reducing infant weight gain, especially if quitting smoking by 27 weeks of pregnancy. Infants of mothers with low education benefit more than others, which has implication to reducing socioeconomic disparities in childhood obesity.

FUNDING: Federal; Academic Institution

POS2-120

AWARENESS AND CREDIBILITY OF FDA AS A TOBACCO REGULATOR AMONG US ADOLESCENTS: RESULTS FROM A NATIONAL SURVEY

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Significance: The FDA was granted regulatory authority over tobacco products in 2009 and tasked with communicating the risks of tobacco products to the public. Many of their communication campaigns to date have focused on preventing adolescent tobacco use, yet little research examines adolescent perceptions of FDA as a tobacco regulator. The current study examines awareness of FDA tobacco regulation and their credibility as a



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tobacco regulator among adolescents (13-17) in the US over two time periods. **Methods** A nationally representative repeated cross-sectional telephone survey was conducted between 2014-2015 (Wave 1) with 1125 adolescents, and between 2016-2017 (wave 2) with 975 adolescents. Survey items assessed awareness and trust of FDA, knowledge that FDA regulates how tobacco products are made, advertised, sold, and awareness that FDA communicates the risks of tobacco products to the public. Survey items also assessed credibility of FDA with a 7-item scale. **Results** At both survey waves, greater than 80% of adolescents reported that they had heard of FDA. Among those who had heard of FDA, awareness that FDA regulates how tobacco products are made, advertised and sold in stores increased from 1.4 in wave 1 to 1.8 in wave 2 (1.4, 95% CI: 1.3 - 1.5; 1.8, 95% CI: 1.7 - 1.9). Similarly, credibility of FDA regulation significantly increased from wave 1, 4.9 (95% CI: 4.7 - 5.0) to 5.2 at wave 2 (95% CI: 5.1 - 5.4). At wave 2, the great majority of US adolescent knew that FDA communicates the risks of tobacco products to the public (73.7%; 95% CI: 69.6 - 77.8). **Conclusions** Awareness and credibility of FDA as a tobacco regulator among US adolescents has significantly increase from 2014 to 2017. Ongoing efforts to educate the public about FDA and their tobacco regulatory and communication roles are likely to further increase awareness and credibility of FDA in their tobacco regulatory role.

FUNDING: Federal

POS2-121

PREVALENCE OF SMOKING CESSATION STRATEGIES USED BY CURRENT AND FORMER SMOKERS: RESULTS FROM A NATIONAL SURVEY OF U.S. ADULTS

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Introduction: Despite the recent declines in the prevalence of cigarette smoking among U.S. adults, an estimated 15.5% still smoked cigarettes in 2016. This study examined quit methods used by current and former smokers among U.S. adults including use of e-cigarettes. **Methods:** We used data from a nationally representative 2015 cross-sectional survey of U.S. adults. Respondents were current (n = 1,280) and former smokers (n = 341). Information was collected on potential strategies used for trying to quit smoking including unaided methods, use of e-cigarette, switching to other tobacco products or milder forms, or use of approved cessation tools. Outcome measures were weighted adjusted odds ratios (AOR) for successful quitting based on reported smoking status. **Results:** Most current smokers reported cutting down on cigarettes (63.7%), whereas most former smokers reported giving up smoking all at once (80.1%) as the most frequent strategy for quitting smoking. Getting help from a quit line was the least frequent strategy tried among both current (11.2%) and former smokers (10.9%). 54.8% of current and former smokers in this study had tried e-cigarettes. 27.6% of current smokers reported trying to switch to e-cigarettes compared to 44.2% of former smokers; in addition, 59% of current smokers reported substituting some of their regular cigarettes to e-cigarettes compared to 55.1% of former smokers. Respondents who switched entirely to e-cigarettes during their last quit attempt were more likely to report a successful quit attempt (AOR = 2.81; 95% CI: 1.28-6.15) compared to those who did not switch completely. **Conclusion:** Unaided quit attempts were the most common smoking cessation strategy among current and former smokers. These findings have implications for public health professionals and underscore the need for public education campaigns to encourage quitting smoking completely. Trying to cut down on cigarettes was a cessation strategy most used among current smokers, however former smokers most often tried giving up smoking completely. Additionally, completely switching over to e-cigarettes among current smokers may help with quitting cigarettes; partial substitution is less likely to support quitting.

FUNDING: Federal

POS2-122

SMOKING TOPOGRAPHY AMONG KOREAN SMOKERS' INTENSIVE SMOKING BEHAVIOR

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The difference of smoker's topography has been found to be a function many factors, including sex, personality, nicotine yield, cigarette type (i.e., flavored versus non-flavored) and ethnicity. We evaluated the puffing behaviors of Korean smokers and its association with smoking-related biomarker levels. A sample of 300 participants was randomly recruited from metropolitan areas in South Korea. Topography measures during

a 24-hour period were obtained using a CReSS pocket device. Korean male smokers smoked two puffs less per cigarette compared to female smokers (15.0 (13.0-19.0) vs. 17.5 (15.0-21.0) as the median (Interquartile range)), but had a significantly larger puff volume (62.7 (52.7-75.5) mL vs. 53.5 (42.0-64.2) mL; p = 0.012). The interpuff interval was similar between men and women (8.9 (6.5-11.2) s vs. 8.3 (6.2-11.0) s; p = 0.122) but much shorter than other study results. A dose-response association (p = 0.0011) was observed between daily total puff volumes and urinary cotinine concentrations, after controlling for sex, age, household income level and nicotine addiction level. An understanding of the difference of topography measures, particularly the larger puff volume and shorter interpuff interval of Korean smokers, may help to overcome a potential underestimation of internal doses of hazardous byproducts of smoking.

FUNDING: Federal

POS2-123

HOW DO VAPING PRACTICES EVOLVE: A QUALITATIVE ANALYSIS

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SIGNIFICANCE: Numerous studies have examined smoking to vaping transitions and the identity shifts that occur as smokers become vapers. However, few studies have probed how, or in what circumstances, movement from vaping to becoming vape-free occurs. Nor have researchers explored factors that reinforce vaping identities, foster continued vaping, and impede vaping cessation. **METHODS:** Using social media platforms, we recruited 14 exclusive daily vapers who had not smoked tobacco within the last month and undertook in-depth interviews to probe their identity positions and vaping practices. Participants' ages ranged from 21 to 50; all used third generation devices and their stated intentions to quit vaping varied. **RESULTS:** Although participants began vaping to quit smoking, their initial pragmatic, functional perspective often changed and many came to see vaping as a hobby where they acquired expertise and experienced pleasure. Participants' enjoyment of vaping had different dimensions, but each comprised new ritualistic practices that created social capital. Some participants had evolved into flavour mixologists who customized the blends they vaped and created bespoke taste experiences. Others used the large vapour clouds they created to practise and perform 'tricks' that their peers admired and envied. Yet others described their vapes as 'toys' and saw themselves as 'techies' with the skill and knowledge to craft devices with unique performance attributes. Establishing themselves as mavens within their communities offered this group status and esteem they had never derived from smoking and provided a powerful incentive to continue vaping. **CONCLUSION:** Because vaping represented pleasure without guilt and provided hedonic experiences that lacked the stigma of smoking, many participants revised their initial intentions to become smoke-free and vape-free, and saw little reason to quit vaping. Our findings highlight the need for careful monitoring of vaping's longer-term effects and analysis of the advice provided to smokers who commence vaping.

FUNDING: Unfunded; Academic Institution

POS2-124

TOBACCO SMOKE IS A MAJOR SOURCE OF ETHYLBENZENE AND STYRENE EXPOSURE IN THE U.S. POPULATION: RESULTS FROM NHANES 2005-2006 AND 2011-2012

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Significance: Styrene is a potential human carcinogen with widespread non-occupational exposure sources, including tobacco smoke and diet. There are no large-scale biomonitoring studies examining urinary styrene metabolites in order to estimate styrene exposure in the general population. Moreover, the effect of diet on styrene exposure has not been assessed systematically. **Methods:** To address these knowledge gaps, styrene exposure was assessed based on UPLC-MS/MS quantitation of styrene metabolites mandelic acid (MA) and phenylglyoxylic acid (PGA) in spot urine samples obtained from the National Health and Nutrition Examination Survey (NHANES; N = 4690; 2005 - 2006 and 2011 - 2012; ages 6+). **Results:** Exclusive smokers had 2-fold and 1.6-fold higher median urinary MA and PGA, respectively, compared with non-users. The relative contributions of smoking and diet to styrene exposure were further explored through sample-weighted multiple regression among exclusive smokers in



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NHANES; this analysis showed that smoking 0.5-pack cigarettes per day significantly increased MA (+97.9 µg/L) and PGA (+69.3 µg/L), controlling for potential confounders. In comparison, exposure from the median daily dietary intake of grain products was associated with a significant increase in MA of 1.95 µg/L and a non-significant change in urinary PGA. Conclusion: These results confirm that tobacco smoke is a major source of styrene exposure for the general U.S. population.

FUNDING: Unfunded

POS2-125

ASSOCIATIONS OF NEIGHBORHOOD DEMOGRAPHICS WITH THE AVAILABILITY, ADVERTISING, AND PROMOTIONS OF LITTLE CIGARS AND CIGARILLOS, UNITED STATES, 2015

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Significance: Between 2012-2016, sales of cigars increased by 29% in the United States (US), in part due to an increase cigarillo sales. Because little cigars and cigarillos (LCCs) have not been subject to the same FDA regulations as cigarettes, they provide an appealing and affordable alternative. National estimates show that LCCs are most popular among both young adults and Black people. In local areas, greater LCC marketing has been documented in neighborhoods with a greater proportion of Black residents. This national study assesses whether the availability and marketing of LCCs is associated with neighborhood racial, ethnic, income, and youth demographics. **Methods:** In 2015, we collected availability and marketing data on LCCs through store audits of a nationally representative sample of 2067 tobacco retailers. Using 2011-2015 American Community Survey census tract estimates, we modeled associations of neighborhood demographics (in quartiles) with LCC flavored products, exterior advertisements, youth marketing (e.g., products/advertisements at low heights or near products for youth), and promotions. **Results:** Nearly 90% of retailers sold LCCs, 83.5% sold flavored LCCs, and 31% had marketing appealing to youth. Controlling for store type, neighborhoods with the highest proportion of Black residents had significantly higher odds of selling flavored LCCs (AOR=2.10, 95% CI=1.40, 3.15); exterior advertisements (AOR=2.83, 95% CI=1.91, 4.20); and marketing to youth (AOR=1.92, 95% CI 1.43-2.57). Results were similar for low income neighborhoods. Conversely, retailers located in the neighborhoods with the highest proportion of Hispanic or Latino residents had lower odds of exterior advertisements (AOR=0.55, 95% CI=0.37-0.82) and youth marketing (AOR=0.72, 95% CI=0.52-0.98). No associations were found by percent youth or for promotions. **Conclusion:** US neighborhoods with a greater proportion of Black or low income residents are at a higher risk of exposure to LCC marketing and flavored products. Without stronger LCC regulation, residents of these neighborhoods may be at a greater risk of LCC use.

FUNDING: Federal

POS2-127

DETERMINATION OF LEACHABLE ORGANIC COMPOUNDS IN SMOKED CIGARETTES AND THEIR BIOACCUMULATION POTENTIALS IN THE MARINE MUSSEL, *MYTILUS GALLOPROVINCIALIS*

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Cigarette waste can introduce anthropogenic chemical contaminants into the natural environment. Smoked cigarette filters are one of the most abundant forms of litter found in coastal and urban areas. One study found that 76% of cigarettes smoked in urban areas were littered. Despite the intensive studies of tobacco and tobacco smoke, studies on the fate and effects of cigarette waste are limited. In this study, a non-targeted analysis based on comprehensive two-dimensional gas chromatography analysis with time-of-flight mass spectrometry (GC×GC/TOF-MS) was implemented to identify leachable chemical constituents and bioaccumulative compounds from seawater leachates of smoked cigarette litter. A total of 844 unique compounds were found in the seawater leachate. Eighty-one compounds were tentatively identified by mass spectral similarity. Forty-seven compounds were confirmed with authentic standards. Abundance order was made based on each compounds' GC peak area. The top 20 most abundant compounds composed 71.75% of the total peak area. The top five abundant constituents were diacetin; nicotine; triacetin; phenol; 2-cyclopenten-1-one, accounting for 55.08% of total compounds in the leachate. Based on the abundance and sources,

nicotine, cotinine, anatabine and coexisting diacetin and triacetin, may be used as indicators of smoked cigarette litter contamination in coastal waters. To determine the bioaccumulation potential of the leachable chemical constituents of smoked cigarettes, *Mytilus galloprovincialis* was exposed to the seawater leachate at 1 smoked cigarette/liter for 28 days. In total, 329 unique compounds were found in the mussels exposed to the leachate. Twenty-two compounds were found in both the leachate and the mussels exposed to the leachate, suggesting that they were bioaccumulative. Some of the chemical constituents present in the mussel may exert toxicity to humans or animals. Further research is necessary on both shellfish and human exposure to environmentally realistic levels of cigarette litter toxics to better characterize the risk for persons that may consume such contaminated shellfish.. For environmental monitoring of mussels, we propose 2-furanmethanol, cotinine, 4,4'-bipyridine and 2,3'-dipyridyl as potential suitable markers for evaluating cigarette litter pollution.

FUNDING: State

POS2-128

LEVERAGING TECHNOLOGY TO ADDRESS THE PROBLEM OF CIGARETTE SMOKING AMONG WOMEN OF REPRODUCTIVE AGE

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Significance: Women of reproductive age and particularly pregnant women underutilize evidence-based smoking cessation services such as counseling and quit lines. Mobile health (mHealth) may constitute an unexplored and innovative avenue for providing smoking cessation support to a population that is otherwise difficult to reach with evidence-based interventions. **Methods:** Female respondents aged 18-44 years (N=10023) were drawn from the first wave of the Population Assessment of Tobacco and Health (PATH) study (2013-2014). We examined prevalence of use of various digital forms of communication (e.g., social media, text messaging, smartphone ownership) among non-pregnant women of reproductive age, pregnant women, and among smokers versus non-smokers within these groups. Multiple logistic regression modeling was conducted to identify correlates of using each digital form adjusting for smoking status, pregnancy, and demographic characteristics. **Results:** Over two thirds of women overall and within subgroups of non-pregnant and pregnant smokers reported using social media, owning a cell phone, owning a smartphone, downloading apps, and sending/receiving text messages. Current smokers and those with lower educational attainment generally had lower odds of using each digital form relative to non-smokers and those with higher educational attainment, the exception being that smokers had higher odds of using social media relative to non-smokers. **Conclusion:** The high prevalence of using various digital forms among both non-pregnant smokers of reproductive age and pregnant smokers suggests that leveraging technology to expand access to prevention, education, and treatment resources may reduce smoking-attributable adverse health effects among reproductive-aged women and their offspring.

FUNDING: Federal

POS2-129

SMOKING CESSATION INTERVENTIONS FOR U.S. YOUNG ADULTS: NEW EVIDENCE FROM A SYSTEMATIC REVIEW

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SIGNIFICANCE Studies have highlighted the benefit of smoking cessation before age 30 years to prevent tobacco-related disease and premature death; however, a 2010 systematic review of young adult smoking cessation interventions in the U.S. highlighted few efficacious smoking-cessation interventions for young adults separate from adolescents and older adults. The objective of this study was to update the 2010 review. **METHODS** Electronic searches conducted in 5 databases (CINAHL, Embase, PsychINFO, PubMed, and SCOPUS) in March 2018 identified articles from August 31, 2009 to March 1, 2018. Two independent reviewers coded the articles as "include" or "exclude" based on a hierarchical list of exclusion criteria. Included studies comprised smoking cessation interventions focused on U.S. young adults aged 18-24 with at least one control/unexposed group, cessation-related outcomes, and more than



one month follow-up at the same time point for both control and intervention groups. **RESULTS** The electronic searches and 14 previously included studies resulted in 3,922 publications for title and abstract review, of which 3,868 studies were excluded. Full text review was conducted for 54 articles, resulting in 31 included studies: 14 included in the 2010 review and 17 new studies. All of the new studies were randomized controlled trials. They used a range of modalities to deliver the smoking cessation intervention: 6 counseling, 5 computer-assisted or web-based, 2 text-messaging, 2 smart-phone app, 1 quitline, 1 quit and win contest, and 1 campus-wide activities. Four studies demonstrated short-term efficacy (<6 months) for smoking reduction, 4 for smoking cessation, and 3 for smoking cessation of 6 months or more. Four of the studies addressed multiple behaviors (e.g., drinking and smoking). **CONCLUSION** New studies show promise in improving smoking cessation or reduction in U.S. young adults, including multiple behavior change interventions and text messaging interventions. Continued heterogeneity of outcome and follow-up measures, however, limit comparison across cessation intervention studies.

FUNDING: Federal

POS2-130

CHARACTERISTICS OF TOBACCO USERS WHO USE CANNABIS: RESULTS FROM THE NEW YORK STATE SMOKERS QUITLINE (NYSSQL)

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SIGNIFICANCE: Quitlines reach ~1% of all cigarette smokers in the US annually with tobacco cessation services. Cannabis use is linked with a higher propensity for smoking relapse. In the past 15 years, cannabis regulations have evolved and cannabis use has more than doubled among tobacco users. As cannabis use increases, the need to examine cannabis use as a barrier to tobacco cessation among Quitline callers becomes more important. New York (NY) allows limited medicinal cannabis use, but recreational use remains illegal. At present, there are significant efforts to liberalize medicinal and recreational cannabis use in NY. **METHODS:** We examined demographic and clinical characteristics of n=8,673 consecutive tobacco users who called the NYSSQL to quit tobacco in 2018. We compared callers who reported cannabis use in the past 30 days with callers who reported no cannabis use in the past 30 days. **RESULTS:** Cannabis users (n=721; 7.4%) were more likely to be non-White (54.4% vs 47.2%, p=.04), female (50.5% vs 42.6%; p<.001) and were younger than non-cannabis users (M=47.52 vs M=53.86, p<.001). There was no difference between cannabis users and non-users in the number of cigarettes smoked per day; however more cannabis users used multiple tobacco products (3.5% vs 1.9%; p<.01) than non-users. No differences between cannabis users and non-users were found in readiness to quit tobacco, importance of and confidence in quitting tobacco, time to first cigarette, proportion living with cigarette smokers, or proportion with previous quit attempts. Cannabis users were more likely to report past month alcohol use (53.4% vs 25.6%; p<.001) than non-users, but no differences were found in the incidence of depression or tobacco-related diseases. The mean and modal number of days of past month cannabis use were 14.14 and 30 days with about one-third (32.2%) of cannabis users reporting daily cannabis use in the past month. Cannabis users were minimally motivated to reduce or quit cannabis reporting a mean of 3.67 on a scale of 0 (none) to 10 (most); 43.4% reported no desire to quit cannabis. **CONCLUSIONS:** NYSSQL callers who use cannabis are more likely than non-users to be younger, women, and non-White. Cannabis users were similar to non-users in terms of motivation, readiness, and confidence to quit tobacco; however, cannabis users are more likely than non-users to be poly-tobacco users and use alcohol, established barriers to cessation. Future research needs to examine whether and how cannabis use might be a barrier to tobacco cessation among Quitline callers.

FUNDING: Federal; Other

POS2-131

SEXUAL MINORITY WOMEN ARE MORE LIKELY TO USE THE INTERNET IN THE GENERAL POPULATION, BUT NOT AMONG TOBACCO USERS

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Significance Lesbian and bisexual women (sexual minority women (SMW)) use tobacco at higher rates than the general population. Young adult SMW are 4.8 times more likely to smoke than heterosexual women. SMW face challenges to smoking cessation including the fear of anti-SMW attitudes, difficulty finding a healthcare provider and tobacco industry targeting. Because of these tobacco-related disparities it is important to understand how and where to reach SMW in general, and SMW smokers in particular with cessation-related information. **Methods** We combined the National Health Interview Survey (NHIS) 2015 sample adult and cancer supplement files and the 2016 sample adult files to look at women in the general population (n=36,638), and female smokers of conventional cigarettes (n=5,318). Our independent variable of interest was sexual orientation. Individuals were classified as straight (not lesbian or gay), and SMW (lesbian or bisexual). Due to the small number of individuals, lesbian (n=505) and bisexual (n=427) women were combined. Respondents were asked if in the last 12 months they had (1) used the internet, (2) looked for health information online, (3) filled a prescription online, (4) made a medical appointment online, (5) contacted a provider via email, and (6) used a chat group to discuss medical information. We ran a series of binary logistic regressions to see if these information sources had higher use rates among SMW compared to heterosexual women among the general female population and within the smoking population. **Results** Among all women, SMW had higher odds than straight women of looking up health information online (OR=1.65, p<.001), using a chat group to learn about health information (OR=1.51, p=.026), fill a prescription (OR=1.72, p<.001), make a medical appointment (OR=1.78, p<.001) and contacting their provider via email (OR=1.75, p<.001). Among smokers, sexual minority women had higher odds of filling a prescription online (OR=2.11, p=.006) than straight women. **Conclusion** SMW women generally may be reached using most information channels, targeting smoking information via these channels (excepting of prescription refills) may not be effective.

FUNDING: Unfunded

POS2-132

SMOKEBEAT™ AUTOMATIC TRACKING TECHNOLOGY FOR SMOKING CESSATION SUPPORT OF LOW-INCOME PREGNANT SMOKERS: A FEASIBILITY PILOT STUDY

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Significance: Smoking cessation support for pregnant women is a public health priority. Financial incentives to quit smoking may be more effective when tied to real-time feedback. SmokeBeat™ is a smartwatch-based app that tracks smoking in real-time through hand gestures. Two randomized pilots were designed to: 1. assess the feasibility of SmokeBeat™ to remotely track smoking and provide feedback to participants; and 2. assess the feasibility and acceptability of financial incentives to engage with the SmokeBeat™ app and reduce smoking. **Methods:** Medicaid participants of two prenatal care programs in Lancaster County, PA who smoked during pregnancy and owned an Android smartphone with a data plan were recruited for Pilot 1. Those who completed and continued to smoke after Pilot 1 were eligible for Pilot 2. In each pilot, participants were randomized to one of two conditions, met weekly with study staff via video chat to complete a remotely-supported urine or saliva cotinine test, answered questions about their smoking behavior, and received \$10-15 per weekly video chat. **Study Designs:** *Pilot 1: Intervention:* SmokeBeat™ installed on phone and linked to smartwatch. *Control:* Usual care. *Pilot 2:* SmokeBeat™ installed on phone and linked to smartwatch for both groups. *Pay to Quit:* Daily escalating streak-based payments (\$1-\$7) for wearing the smartwatch and not smoking. *Pay to Wear:* Daily fixed incentives (\$1 per day) for wearing the smartwatch. **Results:** *Pilot 1:* Among 21 participants, the average cigarettes smoked per week decreased from week 1 (60 cigarettes) to week 12 (40 cigarettes). Reductions in weekly smoking were similar in the intervention group (65 in week 1 to 48 in week 12) and the control group (50 in week 1 to 24 in week 12). Battery life of the third-party smartwatch limited feasibility and acceptability of the SmokeBeat™ program. Participants expressed strong interest in an incentives-based cessation program. *Pilot 2:* In progress as of September 2018, with full results available by December. Pilot 2



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is using a different third-party smartwatch with an extended battery life. **Conclusion:** Smoking cessation among our sample of low-income pregnant women motivated to quit was minimal. Implementation of smartwatch-based cessation support technologies faces practical challenges such as poor battery life and length on-boarding. Real-time tracking and immediate financial rewards are appealing. Designing cessation support programs for maximum feasibility and acceptability is critical to uptake and success.

FUNDING: Academic Institution; Other

POS2-133

QUALITATIVE FORMATIVE RESEARCH FOR A COUPLE FOCUSED PREGNANCY SMOKING CESSATION APP

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Significance: Formative research is important to inform the development of mHealth interventions. There is limited evidence on mHealth tobacco interventions during pregnancy, including couple-focused approaches. Romania has high pregnancy smoking rates. We report on qualitative data informing the development of an app for smoking cessation in families expecting a baby, a first in Romania. **Methods:** Subjects were recruited in May-June 2018 through Facebook ads leading to a dedicated website where they could self-assess their eligibility and fill out an informed consent for contact. We conducted 11 semi-structured telephone interviews with pregnant smokers (5/11) and ex-smokers (6/11). Interviews were transcribed and analyzed using a hybrid deductive-inductive thematic analysis at the semantic level. **Results:** The women's mean age was 28.9 years (SD=5.48, range 22-41), most were in their first pregnancy trimester (6/11), and had at least high school education (5/11). Women reported using pregnancy and nutrition tracking apps (10/11), but most did not meet their needs because they offered too much text, were not interactive, and the information seemed not trustworthy. Most women (9/11) expressed interest in installing and using a smoking cessation app, and requested it to be easy to use, colorful, interactive, and offer information about the baby's development. All women agreed to offer personalized information such as name, pregnancy week, and to answer questions in the app (i.e. momentary assessments of importance/confidence/motivation to quit) in order for the app to tailor the content. Most women (9/11) agreed with the strategy to set a quit date and work towards it with the help of push notifications. Women reported (5/11) that their partners would not be interested in using the app and those who would be, would not have the time to use it. Use of mobile data was not a concern for any of the subjects. When offered the alternative to talk with a smoking cessation counselor, five women preferred the counselor instead of the app. **Conclusion:** A tailored smoking cessation app would be accepted and used by pregnant women in Romania, a low-resource setting.

FUNDING: Federal

POS2-134

GROUP CESSATION TREATMENT AT BEHAVIORAL HEALTH SITES IN FLORIDA

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Significance: People with behavioral health conditions use tobacco at a greater rate and have higher prevalence of tobacco-related health conditions. Tobacco Free Florida (TFF) offers in-person cessation courses and free NRT to Floridians throughout the state at behavioral health facilities through Area Health Education Centers (AHECs). This study explores how individuals at these sites use cessation services. Preliminary outcomes and satisfaction rates are also presented. **Methods:** Program data were analyzed for AHEC services at behavioral health facilities in calendar year 2017. The data was used to calculate the number of participants, sites, courses offered, attendances, and the extent to which the services were used. Quit rates (ITT) and satisfaction levels were calculated from a 7-month follow-up survey (N=255 respondents). The response rate was 20.8%. **Results:** The AHEC in-person cessation program was offered at 111 behavioral health sites to 8,234 individuals, 18.1% of individuals attended more than one course. The program administered 1,521 courses, 88.2% were single session and 11.8% were multi-session (5-6 sessions). Half (50.6%) of the multi-session participants completed 4 or more sessions. The majority of participants received NRT (80.84%). The ITT 30-day point prevalence quit rate was 5.4% (95% CI: 3.9%-7.0%) and the ITT 24-hour quit attempt rate was 15.0% (95% CI: 12.6%-17.4%). Most participants reported

being satisfied with the program (84.0%). **Conclusion:** The large number of individuals who attended a course and received NRT indicates there is interest in tobacco cessation among individuals with behavioral health conditions who are seeking treatment. More participants took the single session course, but those who took the more intensive course completed most of the sessions, even with barriers to attendance. Despite program uptake, the quit outcomes, while conservative measures, are very low. This indicates other services may be needed to help this population quit tobacco. In addition, the low response rate speaks to the difficulty of reaching this population.

FUNDING: State

POS2-135

A TAILORED TOBACCO TREATMENT INTERVENTION FOR PREGNANT AND PARENTING WOMEN IN RESIDENTIAL TREATMENT FOR SUBSTANCE USE DISORDER

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Introduction: Perinatal tobacco use is a leading cause of preventable adverse health outcomes, yet smoking rates remain high among pregnant and parenting women with substance use disorders (SUDs). Further, evidence suggests that treating tobacco use and substance use concurrently increases the likelihood of sustained abstinence. However, women in residential treatment face unique barriers to smoking cessation, including high levels of stress. **Methods:** Based on our community engaged, qualitative work with this population (N=98), we developed a tailored tobacco treatment intervention that provided social support and physical activity to reduce stress. Get Fit and Quit is an 8-week tobacco cessation program led by certified tobacco cessation specialists who teach evidence-based cessation curriculum and physical activity classes in a group setting. This program targets women of childbearing age who are interested in quitting or reducing smoking behavior. Throughout the study, we will evaluate the impact of the program on tobacco use behaviors by measuring urine cotinine levels and expired CO, as well as administering a survey at three time points (baseline, week 4, and 8 weeks). By the end of this five-year project, we will have data for 15 cohorts. **Results:** To date, we have completed one cohort with 17 participants. The average age of participants was 33 (range 22-52). Most (94%) participants are white, single (69%), and reported a household income of less than \$20,000 annually. The majority of the participants were in treatment for opioid use (81%), and 63% reported that were also being treated for more than one substance (methamphetamines, cocaine, benzodiazepines, alcohol and/or marijuana). Overall, 65% of participants completed the program. Participants who completed the program experienced a reduction of three cigarettes per day ($p < .001$). **Conclusion:** Get Fit and Quit has potential to reduce smoking among pregnant and parenting women with SUDs. Future studies are needed to test the impact of a more intensive, longer intervention for this high risk population.

FUNDING: Nonprofit grant funding entity

POS2-136

GESTATIONAL WEIGHT GAIN AMONG CIGARETTE SMOKERS AND QUITTERS SWITCHING FROM INADEQUATE TO EXCESSIVE

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Significance: Appropriate gestational weight gain (GWG) is crucial for maternal and child health. GWG can be influenced by smoking and smoking cessation, given effects of nicotine on suppressing appetite and enhancing resting metabolic rate. But current guidelines on GWG do not consider smoking or smoking cessation status. We aimed to examine GWG among persistent cigarette smokers and quitters. **Methods:** Within the UB Pregnancy and Smoking Cessation Study (2015-2018), we analyzed weight data of 23 daily smoking pregnant women in Buffalo, NY. Smoking abstinence was confirmed by breath carbon monoxide (4 ppm or lower) and urine cotinine (below 100 ng/mL) tests. To track maternal weight trajectories around pregnancy, women reported their pre-pregnancy at enrollment and we measured their weight repeatedly at pre-test, initial intervention, post-test, end of pregnancy, pre-delivery, and then monthly visits from delivery to 12 months postpartum. We calculated total GWG by subtracting pre-pregnancy weight from the latest available weight measure before delivery. According to the Institute of Medicine (IOM) guidelines, we classified total GWG into 3 categories (inadequate, appropriate, and excessive), by pre-pregnancy body mass index. We compared mean GWG using *t*-test and GWG categories using Fisher's Exact Test. **Results:** Most women gained weight during pregnancy at a much faster rate than the



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IOM recommendation, especially in the 1st trimester. Seventeen quit smoking by our smoking cessation intervention. Quitters had much higher total GWG (mean [SD], 41.4 [21.8] pounds) compared to non-quitters (9.9 [23.7] pounds; $p=0.012$). Only 11.8% of quitters and 16.7% of non-quitters had appropriate GWG. Patterns of inappropriate GWG were strikingly distinct ($p=0.001$) between quitters and non-quitters: 76.5% of quitters (13/17) had excessive GWG, whereas 83.3% of non-quitters (5/6) had inadequate GWG. **Conclusion:** Maternal smoking is associated with inadequate GWG, while smoking cessation is associated with excessive GWG. Research is needed to understand underlying mechanisms, and develop intervention to promote healthy weight gain while quitting smoking during pregnancy.

FUNDING: Federal; Academic Institution

POS2-137

WHERE DO CALIFORNIA STUDENTS GET THEIR E-CIGARETTES?

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Significance Use of e-cigarettes among students is a major concern for the public health. In California, one needs to be 21 years old to buy them. As the most prevalent tobacco product used by youth, a question arises as to how youth acquire e-cigarettes. This study presents the most recent data on how California middle and high school students acquire e-cigarettes. **Methods** The 2017-18 California Student Tobacco Survey (CSTS) is a statewide population survey of middle and high school students. A total of 13,878 students (current users) were asked how they obtained their e-cigarettes. Students were first asked if they "pay for their own." If they did, they were then asked to identify the source of purchase. **Results** A total of 42.8% of current e-cigarette users reported paying for their own devices - the rest were obtained by other means. Among those who paid for the devices themselves: 46.1% were purchased on their behalf; 39.1% purchased by themselves at the store; and 10.7% from the internet (4.2% reported other method). Among those who purchased e-cigarettes from the stores themselves (16.4% of all current users): 60.7% were made at vape shops; 20.2% at tobacco shops; 10.3% at gas stations/convenience stores; 3.2% others; 2.6% at drugstores; 1.7% at grocery stores; and 1.3% at restaurants. Further analysis also correlated e-cigarette brands with store type. For example, 51.8% of JUUL devices came from vape shops, while 23.8% came from traditional retail channels. Conversely, 47.6% of blu devices came from traditional retail channels, while 28.6% came from vape shops. **Conclusion** Students who are too young to purchase e-cigarettes legally have used other means to obtain them. Still, over 40% of them paid for their own products. A more surprising fact is that among those who purchased the products themselves from brick and mortar stores, most bought them from vape and tobacco stores. These findings suggest that these stores are inconsistent in enforcing age restrictions. Additionally, vapers who used cigalikes (e.g. blu) were more likely to obtain them from traditional retail stores. These results call for greater vigilance by state and local authorities.

FUNDING: State; Academic Institution

POS2-138

SELF-REPORTED USE OF E-CIGARETTE AS A MEANS TO QUITTING CIGARETTE SMOKING

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Background: Use of e-cigarettes as smoking-cessation tool remains debatable, however, little is known about individuals who self-report using this product as a means to quit cigarette smoking. Therefore we examined the prevalence and characteristics of individuals using e-cigarette as a means to quit smoking. **Methods:** Data for this study was derived from the 2018 Texas Population Health Assessment survey ($n=2034$). Prevalence of self-reported use of e-cigarettes to quit smoking was estimated. Multivariate logistic regressions were carried out to examine the association between using e-cigarettes to quit smoking and i) sociodemographic characteristics and ii) health related behaviors and outcomes. **Results:** Overall, 28.49% of respondents were e-cigarette users, of this population, 49.0% reported using e-cigarettes exclusively as an alternative to quitting tobacco use. Respondents aged 35-44 years (aOR: 3.71, 95% CI: 1.59-8.87) and those who had been advised to quit cigarette smoking by a health professional (aOR: 2.12, 95% CI: 1.20-3.72) had increased odds of reporting using e-cigarettes as an alternative to quitting cigarette smoking. Compared to employed respondents, students were less

likely to use e-cigarettes as a smoking cessation tool (aOR: 0.37, 95% CI: 0.14-0.97). **Conclusion:** Findings suggest e-cigarettes are more likely to be used as a smoking cessation tool by early middle aged adult smokers, following a health professional's advice to quit. Since advice from health professionals promotes use of e-cigarettes to quit, health care providers should be encouraged to be clear and explicit in their cessation aid recommendations in line with FDA approved measures.

FUNDING: Federal; State; Academic Institution

POS2-139

PEER CROWD SEGMENTATION FOR TARGETING PUBLIC EDUCATION CAMPAIGNS: HIP HOP YOUTH AND TOBACCO USE

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Purpose: Identification with certain peer crowds can be associated with health risk behaviors, including smoking. A growing body of literature indicates that peer crowd identification can be used to characterize and target high-risk subgroups of youth and young adults for tobacco control public education campaigns that can be salient and appealing. We examine the potential association between strength of Hip Hop peer crowd identification and tobacco use in one of the first large samples of Hip Hop youth in the United States. **Methods:** Data are from a geographically-targeted, address-based convenience sample of 2,194 youths aged 12-17 who identify with the Hip Hop peer crowd collected via in-person and web interviews in 30 U.S. media markets in 2015. We examined strength of associations between Hip Hop peer crowd identification, perceived peer tobacco use, and tobacco use outcomes using logistic regression. **Results:** Overall, 18.3% of Hip Hop youth reported current blunt (cigar with added marijuana) use, followed by electronic cigarettes (e-cigarettes) (11.6%), cigar (without added marijuana) (8.8%), hookah (6.5%), and cigarette (5.6%) use. Stronger Hip Hop peer crowd identification was associated with increased odds of using cigarettes (Odds Ratio=2.25, $p<.05$), cigars (Odds Ratio =2.14, $p<.05$), and blunts (Odds Ratio =1.61, $p<.05$), controlling for demographic characteristics and perceived peer tobacco use. **Conclusions:** Overall, these results among the Hip Hop peer crowd suggest that peer crowd-targeted youth public education campaigns are promising for addressing a range of tobacco use behaviors. Peer crowd-targeting may be an efficient way to reach the larger population of youth at risk of initiating or escalating use of a variety of tobacco products and merits consideration. Our findings support the potential utility for further research and development of effective messaging to address use of a range of tobacco products, including cigars with and without added marijuana, e-cigarettes and hookah among the Hip Hop peer crowd.

FUNDING: Federal

POS2-140

UNDERSTANDING RELATIONSHIPS BETWEEN SOCIAL MEDIA REACH AND SMOKING CESSATION RESOURCE ADOPTION

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Significance: As social media solidifies its role in digital health promotion, public health professionals need to develop sophisticated evaluation models to optimize efforts. The National Cancer Institute's Smokefree.gov Initiative (SFGI) has a robust social media presence; these accounts are used to promote a suite of smoking cessation resources, including evidence-based web content. The objective of this analysis was to define relationships between social media performance and user engagement with SFGI web resources. It considered and assessed the ever-changing social media landscape as it related to those associations. **Methods:** Monthly performance metrics, such as reach, likes, comments, and shares, from Facebook posts ($N=593$) published between June 2017 and July 2018 on the SmokefreeUS Facebook page were analyzed for associations with monthly web traffic referral data from Google Analytics. In February 2018, Facebook changed the way organic reach was measured in an effort to more accurately reflect user exposure to content. To assess the implications of this change, data were also explored through comparative analyses of the six-month periods before and after its implementation. **Results:** In the 12-month data set, total reach (encompassing both paid and organic efforts) was correlated with web referrals from Facebook ($r=0.7$, $p=0.01$). In the pre-post analysis, organic reach was found to have no correlation with web referrals from June 2017 to January 2018 (prior to the Facebook algorithm modification), but a correlation coefficient of 0.85 ($p=.028$) from February 2018 to July 2018. **Conclusions:**



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Facebook data is valuable to public health researchers, but its ever-changing nature can make it difficult to understand and apply. This analysis implies that the February 2018 change has improved the accuracy of reach measurements, and that current Facebook reach numbers could inform campaign optimizations and contribute to efforts to spread important public health messages through digital media.

FUNDING: Federal

POS2-141

IMPLICATIONS OF EXPOSURE TO CONFLICTING SCIENTIFIC RECOMMENDATIONS FOR SOCIAL DIFFUSION OF ELECTRONIC CIGARETTES: RESULTS FROM A RANDOMIZED CONTROLLED EXPERIMENT

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Significance Impacts of exposure to conflicting recommendations (CR) directly from scientific organizations (e.g., American Academy of Pediatrics, American Cancer Society) are understudied in previous research. Given that social influences (e.g., interpersonal discussion, peer recommendation) play an increasingly larger role in tobacco product marketing and diffusion, the current research aims to experimentally examine social consequences of exposure to CR. **Methods** We recruited a sample of 363 never and 354 ever e-cigarette users (309 former and 408 current smokers) from Survey Sampling International, each randomized to one of the five conditions: 1) CR about e-cigarette use for smoking cessation, recommendations 2) favoring (pro) and 3) discouraging (con) e-cigarette use for cessation, 4) general introduction of e-cigarettes, and 5) no-message control. All message stimuli were public statements from credible scientific organizations. 85% of the original sample ($n = 610$) reported having at least a smoker they know, who were then asked to report intention to 1) talk about e-cigarettes with and 2) recommend e-cigarettes to a smoker they know (Yes = very unlikely/unlikely, No = extremely likely/likely) after message exposure. **Results** Compared with the no-message control, CR increased intention to talk by 13.1% (95% CI = 1.2%, 25.3%, $p = .034$) collapsing e-cigarette use status. Furthermore, vaping status moderated main effects and the talk-boosting effect of CR was only found among never users. No main effects of CR on social recommendation were found. However, CR reduced former smokers'—but not current smokers'—intention to recommend e-cigarettes in comparison with the pro (-16.2%, 95% CI = -32.1%, -1.0%) and the no-message control (-15.7%, 95% CI = -30.9%, -0.8%). **Conclusion** Exposure to CR about e-cigarettes from scientific organizations increased never users' likelihood to engage in interpersonal discussion, potentially activating the social route for product diffusion. CR also made former smokers less likely to recommend e-cigarettes to a smoker they know. The net behavioral impact of CR on social diffusion for e-cigarettes needs further examination.

FUNDING: Federal

POS2-142

DISSIMILAR APPROACHES TO POPULATION MODELING LEAD TO DIRECTIONALLY SIMILAR DETERMINATIONS REGARDING THE POTENTIAL FOR TOBACCO HARM REDUCTION

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Statistical models can be used to quantify and integrate the population health effects of both beneficial and harmful changes in tobacco use patterns. Models can be broadly categorized according to whether they follow individuals indexed to the same age at the start of the simulation for a specified time interval (i.e., until the outcome occurs or a specific age is reached), or a mixed cohort consisting of individuals of different ages followed to a specific calendar year. We have explored methodological differences between models, including the choice of outcome measures (smoking prevalence, survivors, premature deaths or smoking-related mortality), the choice of exposure measures (tobacco use state, duration or amount), and the estimation of mortality rates. Given similar input data, the two types of models provide different magnitude estimates for overall population health effects. This may present challenges to policymakers wanting to make informed decisions regarding the potential impact of introducing and

or promoting lower-risk alternatives to cigarettes. However, findings from this research show that these differences are unlikely to be extreme enough to lead to directionally different conclusions regarding the potential for tobacco harm reduction.

FUNDING: Tobacco Industry

POS2-143

PREVALENCE OF EVER VAPING CANNABIS AND ASSOCIATIONS WITH TOBACCO USE AMONG ADOLESCENTS

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Significance. Previous research suggests that some adolescents are using e-cigarettes to vaporize ("vape") other substances beyond nicotine, including cannabis in the form of hash oil, THC wax or oil, or dried cannabis buds or leaves. However, it is unclear how adolescents who vape cannabis use other tobacco products. This study examined the extent to which adolescents reported ever vaping cannabis and investigated how demographic variables and tobacco behaviors were associated with use. **Methods.** We used cross-sectional data of 2,835 adolescents in high school (total response rate, 64.5%) from the 2017 North Carolina Youth Tobacco Survey. Adolescents were asked to indicate whether they had ever used an e-cigarette device with marijuana, THC or hash oil, or THC wax. SAS logistic regression survey procedures were used to account for the complex survey design and sampling weights. **Results.** Approximately one in ten adolescents reported ever vaping cannabis in the overall sample (9.6%). Prevalence was significantly higher among adolescents who reported using tobacco products in the past 30 days (ranging from 28.3% among those using smokeless tobacco to 43.0% among those using waterpipe). In multivariable models, adolescents who reported using cigars (aOR: 3.76, 95% CI: 2.33, 6.07), waterpipe (aOR: 2.32, 95% CI: 1.37, 3.93), or e-cigarettes (aOR: 3.18, 95% CI: 2.38, 4.25) in the past 30 days had higher odds of reporting ever vaping cannabis compared to their counterparts. **Conclusions.** These findings provide evidence that large numbers of high school students who use tobacco products have vaping cannabis. As tobacco control policies—such as communication campaigns or smoke-free laws—increasingly focus on e-cigarettes, attention to understanding how adolescents use e-cigarettes to vape substances other than nicotine is essential.

FUNDING: Federal

POS2-144

AWARENESS AND EVER USE OF HEATED TOBACCO PRODUCTS AMONG U.S. ADULTS, 2018

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Significance: In July 2018, FDA issued substantial equivalence authorization permitting two heated tobacco products (HTPs) to be marketed in the United States. Although HTPs are not widely available nationally, in 2017, 5% of U.S. adults were aware of HTPs and 1% had ever used HTPs, including 2.7% of current cigarette smokers. This study assessed awareness and ever use of HTPs among U.S. adults in 2018. **Methods:** Data are from the 2018 Summer Styles, an Internet survey of U.S. adults aged ≥ 18 years fielded during June-July (N=4,088). Respondents were provided images of HTPs and asked: "Before today, have you heard of 'heat-not-burn' tobacco products?" A description of HTPs followed. Those responding "yes" were asked, "Have you ever tried a 'heat-not-burn' tobacco product, even just one time?" Weighted point estimates were assessed overall and by sex, age, race/ethnicity, education, U.S. region, household income, cigarette smoking status, and past 30-day use of non-cigarette tobacco products. Adjusted odds ratios (AOR) were calculated using logistic regression. **Results:** Overall, 16.3% of adults were aware of HTPs, including 24.0% of current cigarette smokers and 36.2% of non-cigarette tobacco product users. Moreover, 2.4% of adults reported ever use of HTPs, including 6.7% of current cigarette smokers and 15.6% of non-cigarette tobacco product users. Awareness was higher among males (AOR=1.3) than females; those aged 18-24 (AOR=2.1), 25-44 (AOR=2.0), and 45-64 years (AOR=1.7) than those 65 years or older; current (AOR=1.6) and former (AOR=1.3) cigarette smokers than never smokers; and non-cigarette tobacco product users (AOR=2.8) than non-users. Ever use was higher among current (AOR=3.0) and former smokers (AOR=2.4) than



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never smokers; non-cigarette tobacco product users (AOR=10.6) than non-users; and Hispanic (AOR=2.7) than non-Hispanic white respondents. **Conclusion:** In 2018, about 1 in 6 adults were aware of HTPs and about 1 in 40 had ever used HTPs. Given apparent rapid increases in awareness and use of HTPs in the U.S., continued assessment can inform strategies to maximize any potential benefits and minimize health risks.

FUNDING: Federal

POS2-145

THE ASSOCIATION OF FORCED MIGRATION WITH CIGARETTE SMOKING

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Significance: Stressful life events associated with forced migration have been shown to increase vulnerability for adverse health consequences. Intermediate factors, such as smoking and mental problems, can shed light on the mechanisms underlying this process. **Methods:** We investigated if and how forced migration from Ceded Karelia and other war zones due to the World War II is associated with subsequent cigarette smoking within the nationwide Finnish Adult Twin Cohort. Further, we tested if poor mental health confounds this association. Total of 12,231 individuals born before 1945 were included in this analysis. The exposure (forced migration due to war, categorized as 'no', 'once', '2+' used following measures: the municipality of birth and whether the respondent had moved municipality ever and if so, for what reason (10 options, including war). Of the respondents born in Ceded Karelia 83% replied that they had been forced to move due to war, with the corresponding percentages varying from 6% to 15% in other provinces. Detailed smoking questions were used to create the 'ever smoker' versus 'never smoker' variable. As a potential confounder we considered poor mental health, applying a 4-item life dissatisfaction as a proxy measure. (Life dissatisfaction correlates highly with depression in our data: $r=0.60$ with Beck Depression Inventory). Logistic regression with correction for sampling of twins as pairs was used for analyses. **Results:** When adjusted for sex, age, birth region, and education, both one (OR 1.69; 95% Confidence Intervals [CI] 1.42 - 2.02) and at least two (OR 1.28; 95% CI 1.05 - 1.56) forced migrations due to war were associated with higher likelihood of being ever smoker compared to those without such experience. When additionally adjusting for mental health status, increasing life dissatisfaction increased likelihood of ever smoking (OR 1.06; 95% CI 1.04 - 1.07), but the association of both one and 2+ forced migrations with ever smoking remained significant (OR 1.71; 95% CI 1.44 - 2.05 and OR 1.28; 95% CI 1.05 - 1.56, respectively). **Conclusion:** Forced migration experience as a stressful life event seems to increase vulnerability for cigarette smoking, independently of mental health.

FUNDING: Academic Institution; Nonprofit grant funding entity

POS2-146

ELECTRONIC CIGARETTE USE IS ASSOCIATED WITH RESPIRATORY DISEASE AMONG ADULTS IN THE UNITED STATES POPULATION ASSESSMENT OF TOBACCO AND HEALTH: A LONGITUDINAL ANALYSIS

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Background: Electronic cigarettes are marketed as a less harmful nicotine delivery system and as a new smoking cessation tool. This study aim is to determine the longitudinal associations between electronic cigarette use and respiratory disease. **Methods:** Longitudinal analysis of the Population Assessment of Tobacco and Health (PATH) Waves 1, 2 and 3. The Wave 1 dataset includes 32,320 adults, Wave 2 has 28,362 and Wave 3 has 28,148 American adults aged 18 years and above, of whom 23,670 completed all three waves. Wave 1 data were collected from September 2013 to December 2014, Wave 2 from October 2014 to October 2015 and Wave 3 from October 2015 to October 2016. PATH uses a four-stage stratified probability sample technique. Multivariable logistic regression was performed to determine the longitudinal associations between e-cigarette use and respiratory disease, controlling for cigarette smoking, demographic and clinical variables. **Results:** Among people who did not report respiratory disease at Wave 1, the longitudinal analysis reveals statistically significant associations between former e-cigarette use (adjusted odds ratio, 1.24, 95% CI: 1.03, 1.51) and current e-cigarette use (1.23, 95% CI: 1.00, 1.52) at Wave 1 and having incident respiratory disease at Waves 2 or 3, controlling for cigarette smoking, demographic, and clinical variables. Current cigarette smoking (2.68, 95% CI: 2.10, 3.42) was also significantly associated with having respiratory disease at Waves 2 or 3. Odds of developing lung

disease for a current dual user is 3.30 compared with a never smoker who never used e-cigarettes. **Conclusions:** Current use of e-cigarettes is an independent risk factor for respiratory disease that accrues in addition to the effects of any cigarette smoking. Dual use is riskier than using either product alone.

FUNDING: Federal; Academic Institution

POS2-147

MATERNAL SMOKING AROUND PREGNANCY PARTIALLY MEDIATES SOCIOECONOMIC DISPARITIES IN EARLY CHILDHOOD OBESITY

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Significance: There are alarming widening socioeconomic disparities in childhood obesity in the US. It remains unclear which early life determinants cause these disparities. We aimed to examine the potential mediation role of maternal smoking around pregnancy. **Methods:** We analyzed 6,300 mother-child dyads at the 5-year follow-up in the U.S. Early Childhood Longitudinal Study - Birth (ECLS-B, 2001-2007). Child weight and height at age 5 years were measured by trained research staff. Using the CDC 2000 sex-specific growth charts, we defined obesity as body mass index at or above 95th percentile. Maternal education attainment was classified into a binary variable: high school or less vs. college. From birth certificates and interviews, maternal smoking status around pregnancy was classified into 5 categories: never-smoking, stable or increased smoking during pregnancy, reduced smoking during pregnancy, quitting smoking by end of pregnancy and remaining abstinent at 9 months postpartum, and quitting smoking by end of pregnancy but relapsing at 9 months postpartum. We fit multivariable logistic regression models to examine the association between maternal education and childhood obesity, adjusting for pre pregnancy body mass index. Based on the causal step method, we conducted mediation analysis on maternal smoking around pregnancy. **Results:** Mothers with high school or less education were more likely to smoke before pregnancy (32.9 vs. 13.3%), continue smoking during pregnancy (17.4% vs. 5.1%), and (among quitters) relapse to smoking at 9 months postpartum (70.1% vs. 58.0%) than mothers with college education. At age 5 years, children with maternal high school or less education had a higher risk of obesity (14.9% vs. 9.1%, $p<0.001$) than those with maternal college education; and the adjusted odds ratio was 1.64 (95% confidence interval, 1.40 to 1.92). After including maternal smoking status around pregnancy into the regression model, the odds ratio was considerably attenuated to 1.57 (95% confidence interval, 1.33 to 1.84). **Conclusion:** Maternal smoking around pregnancy can partially mediate or contribute to socioeconomic disparities in early childhood obesity.

FUNDING: Federal; Academic Institution

POS2-148

CHARACTERISTICS OF DAILY SMOKERS, FREQUENT AND INFREQUENT NONDAILY SMOKERS: RESULTS FROM THE NATIONAL SURVEY OF DRUG, ALCOHOL AND TOBACCO USE. MEXICO 2016

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Background: The smoking pattern in Mexico has been different from that observed in high income countries, in which daily smokers are the majority of current smokers. However, in Mexico, 66% of the current smokers are nondaily. This study aimed to compare the correlates of infrequent nondaily smokers, frequent nondaily smokers, and daily smokers among Mexican smokers. **Methods:** Data came from a National Survey of Drug, Alcohol and Tobacco use in Mexico (ENCODAT 2016). Current smokers were classified in three groups: daily smokers ($n=2,904$), frequent nondaily smokers ($n=1,337$) (smoke 3 or more cigarettes per week) and infrequently nondaily smokers ($n=1,507$) (smoke 2 or less cigarettes per week). Multinomial logistic regression model regressed current smoking status on sex, age group (18-24, 25-44, 45-65), 8 item scale of physiological (i.e., smoking helps me control my stress, anxiety and anger) and physical addiction (time to first cigarette), e-cigarette current use, place of residence, education, wealth index and quit attempts in the last year. **Results:** Daily smokers were more likely to be older (45-55 years vs 18-24 years: AOR=3.36 CI 2.36-4.78), current e-cigarette users (AOR=2.60 95% CI=1.36-4.99), have higher wealth (AOR=1.77 95% CI 1.05-2.98), lower education (e.g., high vs low: AOR=0.46 95% CI 0.28-0.74) and have higher levels of physical and psychological addiction compared to infrequent nondaily



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smokers. Frequent nondaily smokers vs infrequent nondaily smokers were more likely to have higher levels of psychological addiction (e.g., moderate vs low: AOR=3.49 95% CI 1.95-6.26). **Conclusions:** This study suggest that the risk factors for frequent daily smokers and infrequent nondaily smokers are shared and only differ by psychological addiction. Therefore, it is possible that nondaily smokers in Mexico are a homogenous group. Nevertheless, daily smokers differed from infrequent and frequent nondaily smokers in demographic and social factors as well as in physical and psychological addiction. These difference need to be addressed when developing and implementing effective policies that aim to reduce smoking.

FUNDING: Federal; State

POS2-149

REPORTED USE OF NICOTINE AND NON-NICOTINE LIQUIDS FOR VAPING IN AUSTRALIA, CANADA, UNITED STATES AND ENGLAND

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Significance: To understand differences in vaping and related beliefs as a function of whether the person believes they are vaping a nicotine-based e-liquid. **Methods.** Data analysed come from 3,073 at least monthly (1775 daily) vapers who participated in the 2016 ITC Four Country Smoking and Vaping survey. Analyses examined the relationship between reported e-cigarette nicotine content and a range of behaviours and beliefs related to vaping and cigarette smoking. **Results.** Overall, 93.6% of current vapers reported using a nicotine e-liquid in their e-cigarette device. Only 3.8% of respondents said the e-liquid they use does not contain nicotine, and 2.6% did not know. No-nicotine e-liquid use was higher in recent (10.8%) and long-term (14.0%) cigarette quitters and higher in those intending to quit smoking within the next month (30.2% versus 19.9% in any-nicotine users). Daily vapers were more likely to report using nicotine than non-daily vapers (95.6% versus 90.9%, $p < 0.001$). Among daily vapers ($n=1,241$), those who were also smoking daily (95.0%) were equally likely to use nicotine as those who were smoking less (weekly 96.5% or occasional, 96.0%). Vaping with nicotine was least common in Australian vapers (82.9%) and highest in the US (97.1%). Younger or male daily vapers reported being significantly more likely to use nicotine than older or female vapers ($p < 0.05$). No significant differences in reported nicotine use were observed by education or income level. Among daily vapers there were surprisingly few or only small differences between those using nicotine and those not using nicotine on reported satisfaction and enjoyment from vaping, perceived harm of nicotine, vaping device used and preferred e-liquid flavouring. No-nicotine users were less likely to agree that e-cigarettes are “an important part of life” and reported lower urges to smoke in the past 24 hours. **Discussion.** Despite many similarities in vaping and nicotine beliefs and behaviours, there are a small minority of no-nicotine vapers differ from nicotine users, in nicotine dependence, intention to quit and use once quit, suggesting they are a subgroup for whom the nicotine is less important.

FUNDING: Nonprofit grant funding entity

POS2-150

COTININE, METHYLATION AT IMPRINTED GENES, AND SMALL-FOR-GESTATIONAL-AGE

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Prenatal smoke exposure (PSE) has been associated with perinatal outcomes (reduced birth weight, restricted fetal growth) and increased risk for morbidity (poor developmental and psychological outcomes) and mortality. Although the underlying mechanisms of these associations are not yet fully understood, we hypothesized that PSE may affect pathways influencing fetal growth and development through epigenetic alterations. To test this, data were obtained from a community sample of pregnant women and children in the Newborn Epigenetic Study ($N=2681$). Structural equation mediation models were implemented to: investigate associations between log-transformed prenatal cotinine

concentration in blood plasma ($N=853$) and a binary measure of small-for-gestational age (SGA, $N=317$); determine if associations differed by smoking status by running separate models for passive smoke exposed mothers (validated by cotinine < 4 ng/mL; $N=595$) and active smoker mothers ($N=190$); and, test whether associations were mediated by differentially methylated regions (DMRs) of control regions for the *MEG3* gene, previously associated with smoke exposure (*DLK1-MEG3* intergenic DMR, *IG-DMR*, and maternally expressed 3, *MEG3-DMR*). Controlling for covariates (sex of baby, maternal education, race, mother's age), associations between cotinine and SGA differed by smoking status. Cotinine was not associated with SGA among non-smoking mothers ($OR=0.98$, $p=0.83$ and $OR=0.98$, $p=0.79$, for models including *MEG3-DMR* and *IG-DMR* respectively), but was associated with SGA in smoking mothers ($OR=1.46$, $p=0.01$ and $OR=1.32$, $p=0.05$, respectively). Cotinine was associated with increased methylation of the *MEG3-DMR* ($OR=1.29$, $p=0.05$) and *IG-DMR* ($OR=1.18$, $p=0.05$) among passive smoke exposed mothers. Among active smoker mothers, cotinine was also associated with increased methylation of the *MEG3-DMR* ($OR=2.22$, $p<0.01$), but not the *IG-DMR* ($OR=1.13$, $p=0.47$). Although low levels of cotinine were related to methylation at *MEG3* DMRs, associations between cotinine and SGA were not mediated by *MEG3* DMRs. Further research is needed to identify genetic and biological pathways influenced by cotinine and SGA.

FUNDING: Federal

POS2-151

TOBACCO PREVENTION RESEARCH AT THE NATIONAL INSTITUTES OF HEALTH

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SIGNIFICANCE: Smoking is the leading cause of preventable death worldwide, yet investment in tobacco prevention does not reflect the magnitude of tobacco's impact on health outcomes. As the largest funder of biomedical research in the world, we were interested in examining what level of NIH prevention research support is focused on tobacco, as well as characteristics of projects that comprise tobacco grant awards.

METHODS: We accessed the NIH tobacco research grant portfolio using an Office of Disease Prevention (ODP) database representing 91.7% of all new projects and 84.1% of all dollars NIH obligated for new and renewed prevention research grants (R and P mechanisms) and cooperative agreements (U mechanisms) awarded in fiscal years 2012-2017. ODP defines prevention research to include primary and secondary prevention research in humans and studies of prevention-related methods for use in humans. **RESULTS:** Tobacco prevention research represented 1.1% of NIH research grants, or 6.6% of the NIH prevention research portfolio, with a downward trend over the time period covered for tobacco research as a fraction of the entire NIH research portfolio, but not as a fraction of the NIH prevention research portfolio. Fifteen percent of NIH tobacco prevention grants were provided funding through the FDA Center for Tobacco Products. Tobacco motivated a majority of tobacco prevention studies (81.9%) followed by mortality (43.7%) and cancer (25.4%). Study populations included adults (or unspecified) in 75.4% of tobacco prevention studies and 24.4% included youth. Other study populations (e.g., rural, low income, etc.) were included in less than 10% of studies. Research study designs most often included observational studies (48.9) followed by randomized interventions (30.0%) and analysis of existing data (29.9%). **CONCLUSION:** It is not possible to determine exactly what is driving the downward trend in tobacco prevention as a proportion of NIH research. Regardless, more tobacco prevention research is warranted given tobacco's toll on public health. A greater focus on populations vulnerable to tobacco use also is needed to address tobacco-related health disparities.

FUNDING: Federal

POS2-152

ASSOCIATION BETWEEN SMOKING, AND HOSPITAL READMISSION AMONG INPATIENTS WITH PSYCHIATRIC ILLNESS AT AN ACADEMIC INPATIENT PSYCHIATRIC FACILITY, 2000-2015

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Introduction: Smoking rates are up to 2-4 times higher among individuals with mental illness compared to the general population. Psychiatric hospital readmissions for patients with psychiatric illness within a year of discharge are also high. There is however limited evidence of associations between smoking and readmissions for inpatients with psychiatric illness. **Methods:** This study was a secondary data analysis using clinical data of psychiatric inpatients at the University of Utah Neuropsychiatric Institute whose initial inpatient admission were between the years 2000 and 2015. Following a descriptive analysis, logistic regression models were fitted to explore relationships between smoking and psychiatric hospital readmission within 30 days and a year of initial discharge. **Results:** A total of 5,439 patients with average age was 30.18 ± 15.97 were identified. Of this number, 2,558 (47.03%) were current smokers and 2,881 (52.97%) were never smokers. Within 30 days of discharge, 11% of the current smokers were readmitted compared to 9% of the never smokers. The primary diagnoses with highest proportion of smokers were, opioid or substance use disorders (80.00%), schizophrenia (70.73%), alcohol dependence (68.19%), psychotic disorders (51.70%), and bipolar disorders (50.84%). About 31% of current smokers were readmitted within one year of discharge compared to 26% of the never smokers. Within 30 days of discharge, adjusted odds ratios for readmission were, bipolar (1.34, $p = 0.445$), bipolar*smoking (2.19, $p = 0.020$), schizophrenia (3.82, $p = 0.002$), and schizophrenia*smoking (1.15, $p = 0.714$). Adjusted odds ratios for readmission within 1-year of discharge were, bipolar disorders (1.41, $p = 0.009$), schizophrenia (2.33, $p < 0.001$), psychosis (1.77, $p = 0.003$), opioid/substance use (1.55, $p = 0.011$), and mood disorders (1.34, $p = 0.035$). **Conclusion:** Significant relationships exist between smoking and readmission for patients with psychiatric illness. Smokers are more likely to be readmitted within 30 days or one year after discharge. The interaction of smoking and certain specific diagnoses increases the likelihood of readmission significantly.

FUNDING: Unfunded

POS2-153

ALDEHYDE CONCENTRATIONS PRODUCED ACROSS DIFFERENT GENERATIONS OF ELECTRONIC CIGARETTES META ANALYSIS AND RISK ASSESSMENT OF AEROSOL CONCENTRATIONS

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The changing regulatory landscape within the electronic nicotine delivery systems (ENDS) industry has highlighted the need for companies to fully characterize and evaluate exposure to chemical constituents found in aerosols. The FDA requires the tobacco industry to report levels of harmful and potentially harmful constituents (HPHCs) found in tobacco products and tobacco smoke, as well as levels found in noncombustible tobacco products such as ENDS. Aldehydes listed as HPHCs include formaldehyde (FA), acetaldehyde (AA), and acrolein (Acr); these chemicals are generated by the oxidation and thermal degradation of the primary constituents of ENDS liquids, propylene glycol (PG) or vegetable glycerin (VG). The aim of this meta-analysis was to evaluate existing analytical measurements of FA, AA, and Acr in aerosols produced by various ENDS devices and the potential influence of device and user features on FA, AA, and Acr aerosol concentrations. In addition, FA, AA, and Acr concentrations from ENDS aerosols were compared to that of tobacco cigarette smoke. Daily FA, AA, and Acr exposures were calculated from aerosol analytical data reported in published studies, as well as from topography data collected from published studies. The average weighted aerosol concentrations were calculated for FA, AA, and Acr. Lastly, a risk assessment was performed comparing daily FA, AA, and Acr exposures to values reported by various government agencies for both the general and worker population. A significant number of samples were below the analytical limit of detection. Additionally, the majority of the estimated daily concentrations of FA, AA, and Acr from the pooled data were below estimated daily levels from cigarettes. While the majority of studies did not indicate device power settings, such information along with other device features (e.g., temperature, power, topography parameters) will be critical to report as ENDS chemical emissions patterns are compared across future exposure studies, product types and reasonable use scenarios for human risk assessment purposes. A set of standard experimental design reporting parameters are recommended for future studies.

FUNDING: Other

POS2-154

HOOKAH TOBACCO AND OTHER TOBACCO USE IN YOUNG ADULTS

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Introduction. Increasing numbers of teenagers and young adults are viewing hookah tobacco smoking as socially acceptable and non-harmful. In this study, we considered 18-30 year-old adults in the U.S. who were ever-smokers of hookah tobacco. Our study goals were to determine whether ever-use of hookah tobacco was associated with regular-cigarette smoking and use of other tobacco products.

Methods. We analyzed data from the 2010-2011 and 2014-2015 Tobacco Use Supplement to the Current Population Survey, $n = 55,352$. Our main measure of interest was ever-use of hookah tobacco. We used Rao-Scott chi-square tests to determine associations at the 5% significance level.

Results. The prevalence of ever-use of hookah tobacco was significantly higher among current users of smokeless tobacco products ($p < 0.0001$), smokers of e-cigarettes ($p < 0.0001$), smokers of cigars, cigarillos, or little filtered cigars ($p < 0.0001$), and smokers of regular tobacco pipes ($p < 0.0001$). The prevalence of ever-use of hookah tobacco was higher among former (21.2%, SE = 0.75%), occasional (23.0%, SE = 1.06%), and daily (16.2%, SE = 0.57%) regular-cigarette smokers than those who had never smoked regular cigarettes (6.7%, SE = 0.15%). **Conclusion.** These results indicated that hookah tobacco smoking is positively associated with use of many other tobacco products. High rates of ever-use of hookah tobacco among former smokers of regular cigarettes suggest that young adults may continue use of tobacco after successful cessation of smoking regular cigarettes.

FUNDING: Federal

POS2-155

EFFECTS OF CURRENT AND ENHANCED TOBACCO CORRECTIVES ON SMOKERS' INTENTION TO QUIT SMOKING AND INTENTION TO PURCHASE CIGARETTES

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Significance: A federal court has ordered tobacco companies to issue corrective messages to address tobacco-related misperceptions. This study examined the effects of viewing current versus two enhanced versions of tobacco corrective messages on smokers' intention to quit smoking and intention to purchase cigarettes.

Methods: US adult smokers ($N=803$) were randomly assigned to view either 1) two current tobacco corrective messages (Current), 2) two corrective messages that include an industry deception statement (Industry Deception), or 3) two corrective messages with an industry deception statement and testimonials of smokers harmed by smoking (Industry Deception + Testimonial). Outcomes were pretest-posttest change in intentions to quit smoking and posttest intention to purchase cigarette measures.

Results: Intention to quit smoking increased significantly after viewing the Current corrective messages versus baseline. In addition, viewing the Industry Deception + Testimonial messages increased intention to quit smoking compared with the Current corrective condition and the Industry Deception condition. Hispanic smokers had increased intention to quit smoking and decreased intention to purchase cigarettes to a greater degree than non-Hispanic smokers in response to Industry Deception + Testimonial messages. There was no significant difference in intention to purchase cigarettes across conditions.

Conclusions: Current corrective messages are effective in increasing intention to quit smoking. However, enhancing current corrective statements by including an industry deception statement and testimonials may strengthen effects and contribute to remedying the effects of tobacco misinformation.

FUNDING: Unfunded



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POS2-156

DIFFERENTIAL ASSOCIATIONS BETWEEN ANTI-TOBACCO INDUSTRY ATTITUDES AND INTENTION TO QUIT SMOKING AMONG YOUNG ADULT PEER CROWDS

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SIGNIFICANCE: Young adult bar patrons have a high prevalence of smoking. However, little is known about the effect of anti-tobacco industry attitudes on smoking cessation in this high-risk population. In addition, these effects have not been examined among different peer crowds. This study examined the relationships between anti-tobacco industry attitude and cessation-related outcomes (i.e., intention and attempts to quit), and compared these relationships across peer crowds. **METHODS:** A cross-sectional survey of 7,871 young adult bar patrons was conducted in 2015 in seven U.S. cities. Intention to quit in the next 6 months and having made a quit attempt in the last 12 months were binary cessation outcomes. Anti-tobacco industry attitude was measured by three items asking for support for actions against the tobacco industry. Peer crowd affiliation was measured using the I-Base Survey. Missing data was addressed by multiple imputation via chained equations. Multivariate logistic regressions examined the association between anti-tobacco industry attitude and the outcomes for the total sample and for each peer crowd, adjusting for demographics, alcohol use, and smoking-related characteristics (e.g., nicotine dependence, smoking intensity). **RESULTS:** Of 2,817 current smokers, 33.17% reported an intention to quit and 40.48% reported making at least one quit attempt. Anti-tobacco industry attitude was positively associated with both intention to quit (OR=1.37, 95% CI=1.24-1.52) and attempt to quit (OR=1.14, 95% CI=1.03-1.27). The relationship between anti-tobacco industry attitude and intention to quit differed across peer crowds, with significant associations for Homebody, Partier, Hipster, and Hip Hop peer crowds, but not the others (i.e., Young Professional, Country). **CONCLUSIONS/DISCUSSION:** This study provides further evidence that anti-tobacco industry attitudes may promote cessation among young adult smokers. Intriguingly, we found that peer crowd identity may moderate the relationship between anti-industry attitude and intention to quit. Therefore, integration of anti-industry content into certain peer crowd-tailored interventions may be a more relevant approach to reduce tobacco use among some of the highest risk young adults.

FUNDING: Federal

POS2-157

PICTORIAL CIGARETTE PACK WARNINGS INCREASE NEGATIVE AFFECT AND THINKING ABOUT RISKS BUT NOT RISK PERCEPTIONS: A META-ANALYSIS

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SIGNIFICANCE: Pictorial cigarette pack warnings motivate smokers to quit. To better understand the mechanisms that underlie the efficacy of pictorial warnings, we conducted a meta-analysis of experimental studies that assessed the impact of pictorial warnings on risk appraisals: fear and negative affect, thinking about risks, and risk perceptions. **METHODS:** We searched seven computerized databases in April 2018. We also searched the bibliographies of all relevant articles identified in the search. We included studies that used an experimental protocol to test cigarette pack warnings, reported data on both pictorial and text-only conditions, and assessed one or more forms of risk appraisals: risk-related warning reactions (fear and negative affect, thinking about risks) and risk perceptions (perceived likelihood, severity, experiential risk). Thirty-eight articles reporting data on 55 independent samples (N=42,854) from 13 countries met these criteria. Two independent researchers coded all study characteristics (mean Krippendorff's alpha=.97). Effect sizes were computed from data extracted from study reports and were combined using random effects meta-analytic procedures. **RESULTS:** Pictorial warnings led to stronger risk-related warning reactions relative to text-only warnings. They exhibited moderate-to-large effects on fear only ($d=.89$, $p<.001$), fear combined with other negative affect ($d=.64$, $p<.001$), and negative affect without fear ($d=.61$, $p<.001$). They also exhibited large effects on thinking about risks ($d=1.27$, $p<.001$). In contrast, pictorial warnings had no impact on risk perceptions relative to text-only warnings. They did not influence perceived likelihood of harm ($d=.03$, $p=.064$), perceived severity of harm ($d=.16$, $p=.244$), or perceived experiential risk ($d=.06$, $p=.449$). **CONCLUSIONS:** The evidence from this international body of literature clarifies the role that risk appraisals

play in the effectiveness of pictorial warnings. Pictorial cigarette pack warnings elicit fear, negative affect, and more frequent thinking about risks, but they do not increase smokers' perceptions of the likelihood or severity of smoking-related harms.

FUNDING: Federal

POS2-158

ELECTRONIC CIGARETTE USAGE PATTERNS > A CASE STUDY COMBINING SURVEY AND SOCIAL MEDIA DATA

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Significance: Social media data provide valuable self-reported behavioral and sentiment data in real time, and survey data can also provide similar self-report data, but typically less frequently. Few studies have assessed both to assess whether those data can be triangulated to assess consistencies and trends. The goal of the present study was to identify who were social media active e-cigarette users, to compare the use patterns from both survey and social media data for data triangulation, and to jointly use both datasets to conduct a comprehensive analysis on e-cigarette future use intentions.

Methods: We jointly used an e-cigarette use online survey ($n = 5,132$) and a social media dataset. We conducted analysis from three different perspectives. We analyzed online forum participation patterns using survey data. We compared e-cigarette use patterns, including brand and flavor types, ratings, and purchase approaches, between online survey data and social media data. We used logistic regression to study intentions to use e-cigarettes using both datasets. **Results:** Male and younger e-cigarette users were significantly more likely to participate in e-cigarette-related discussion forums, and forum active survey participants were significantly more likely to be hardcore vapers than occasional users. The e-cigarette use patterns were similar in the online survey data and the social media data. Intention to use e-cigarettes was positively related to e-liquid ratings and flavor ratings. Social media provided a valuable source of information on users' ratings of e-cigarette refill liquids. **Discussion:** For hardcore vapers, social media data was consistent with online survey data, which suggests that social media may be useful to study e-cigarette use behaviors and can serve as a useful complement to online survey research - and should be explored whether it can serve as a substitute for certain populations and questions. Assessing both social media and survey data allows as an innovative framework for data triangulation to characterize ENDS use.

FUNDING: Federal; Academic Institution

POS2-160

RATES OF SMOKE-FREE HOMES ARE INCREASING AMONG SINGLE-PARENT HOUSEHOLDS IN THE UNITED STATES

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In the United States, about 58 million nonsmokers are exposed to secondhand smoke each year. This exposure causes premature death and serious health problems. The home is one of the main sites of secondhand smoke exposure. Thus, smoking restrictions at home play an important role in reducing the exposure to secondhand smoke. Prior studies documented that among households with underage children and at least one adult smoker, the overall rates of smoke-free homes was 50% in 2006-2007 and 60% in 2010-2011. In this study, we estimated the rates of smoke-free homes among single-parent households in 2010-11 and 2014-15, investigated the association between parental reports and survey mode (phone, in-person) and identified characteristics of households where the smoke-free homes were least prevalent. We used data from the Tobacco Use Supplement to the Current Population Survey in 2010-2011 ($n=6,010$) and 2014-2015 ($n=5,662$). The prevalence of smoke-free homes was 82.1% ($SE=0.6\%$) in 2010-2011 and 86.3% ($SE=0.6\%$) in 2014-2015. The rate of smoke-free homes was lower for personal interviews (79% in 2010-2011 and 82% in 2014-2015) than for phone interviews (85% in 2010-2011 and 90% in 2014-2015). Even after controlling for several factors, personal interviews corresponded to lower odds of having a smoke-free home relative to phone interviews ($OR = 0.7$, $CI = 0.6-0.9$, in 2010-11; $OR = 0.5$, $CI = 0.4-0.6$, in 2014-15). Among households where the parent smoked, smoke-free homes were less common among non-Hispanic (NH) Black/African American relative to NH white parents, lower-educated than higher-educated parents, unemployed/not in labor force than employed parents, and households with no toddlers relative to the ones with



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toddlers. The study illustrates overall positive trend in the rate of smoke-free homes in the past two decades but also points to significant discrepancies in the rates for diverse parental and household characteristics.

FUNDING: Federal

POS2-161

EFFECT OF TYPE OF TOBACCO PRODUCT ON EXHALED CARBON MONOXIDE LEVEL IN SMOKERS WITH SERIOUS MENTAL ILLNESS

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Significance: Exposure to carbon monoxide (CO) has detrimental effects that have been implicated in the pathophysiology of atherosclerosis constituting a well-known risk factor for cardiovascular disease. Although tobacco smoke contains many chemicals, not all tobacco products (TP) deliver the same amount of chemicals or have the same cost. Laboratory experiments showed that the mean deliveries per liter of smoke, tar, nicotine, and CO are highest for mini cigars, followed by loose tobacco and cigarettes. In addition, the average price of mini cigars and loose tobacco is lower than that of cigarettes, as are tax rates, making them more appealing to low income adults such as people with serious mental illness (SMI), as they are 3-4 times more likely to smoke, smoke more TPs/day and extract more nicotine and CO from each cigarette than non-SMI. CDC reported in 2013 that 7% of people with SMI smoked mini cigars and 1.3% loose tobacco. It is not known, however, if those with SMI who use mini-cigars or loose tobacco have higher expired CO levels than those who use cigarettes. **Methods:** Smokers with SMI in Greater Boston receiving Department of Mental Health psychiatric rehabilitation services provided smoking self-report and expired CO measurement from 11/2016 to 9/2017. **Results:** 1058 of 1166 enrolled participants (90.7%) provided expired breath for CO and were included in the analysis; 62.3% reported smoking only cigarettes, 11.6% only mini cigars, 4% only loose tobacco, 19% dual use of cigarettes and mini cigars and 3.4% dual use of cigarettes and loose tobacco. Controlling for TPs per day and time since last TP, participants who smoked only mini cigars had a significantly higher CO level than those who smoked only cigarettes (29.5 ± 19.4 vs 18.4 ± 12.8 , $\beta = -0.38$, $p < 0.0001$) and those who smoked only loose tobacco (29.5 ± 19.4 vs 24.3 ± 18.5 , $\beta = -0.30$, $p = 0.035$). There was no difference between those who smoke only mini cigars and dual users. TPs used per day strongly predicted CO levels ($\beta = 0.24$, $SD = 0.03$, $p < 0.0001$), and longer time since last TP was associated with lower expired CO ($\beta = -0.43$, $SD = 0.03$, $p < 0.0001$). **Conclusion:** Thirty-eight percent of smokers with SMI reported that they smoked either cigars or loose tobacco, which is higher than previously reported. Smokers with SMI who smoked only mini cigars had higher CO levels than those who smoked only cigarettes. Higher CO levels associated with mini cigars potentially increase health risk over and above smoking cigarettes alone, contributing to the higher rates of cardiovascular disease that exists in this population.

FUNDING: Federal

POS2-162

EVALUATING THE POPULATION IMPACT FROM THE INTRODUCTION OF A NOVEL ORAL TOBACCO- DERIVED NICOTINE PRODUCT IN THE US

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Computational modeling can inform FDA in evaluating evidence of the population impact with the market authorization of new tobacco products in the US. We present an agent-based model (ABM) to inform the population impact of introducing novel oral tobacco derived nicotine products (NP). The ABM allows prediction of changes in tobacco use prevalence and all-cause mortality by assessing the difference between a Base Case (cigarettes and novel smokeless tobacco (ST) products) and a Modified Case (NP added to the Base Case). We define novel ST products as dissolvable and snus tobacco products. Base Case transition probabilities for novel ST products were estimated from an analysis of Wave 1 and Wave 2 data from the Population Assessment of Tobacco and Health study. The NP transition probabilities (cessation, switching and future intentions to use NP) were estimated from an Actual Use Study (AUS) at the end of 6 weeks of product use, and were adjusted to reflect the US population. The AUS

included 783 adult smokers who expressed intent to use the NP. The excess relative risk (ERR) compared to cigarettes was estimated at 5% based on a multi-criteria decision analysis model developed by an international expert panel (Nutt et al 2014). Dual use of NP and cigarettes was assigned the same ERR as cigarette smoking. Extremely stringent criteria were applied to estimate product adoption by only considering those adult smokers in the AUS with the highest intentions to use (i.e., respondents who only selected "Strongly Agree" on a six-point scale, ranging from "Strongly Disagree" (1) to "Strongly Agree" (6)) and selected "Yes" to future purchase intentions. With market authorization of the NP, we demonstrate a net benefit to the population of ~ 19,000 premature deaths prevented with a reduction in cigarette smoking prevalence by 2060. Sensitivity analysis, utilizing moderate to high intentions to use the NP (i.e., respondents "Somewhat Disagree" to "Strongly Agree") resulted in an estimate of ~146,000 premature deaths prevented. Limitations of model predictions should be taken into consideration when drawing inferences from these results.

FUNDING: Tobacco Industry

POS2-163

DISCUSSIONS BETWEEN HEALTH PROFESSIONALS AND SMOKERS ABOUT E-CIGARETTES: RESULTS FROM THE 2016 FOUR COUNTRY SMOKING AND VAPING SURVEY

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Significance: E-cigarettes (ECs) have become a popular method for smoking cessation; however, debate exists on whether health professionals (HPs) should advise smokers to use ECs. This study included data from smokers in four countries with varying regulations governing EC sales, and examined: (1) the prevalence of: (i) HP advice to quit smoking, (ii) discussions about ECs, and (iii) the recommendation to use ECs; (2) who initiated EC discussions; (3) the type of HP advice received about ECs; and (4) correlates of receiving advice about ECs. **Methods:** Data come from Wave 1 (2016) of the Four Country Smoking and Vaping Survey, which includes nationally representative samples of adult (≥ 18) smokers from the US (n=1,501), England (n=2,105), Australia (n=1,038), and Canada (n=1,922). Participants eligible for analysis had visited a HP in the last year. **Results:** Among all smokers who visited a HP in the last year, 47.5% received advice to quit smoking, 6.8% reported discussing ECs, and 2.1% of smokers were recommended to use an EC (36.1% of those who had a discussion). A lower proportion of Australian smokers discussed ECs with a HP (4.3%) compared to their counterparts in the US (8.8%, $p=0.0004$), Canada (7.8%, $p=0.002$), and England (6.2%, $p=0.07$). Among those who had a discussion, there were no differences between countries regarding who initiated the discussion, or HP recommendations to use ECs. Discussion and EC recommendation were more common among smokers who were: younger, more highly educated, advised to quit smoking, more frequent EC users, positive about ECs, and believed that the public approved of vaping. **Discussion:** Discussions between smokers and a HP about both quitting smoking and the possible role of ECs in quitting smoking were infrequent in the four countries. This may represent a lost opportunity for encouraging quitting smoking, especially among smokers who have not been successful using other cessation strategies. Some country differences were evident, particularly in Australia, which has the most strict EC regulatory environment, and where HPs were less likely to discuss and endorse ECs.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity



SRNT

POS2-164

MONITORING ELECTRONIC CIGARETTE USE AMONG COLLEGE STUDENTS AT FIVE TEXAS UNIVERSITIES: A FOUR-YEAR TREND ANALYSIS

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Significance: The introduction of new Electronic Nicotine Delivery Systems (ENDS), JUUL, have attracted national attention from public health professionals, policy makers, and the media in the last year. ENDS use has become a popular culture phenomenon and continues to be an increasing public health concern. The purpose of this repeated cross-sectional study was to monitor the current use rates of ENDS and cigarette use among a vulnerable demographic, college students, over a four-year period (2015-2018). JUUL was included in 2018. **Method:** Participants were 9,598 college students, aged 18-29 (M=21.1, SD=2.72, 75.7% female; 45.6% non-Hispanic white, 27.2% Hispanic, 17.4% non-Hispanic black, and 5.1% non-Hispanic Asian) attending one of five colleges in Texas in Spring 2015, Spring 2016, Spring 2017 and Spring 2018. The outcomes, current ENDS use and cigarette smoking, were measured by students' response to two items asking if they had used ENDS or cigarettes at least once in the last 30-days. Current ENDS use, and cigarette smoking rates were analyzed to find trend significance over the four yearly points, from 2015-2018, using SPSS. **Results:** Overall, current ENDS use increased over time with a striking increase from 2017-2018, whereas current cigarette use stayed stable. Current ENDS use rate were 2015: 8.1%, 2016: 8.1%, 2017: 6.9%, and 2018: 12.8%. Current cigarette use remained relatively stable from 9.9% in 2015 to 9.8% in 2018 with insignificant fluctuation over four years. Current ENDS use increased significantly from 8.1% in 2015 to 12.8% in 2018 ($p < .05$). However, changes in current ENDS use rates from 2015-2017 each year were not statistically significant ($p > .05$). The data also suggest that non-Hispanic white participants were statistically more likely to be current ENDS users than non-Hispanic black participants ($p < .01$); male participants were statistically more likely to be current ENDS users than female participants ($p < .01$). These findings not only extend existing research by monitoring use trends of ENDS products, but also suggest that inclusion of JUUL in 2018 may explain the significant increase in ENDS use found in the data.

FUNDING: State; Academic Institution

POS2-165

STATE-SPECIFIC CESSATION BEHAVIORS AMONG ADULT CIGARETTE SMOKERS — UNITED STATES, 2014-2015

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Significance: Quitting smoking is one of the most important steps cigarette smokers can take to improve their health. This study assessed state-specific smoking cessation behaviors among U.S. cigarette smokers aged 18 years or older. **Methods:** Data came from the 2014-2015 Tobacco Use Supplement to the Current Population Survey (TUS-CPS), a cross-sectional, household-based survey of noninstitutionalized U.S. adults in the 50 U.S. states and District of Columbia (DC). The TUS-CPS was conducted during July 2014, January 2015, and May 2015 (N=163,920 respondents; average self-response rate: 54.2%). Current smokers were defined as those who had smoked at least 100 cigarettes during their lifetime and were currently smoking every day or some days. Former smokers were those who had smoked at least 100 cigarettes during their lifetime but were currently not smoking at all. Outcomes examined were the prevalence of cigarette smokers who: were interested in quitting smoking; made a quit attempt in the past year; recently quit smoking; and received past-year quit advice from a medical doctor. Weighted point estimates and 95% confidence intervals (CIs) were calculated for all U.S. states and DC. **Results:** At least two-thirds of current adult cigarette smokers in all states expressed some interest in quitting; prevalence ranged from 68.9% (Kentucky) to 85.7% (Connecticut). The prevalence of making a past-year quit attempt ranged from 42.7% (Delaware) to 62.1% (Alaska), whereas the prevalence of former smokers who quit smoking for at least 6 months within the past year ranged from 3.9% (West Virginia) to 11.1% (DC). Finally, the prevalence of current or former smokers who received quit advice from a medical doctor ranged from 59.4% (Nevada) to 81.7% (Wisconsin). **Conclusions:** The prevalence of interest in quitting, past-year quit attempts, recent successful cessation, and receipt of quit advice from a doctor varied

substantially by state during 2014-2015. These findings underscore the importance of comprehensive state tobacco control programs and barrier-free, proactively promoted access to cessation treatments to help smokers quit successfully.

FUNDING: Federal

POS2-166

A QUALITATIVE EXPLORATION OF TOBACCO RETAILERS' SUITABILITY TO SELL ELECTRONIC NICOTINE DELIVERY SYSTEMS (ENDS) AMID LEGISLATIVE CHANGE IN NEW ZEALAND

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Significance: In 2017, the New Zealand Government signalled their intent to permit the sale of ENDS, and allow ENDS point-of-sale promotions, with legislative change slated for 2018. This action provided a unique opportunity to examine tobacco retailers' response to these proposed changes in order to assess their likely suitability as ENDS retailers. **Methods:** Using in-depth interviews with 18 owners/managers of tobacco retail outlets prior to the legislative change, we explored tobacco retailers' knowledge of ENDS products, attitudes towards selling tobacco and ENDS, perceptions of the relative risks and benefits of these products, capacity and willingness to support ENDS users to quit smoking, and views of the proposed legislation. **Results:** Tobacco retailers generally had poor knowledge of ENDS products, misconceptions about their harm relative to tobacco, and provided no or inappropriate advice to customers. While some had strong attitudes for or against selling ENDS, most indicated that that their decision would be driven by demand, and of limited influence to their business. In contrast, they typically perceived tobacco as central to business because of higher turnover, ancillary sales and rebates. Retailers generally felt that, for consumers, cost-saving was the main benefit of using ENDS compared to tobacco, while relatively few saw it as a smoking cessation tool. Consequently, the capacity of tobacco retailers to support ENDS users in smoking cessation attempts appeared limited. In terms of the proposed legislative changes, retailers typically supported the legalization of ENDS, though some had concerns about ENDS promotions. **Conclusions:** Our findings suggest that allowing any type of outlet to stock ENDS alongside tobacco may not be in the users' best interests. Retailers will continue to prioritize selling tobacco over ENDS because it is incentivized through rebates and repeat custom, whereas ENDS is not. Further, ENDS training for existing tobacco retailers is not feasible as the rapidly evolving technology requires expert advice, and the high number of outlets is prohibitive. Restricting ENDS sales to specialist outlets may be the best way to support smoking cessation.

FUNDING: Academic Institution

POS2-168

E-CIGARETTE PRODUCT CHARACTERISTICS AND FREQUENCY OF SMOKING AMONG YOUNG ADULTS

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SIGNIFICANCE: Previous research suggests that e-cigarette use is strongly associated with cigarette initiation, including the frequency and heaviness of cigarette smoking. However, the impact of e-cigarette device characteristics, such as type of device (vape pen vs. mod), flavor (sweet vs. tobacco), and use of nicotine (yes vs. no) on cigarette smoking frequency is not yet known. **METHODS:** Participants in the Southern California Children's Health Study completed questionnaires in 2016 (Wave 2 [W2]) and 2017 (W3). The sample was restricted to participants who used e-cigarettes in the past 30 days at W2 (N=139). Generalized negative binomial models were used to evaluate the association between each device characteristic at W2 and (a) frequency of cigarette smoking at W3 (number of cigarettes smoked in the past 30 days), and (b) nicotine dependence, after adjustment for gender, race/ethnicity, parental education, and log-transformed number of cigarettes smoked in the past 30 days at W2. Interaction models were used to evaluate whether associations differed by W2 cigarette smoking status (never vs. prior vs. past 30-day). **RESULTS:** Participants who used mods smoked about 20.6 cigarettes in the past 30 days at W3, compared to 1.25 cigarettes for those using vape



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pens (rate ratio [RR]=7.15; 95%CI: [1.54, 33.3]). The strongest effects of device type were observed for current cigarette smokers, with an 11-fold increase in the number of cigarettes smoked at W3 ([RR]=11.6; 95%CI: [2.67, 50.7]). There were no statistically significant differences in W3 cigarette smoking associated with e-cigarette flavor or nicotine level (P>0.05). Participants who used mods at W2 had a greater likelihood of reporting symptoms of dependence at W3; however, sample sizes were small and the estimates lacked precision. CONCLUSION: Use of mods (vs. vape pens) was strongly, positively associated with the number of cigarettes smoked approximately 1 year later, particularly among current smokers at W2. Contrary to some hypotheses, in this study of young adults, the use of more efficient devices among smokers increased-rather than reduced-the number of cigarettes smoked.

FUNDING: Federal

POS2-169

PREVALENCE AND CORRELATES OF CIGARETTE AND ALTERNATIVE TOBACCO PRODUCT USE AMONG HOMELESS YOUTH IN LOS ANGELES COUNTY

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Significance: Most unaccompanied homeless youth smoke cigarettes, but little is known about their use of alternative tobacco products (ATPs) such as e-cigarettes and little cigars/cigarillos (LCCs). This study examines past month use of different tobacco products among homeless youth, including whether use is associated with demographic and homelessness characteristics, social factors, product-related cognitions, having a substance use disorder, and screening positive for depression. **Methods:** We surveyed a probability sample of N=469 unaccompanied homeless youth (mean age=22; 69% male) who had used any type of tobacco product (including an electronic nicotine delivery device) at least once in the past 30 days. Youth were sampled from 12 service sites (e.g., shelters, drop-in centers) and 13 street sites in diverse regions of Los Angeles County. **Results:** Nearly all (91%) respondents reported smoking conventional cigarettes in the past month. The most commonly used ATP was natural cigarettes (58%), followed by LCCs (41%), cigars (34%), e-cigarettes or personal vaporizers (32%), hookah (13%), and chewing tobacco (7%). In multivariable models, correlates of past month use differed across these products, but included age, sexual orientation, and race/ethnicity; homelessness severity; depression; exposure to other persons who used the product; and product-related cognitions (perceived relative access, cost, and harm of the product compared to cigarettes). Models did not show associations with gender, past month income, perceived peer prevalence of use, or having a substance use disorder. **Conclusions:** Among young homeless tobacco users, conventional cigarettes are by far the most widely used product. However, the use of certain ATPs (particularly, natural cigarettes, LCCs, cigars, and e-cigarettes) is common as well. Results suggest that certain subgroups of homeless youth may be particularly vulnerable to ATP use, and efforts to reduce the use of ATPs in this population should include a focus on exposure to others using ATPs and product-related cognitions (e.g., relative cost, harm). Funding: National Cancer Institute Grant #R01CA204004.

FUNDING: Federal

POS2-170

SOCIODEMOGRAPHIC CHARACTERISTICS OF HEAT NOT BURN PRODUCT USERS COMPARED WITH CIGARETTE SMOKERS; FIRST YEAR RESULTS OF A REPEATED CROSS SECTIONAL SURVEY IN JAPAN

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Background. A number of potential reduced-risk tobacco products (RRP) have emerged in the last 10 years as part of a tobacco harm reduction strategy to improve public health and lower the individual risk of smoking-related diseases. RRP is the term that Philip Morris International (PMI) uses to refer to products that present, are likely to present, or have the potential to present less risk of harm to smokers who switch to these products versus continued smoking. PMI has a range of RRP in various stages of development, scientific assessment, and commercialization. Because PMI's RRP do not burn tobacco, they produce far lower quantities of harmful and potentially harmful compounds than found in cigarette smoke. This report examines the sociodemographic characteristics

of current users of a new potential RRP (PMI's Tobacco Heating System, commercialized as IQOS®) in comparison with those of cigarette smokers. **Methods.** Here we present annual data of a repeated cross-sectional survey conducted in a representative sample of the Japanese adult general population. **Results.** Out of the total sample of 4,878 participants, 86 (1.8% [95%CI: 1.4%-2.2%]) were using IQOS, and 787 (16.1% [15.1%-17.2%]) were smoking cigarettes. 81.4% [71.5%-89.0%] of IQOS users and 75.9% [72.7%-78.9%] of cigarette smokers were male. IQOS users were 39.9 years old [37.4-42.4] on average, compared with an average age of 48.7 years [47.6-49.8] in cigarette smokers. 36% in both samples were blue-collar employees [95%CI for IQOS: 25.9%-47.2%; for smokers: 32.6%-39.5%], 33.7% [23.8%-44.8%] of IQOS users and 15.6% [13.1%-18.4%] of smokers were clerical workers, and 1.2% [0.0%-6.4%] of IQOS users and 15.4% [12.9%-18.1%] of smokers were retired/unemployed. 43.0% [32.3%-54.1%] of IQOS users and 34.7% [31.3%-38.1%] of smokers had completed higher education. **Conclusions.** Findings showed that IQOS users differed from cigarette smokers in certain sociodemographic characteristics; they were younger, a greater number had completed higher education, and a smaller number were unemployed/retired. Findings that smokers who switched to a novel heat-not-burn tobacco product have a different sociodemographic profile compared to those still smoking can give insight into the potential factors associated with using and switching to a potential reduced-risk product and facilitating tobacco harm reduction.

FUNDING: Tobacco Industry

POS2-171

IMPROVING TRANSLATIONS OF THE WISDM-68 AND NDSS USING COGNITIVE INTERVIEWING

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Significance: Studies have shown that proxies of physical dependence (e.g., number of cigarettes per day, time to first cigarette of the day) are poor predictors of cessation among Latino smokers. There is a need for investigations on the relevance of non-physical aspects of tobacco dependence and motives for smoking among Latinos. Research among Spanish-speaking smokers is hampered by a lack of psychometrically sound multidimensional measures of tobacco dependence. The current study reports the results of formative research conducted in a larger effort to improve the psychometric properties of Spanish translations of the NDSS and WISDM-68. **Methods:** Items of the Spanish-language WISDM-68 and NDSS were subjected to 4-5 cognitive interviews with Spanish-speaking Mexican-origin smokers to gain in-depth information on comprehension, appropriateness, and relevance of item content. Individual item feedback was reviewed and subjected to a content analysis that characterized the nature of participant feedback. Forty-six items were revised and re-tested in a second round of interviews. Results from the first round of interviews and item revisions were reviewed by independent content experts. **Results:** Twenty-two out of 87 items demonstrated comprehension problems, and 65 out of 87 items elicited at least 1 problem report. Content analysis of reported problems revealed that the most commonly identified problems were "translation changed item intent" (19), and "unrealistic" item content (13), and "social desirability concern" (12), and "unclear wording" (11). Reports of common first-round problems among the re-tested items were substantially lower in round two (19 vs. 0, 8 vs. 1, 10 vs. 1, and 11 vs. 4, respectively). **Conclusions:** In combination with standard translation procedures, cognitive interviewing with the priority population is a useful method for ensuring comprehensible and relevant item content. This formative study lays the groundwork for more valid and culturally appropriate assessments of tobacco dependence and motives for smoking in Spanish. To that end, this revised set of WISDM-68 and NDSS items will be psychometrically evaluated in the next phase of the project.

FUNDING: Federal

POS2-172

ALTERNATIVE FORMS OF TOBACCO USE AMONG VETERANS: A DESCRIPTIVE STUDY AT THE ROCKY MOUNTAIN REGIONAL VA MEDICAL CENTER

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Background and significance Tobacco use remains the leading cause of morbidity and mortality in the United States. Even though the prevalence of cigarette smoking has



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decreased over the past several decades, other forms of smoking tobacco such as water pipe and vaping are on the rise. In the past decade, prevalence of alternative tobacco products range between 14.1% to 40% among the general population. Alternative tobacco products have similar health hazards as those of cigarettes. Awareness of those hazards is less known by the public. The current literature on non-cigarette tobacco use among Veterans is limited. The purpose of this current study is to assess the prevalence of alternative tobacco products use among Veterans. This is the first project to investigate the use of such products among Veterans, as most of the prior work conducted focused heavily on cigarettes. The ultimate goal would be to create educational awareness for both Veterans and the community about the health hazards of alternative forms of tobacco products. Method: Veterans from the Rocky Mountain Regional VA Medical Center were invited to participate in a survey that included demographic and tobacco use questions. The questions were adapted from the CDC Behavioral Risk Factor Surveillance System (BRFSS). The participants were approached at the waiting areas in the Rocky Mountain Regional VA Medical Center, primary care outpatient clinics. Data collection started in November 2018, and is still ongoing till desired sample size is achieved. Preliminary Results: A total of 137 Veterans completed the survey. The majority of the participants are males compared to females (87.4% vs 11.9%), with some college education (48.5%). The majority of the sample is White (70.6%), with average age of 58 years. Cigarette use remains to be the most prevalent form of tobacco that Veterans use. Daily cigarette use is 29.2 %, with 41.2 % are current cigarette smokers. The prevalence of "ever vaping" is 16.1% and "ever hookah use" is 13.1% compared to "current vaping" (2.9%) and "current hookah use" (1.5%) Conclusion: The use of alternative forms of tobacco products among Veterans is similar to that of the general population. This problem is not addressed among Veterans. Creating educational awareness about alternative forms of tobacco products and their associated health risks is among the end goals of this current study.

POS2-173

THE EFFECTIVENESS OF RELIGIOUS MESSAGES ON CIGARETTE HEALTH WARNING LABELS IN INDONESIA

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SIGNIFICANCE: Indonesia has the third largest number of smokers and the largest population of Muslims in the world. The influence of religion on the country's political, economic and cultural life is significant. We examined the effectiveness of religious messages on health warning labels (HWLs) among Muslims in Indonesia. **METHOD:** Participants were recruited from April 28th to May 2nd 2018 in Surabaya, Indonesia. Three different health warning labels (HWLs) with religious messages were developed; three nonreligious HWLs were also developed using the same graphical images and themes (suicide, secondhand smoke (SHS) and gangrene). Quotas were utilized for smoking status (80% smokers, 20% nonsmokers), and sex (80% male, 20% female). All participants rated each HWL on a scale of 1 to 10 (1="not at all"; 10="extremely") for credibility, making them concerned about smoking, and motivating them to quit smoking.

RESULTS: Of the 817 participants, 79% were male, 100% were Muslim, 52% were 18-24 years old, and 79% were daily smokers. The SHS themed nonreligious HWL had highest mean rating score with regard to credibility and feeling more concerned about smoking (8.0 and 6.8, respectively); the gangrene themed religious HWL had the highest rating score regarding motivating people to quit smoking (6.7). The SHS themed nonreligious HWL was rated higher than the SHS themed religious HWL with regard to credibility ($p<0.01$), making people more concerned about smoking ($p=0.01$), and motivating people to quit smoking ($p<0.01$). The suicide theme nonreligious HWL was more credible than the religious HWL ($p<0.01$). There was no statistically significant difference between religious suicide and gangrene themed HWLs and nonreligious suicide and gangrene HWLs with regard to feeling more concerned about smoking and motivating people to quit smoking, and between religious and nonreligious gangrene themed HWL for credibility ($p>0.05$). **CONCLUSION:** This is the first study to examine the effectiveness of religious messages on HWLs. The suicide and gangrene themed religious HWLs were as effective as nonreligious HWLs regarding making people more concerned about smoking, and motivating them to quit. Religious messages on HWLs could be considered in countries where religious norms play a large role.

FUNDING: Nonprofit grant funding entity

POS2-174

SOCIOECONOMIC DIFFERENCES IN MOTIVATION TO STOP USING E-CIGARETTES AND ATTEMPTS TO DO SO

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Significance: Little is known about the process of giving up e-cigarettes (EC), or whether it is influenced by socio-economic factors. With smoking, smokers from lower socio-economic groups are less likely to successfully quit, and motivation to quit has been found to predict attempts to quit cigarette smoking, but not necessarily quit success. The aims of this study were to (1) describe socioeconomic characteristics of smokers, ex-smokers and recent ex-smokers who use EC, (2) assess whether socioeconomic characteristics are associated with motivation to stop using EC among these groups, and, (3) assess whether socioeconomic characteristics are associated with attempts to stop using EC. **Method:** Longitudinal survey in Great Britain of a general population sample of smokers and ex-smokers who also use EC, waves in 2016 (n = 994), and 2017 (n=400). First, chi squared tests assessed associations between smoking status and socioeconomic characteristics and EC status. Second, logistic regressions assessed associations between: socioeconomic characteristics, smoking status and motivation to stop using EC, and between socioeconomic characteristics and attempts to stop using EC. **Results:** (1) Daily EC use was more common in all three groups. Smokers and recent ex-smokers were more often motivated to stop EC, whereas motivation to stop EC was less common among ex-smokers. More Ex-smokers and recent ex-smokers had a high education. (2) Simple logistic regression suggested greater odds of being motivated to stop using EC for respondents with higher education, income, who had paid work in the last 12 months, who were recent ex-smokers and had strong urges to use EC. These findings, however, did not hold in the multiple logistic regressions. (3) The multivariate logistic model suggests that non-daily EC users and respondents who were motivated to stop using EC at baseline were more likely to have tried to stop using EC. Ex-smokers had smaller odds of trying to stop using EC. **Conclusion:** Smokers, Ex-smokers and Recent ex-smokers differed significantly in terms of education, ethnic group, age, vaping status, motivation to stop using EC, strength of urges to smoke and use EC. It appears that recent ex-smokers are more likely to be motivated to stop using EC. Additional work is needed to better understand if and how socioeconomic status is associated with the use of EC, especially after a smoking cessation attempt, and how this may affect health inequalities.

FUNDING: Federal

POS2-176

SMOKING AND VAPING IDENTITY IN YOUNG ADULT DUAL USERS

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Significance: Identity formed around a health behavior can influence that behavior as well susceptibility to industry marketing messages. Currently, there is no research on how vaper identity develops in relation to smoker identity or to e-cigarette use. This is a significant area of tobacco use research, as more than half of young adult smokers who initiate e-cigarette use do not quit smoking, instead becoming dual users. **Methods:** As part of a longitudinal study examining the prospective relationship between smoking/vaping identities and smoking/vaping behaviors, young adult established smokers (18-34 years old) who began using e-cigarettes within the last 6 months took an online survey in 2018 that examined vaping and smoking identity and behaviors. An exploratory factor analysis (EFA) of a smoking and vaping identity scale was conducted on a sample of smoking and vaping young adults, followed by a confirmatory factor analysis (CFA) with the study sample. Regression analysis was used to examine associations between smoking and vaping identities. **Results:** Using a sample of young adult smokers who vaped, the EFA of the smoker identity scale (n=317) revealed 2 factors: a core personal identity and a social identity. The parallel vaper identity scale showed a similar factor structure. The CFA, using a separate sample of young adult established cigarette users who began vaping within the past 6 months (n= 780, 64% female, 33% minority), revealed the same 2-factor structure for vaping/smoking identities. Mean scores on the vaping identity scale (19/40) approached the smoking identity score (23/40) despite recent vaping initiation. Smoking identity and vaping identity were significantly positively correlated. Frequency of use, length of use, and dependence were positively correlated with vaping identity. **Conclusion:** Cross-sectional associations between smoker and vaper identities and their parallel identity factor structures indicate similarities in how



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young adult smokers assimilate newly-acquired vaping behaviors within their concept of self. This could indicate an increased risk for continued dual use and may decrease the effectiveness of smoking cessation messages.

FUNDING: Federal

POS2-177

PREVALENCE & DETERMINANTS OF SMOKING AMONG STUDENTS AGED 13 TO 17 YEARS IN MYANMAR: RESULTS FROM THE 2016 MYANMAR GLOBAL STUDENT BASED SCHOOL HEALTH SURVEY

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Significance: The Myanmar Global Student-based School Health Survey was conducted in 2016 for the purpose of monitoring the prevalence of health risk behaviours & protective factors related to the leading causes of mortality & morbidity among students aged 13-17 years. It includes data on prevalence of tobacco use as well as information on attitude towards tobacco use. **Methods:** The 2016 Myanmar GSHS was a school-based survey of students in grades 7-10, which are typically attended by students aged 13-17. A two-stage cluster sample design was used to produce data representative of all students in grades 7-10 in Myanmar. The school response rate was 90%, the student response rate was 95%, and the overall response rate was 86%. A total of 2,838 students participated in the survey. **Results:** In **MYANMAR**, 6.6% of high school students used any form of smoking tobacco. (male 13.8% and female 0.5%). 8.0 % of high school students used smokeless tobacco. (male 14.9% and female 2.1%). 70.6% of high school students tried any smoking tobacco before age 14 years. 88.7% of high school students tried to stop any form of tobacco. 72.2% of high school students reported that people smoked in their presence. 43.1% of high school students had parents or guardians who used any form of smoking tobacco. 72.2% of high school students who were taught in any of their classes about the dangers of tobacco use. **Conclusion:** The study has shown that although there is a reduction in any form of smoking among students, there is an increase in use of smokeless tobacco. The same pattern had been reported with Myanmar Global Youth Tobacco Surveys (2011 and 2016). Currently, the national tobacco control programme is working in collaboration with school health programme. Hazards of tobacco has been incorporated into the school curriculum since 2002 and updated in 2016.

FUNDING: Nonprofit grant funding entity

POS2-178

CONSISTENCY OF MESSAGES ACROSS MEDIA SOURCES FOR TOBACCO AND ELECTRONIC CIGARETTES OVER 36 MONTHS: EVIDENCE FOR A PUBLIC COMMUNICATION ENVIRONMENT

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Significance: We explore the tobacco and e-cigarette (ecig) public communication environment (PCE), the idea that across mediated sources and over time, an individual is exposed to broadly consistent information. Effects of communication on tobacco and ecig behaviors can reflect immersion in the reinforcing media environment, not isolated exposure to specific messages from single sources. **Methods:** We undertook a large scale automated content analysis of tobacco and ecig media coverage between May 2014-June 2017, coding daily content from 7 media sources (50 major newspapers, the Associated Press (AP), 8 broadcast news outlets, 119 popular websites, Twitter, Facebook public 'fan pages' and YouTube). We coded overall product coverage and, where possible, specific themes (addiction, policy, youth, health effects, normative trends, individual norms), and valence towards product use. Reported correlations among sources are by week (N=163), adjusting for time. **Results:** Weekly tobacco texts averaged 300 from newspapers, 46 AP, 24 broadcast news, 399 websites, 313,000 tweets, 18,000 Facebook posts, and 19 highly viewed YouTube videos. For ecig texts, weekly coverage was less for 5 sources (23 newspaper, 7 AP, 2 broadcast news, 34 websites and 149,000 tweets) but more for Facebook (27,000) and YouTube (56). YouTube views and Facebook pages were largely uncorrelated with the other sources. Correlation of tobacco coverage among the other 5 sources was on average .28, although higher for health effects (.35) and pro-tobacco texts (.36), and lower for youth (.13). Ecig coverage was

more consistent: the overall average correlation was .31, with higher mean correlations for theme/valence coverage (.41) varying from .54 (policy) to .17 (pro-ecig). **Conclusions:** Weekly coverage for 5 sources was moderately correlated for both products and more strongly correlated for some themes and valence. The correlations were stronger for the less covered, novel ecig topic than for tobacco. Older media source coverage was associated with 2 newer sources (Twitter and websites) but not with Facebook or YouTube. In sum, there is evidence for the PCE, reinforcing tobacco and ecig media coverage.

FUNDING: Federal

POS2-179

CONCURRENT TOBACCO PRODUCT USE AND TOBACCO RELATED ADDICTION HARM AND RISK PERCEPTIONS AMONG HOMELESS ADULTS

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Significance: Concurrent tobacco product use is increasing among homeless adults, yet few studies have examined the association between tobacco use patterns and tobacco-related addiction, harm, and risk perceptions among this population. **Methods:** Using time-location sampling, we recruited a sample of unduplicated homeless adults who were current cigarette smokers from emergency homeless shelters, homeless referral programs, and community centers in San Francisco between December 2017 and July 2018. We administered a questionnaire to explore cigarette smoking behaviors, non-cigarette tobacco and nicotine product use, perceptions of tobacco-related addiction, tobacco-related harm, and risk of developing a smoking-related illness. We defined concurrent tobacco product use as use of any non-cigarette tobacco or nicotine product in the past 30 days among cigarette smokers. **Results:** 470 participants responded to the questionnaire. The mean age of participants was 49.9 years ($SD=11.6$), 31.1% identified as female, 46.3% identified as Black, and 29.9% identified as White. The majority (76.8%) of participants were daily cigarette smokers, and more than half (57.4%) smoked within 30 minutes of waking. Most participants (65.5%) reported concurrent use of other tobacco products, and among concurrent users, 74.0% reported using cigars, cigarillos, or little cigars, 29.8% reported using e-cigarettes, and 77.5% reported using blunts (marijuana rolled in a tobacco leaf) in the past 30 days. Compared to concurrent tobacco product users, cigarette only users were more likely to perceive cigars and blunts as not at all addictive ($p < 0.02$, respectively) and were more likely to perceive cigars ($p = 0.004$) and tobacco pipes ($p = 0.008$) as not at all harmful. Cigarette only and concurrent tobacco product users did not differ in their perception of risk of developing a smoking-related illness. **Conclusion:** Concurrent tobacco product use has become normative among homeless cigarette smokers. Concurrent users perceived higher levels of addiction and harm from some tobacco products compared to cigarette only smokers, highlighting the need to explore motivations for use of concurrent tobacco products among this population.

FUNDING: Federal

POS2-180

GENDER DIFFERENCES IN SMOKING PREVALENCE AND INTENSITY AMONG AN URBAN EMERGENCY DEPARTMENT SAMPLE: CONTRIBUTION OF SUBSTANCE USE, DEMOGRAPHIC AND COUPLE FACTORS

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SIGNIFICANCE. This study analyzes gender differences in smoking prevalence and intensity among a socioeconomically disadvantaged sample of Emergency Department (ED) patients, and assesses the role of substance use, demographic and couple factors. **METHODS.** Research assistants recruited non-acute patients to a community health study on substance use and intimate partner violence (IPV) at the ED of a Northern California Level I Emergency/Trauma Center. Eligibility criteria were: ages 18-50; English or Spanish speaker; and married, cohabiting, or in a past-year romantic relationship. Cross-sectional data were obtained via confidential interviews following informed consent. The Alameda Health System Institutional Review Board approved the study protocol. Current (past-30 day) smoking and mean cigarettes per day (cpd), past-year fre-



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quency of intoxication, days of marijuana, cocaine, and amphetamine use, and spouse/partner's smoking (yes/no) were measured. Gender-specific logistic and multinomial regression models for current smoking and smoking intensity (light: ≤ 5 cpd; moderate: 6-10 cpd; heavier: > 10 cpd) were estimated with data from 462 males and 531 females (50% Hispanic; 29% African American). Models included race/ethnicity, age, substance use, food insecurity, unemployment and past-year IPV involvement. **RESULTS:** Current smoking is higher among males than females (35.5% vs. 18.9%; Chi-Square=36.38; 1df; $p<0.001$); both rates are double gender-specific statewide prevalence. Intensity varies by gender (Chi-Square=42.49; 3df; $p<0.001$); among smokers, 68% of females vs. 54% of males are light smokers. Marijuana, cocaine and amphetamine use, intoxication frequency, food insecurity, and spouse/partner smoking are linked with male smoking/intensity. Marijuana and amphetamine use, unemployment, IPV, and spouse/partner smoking are associated with female smoking/intensity. **CONCLUSION:** The contribution of substance use, demographic and couple factors to current smoking and intensity varies by gender among a socioeconomically disadvantaged sample of ED patients. Clinicians should consider these factors when screening for smoking and formulating cessation treatment plans.

FUNDING: Federal

POS2-181

CHANGES IN CIGARETTE AND CIGAR SALES ASSOCIATED WITH STATEWIDE TOBACCO 21 POLICY IMPLEMENTATION IN HAWAII AND CALIFORNIA

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Significance: In 2016, two states began enforcing Tobacco 21 (T21) legislation that raised the minimum legal age (MLA) for tobacco sales from 18 to 21 years. Hawaii's (HI's) law, effective January 1, 2016, contains no military exemption, and military installations are complying with state law; California's (CA's) law, effective June 9, 2016, contains a military exemption, and military installations continue to follow federal laws that set the MLA at 18 years. We compared trends in sales of cigarettes and large cigars/cigarillos ("cigars") relative to T21 policy implementation in these states, along with U.S. sales trends. **Methods:** Unit sales of cigarettes and cigars in civilian food stores, and the proportion of product sales that were menthol or flavored ("flavored/menthol sales share"), were assessed, separately, for HI, CA, and the U.S. mainland using approximate monthly data from June 2012 to February 2017. Using segmented regression analyses, we estimated the change in average monthly sales from pre- and post-policy periods in each geography. **Results:** Although unit sales trends were not associated with the T21 policies, average monthly menthol cigarette sales share decreased significantly in HI from pre- to post-implementation periods (-0.8%, $p<.01$) while menthol sales share increased in CA (3.6%, $p<.01$) and the U.S. (1.7%, $p<.01$). HI and CA T21 policies had no detectable association with average flavored/menthol cigar sales share, but there was a significant increase in the flavored/menthol cigar sales share in the U.S. relative to HI's policy implementation date (7.1%, $p<.01$). **Conclusions:** Implementation of HI's T21 law was associated with a decrease in sales share of menthol cigarettes in the state. While average flavored/menthol sales share for cigars did not change in HI or CA following T21 policy implementation, this share increased nationally, suggesting that T21 policies may have attenuated an otherwise upward trend in these states by reducing flavored/menthol tobacco use among young adults.

FUNDING: Unfunded; Federal

POS2-182

ASSOCIATION BETWEEN USE OF E-CIGARETTES IN PUBLIC PLACES AND SOCIAL NORMS AMONG U.S. MIDDLE AND HIGH SCHOOL STUDENTS

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Significance: To date, 9 U.S. states and D.C. currently prohibit e-cigarette use in workplaces, restaurants, and bars. Moreover, even in places with specific prohibitions, use may continue to occur; 52.5% of U.S. adult e-cigarette users reported recent e-cigarette use in an area it was prohibited during 2017, including in restaurants, the movies, and in airports. We investigated associations between e-cigarette use in public places and tobacco-related social norms among youth who had never used tobacco products.

Methods: A national sample of 24,353 tobacco nonusers in U.S. 6th-12th grades was analyzed from the pooled 2016 and 2017 iterations of the National Youth Tobacco Survey. Multivariable logistic regression was used to measure associations between exposure to public episodes of combustible tobacco and e-cigarette use in places such as "school buildings, stores, restaurants, and sports arenas", and perceived tobacco-related social norms. Self-reported exposures to secondhand smoke (SHS) and secondhand aerosol (SHA) in public areas were used as proxies for exposure to public episodes of combustible tobacco and e-cigarette use, respectively. Data were weighted to be nationally representative. **Results:** Overall prevalence of public exposures to SHS and SHA among never tobacco users was 46.6% and 18.3%, respectively. SHA-only, but not SHS-only exposure in public places, was associated with increased odds of overestimating peer e-cigarette use (AOR=2.13; 95%CI=1.55-2.92) and decreased odds of perceiving e-cigarettes as harmful (AOR=0.64; 95%CI=0.52-0.80), compared to those exposed to neither emission. SHA-only exposure in public places was also independently associated with increased susceptibility to using e-cigarettes (AOR=2.25; 95%CI=1.81-2.80) and cigarettes (AOR=1.50; 95%CI=1.19-1.89). **Conclusions:** Exposure to SHA is associated with overestimating peer e-cigarette use and lower perceptions about the harms of e-cigarettes. Thus, e-cigarette use in public places may renormalize tobacco use. Policies prohibiting both e-cigarette and cigarette use in public places could protect public health and reinforce tobacco-free norms.



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POS3-2

DOES ELECTRONIC CIGARETTE HEATER RESISTANCE INFLUENCE PLASMA NICOTINE, SUBJECTIVE EFFECTS, AND PUFF TOPOGRAPHY?

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Significance: Electronic cigarette (ECIG) nicotine delivery and other effects can be influenced by device, liquid, and behavioral factors. An emerging class of ECIG models includes "sub-Ohm" devices that contain low resistance heaters (e.g., < 1 Ohm), much lower than those observed in conventional devices (e.g., ≥ 1.5 Ohm). However, little is known about the individual and combined effects of heater resistance and nicotine concentration on ECIG acute effects. **Methods:** Twelve experienced ECIG users completed four independent laboratory sessions that differed by heater resistance (0.5 or 1.5 Ohm) and liquid nicotine concentration (3 or 8 mg/ml). In each session, participants used a 4.5 V "Kanger SUBOX" with 3.5 ml ECIG liquid (30% PG: 70%VG) in a 10-puff directed (30 sec IPI) and 60-min ad libitum bout. Outcome measures include nicotine delivery, subjective experience, and puff topography. **Results:** After bout 1, mean (SD) plasma nicotine concentration, in ng/ml, was 5.2 (3.5) in the 3mg+1.5 Ohm combination, 7.1 (4.1) in the 3mg+0.5 Ohm combination, 6.4 (3.1) in the 8mg+1.5 Ohm combination, and 10.5 (6.6) in the 8mg+0.5 Ohm combination. Nicotine delivery was significantly greater in the 8mg+0.5 Ohm combination relative to the 3mg+1.5 Ohm and 8mg+1.5 Ohm combinations ($p < .05$). Abstinence symptoms (e.g., "craving") were suppressed similarly across combinations but product effects (e.g., "satisfy") were significantly higher in the 3mg+0.5 Ohm combination relative to the 8mg+1.5 Ohm combination ($p < .05$). Participants took significantly shorter puffs in the 8mg+1.5 Ohm combination (2.0s) relative to all other combinations ($p < .05$). **Conclusions:** Nicotine delivery was greatest when using 8 mg+0.5 Ohm combination relative to other resistance/nicotine combinations. Abstinence symptom suppression did not differ across combinations though participants reported higher satisfaction when using the 3mg+0.5 Ohm combination. Overall, participants took shorter puffs when using the 8mg+0.5 Ohm combination. Effective ECIG regulation likely will need to account for the individual and combined influence of ECIG device features and liquid nicotine concentration on ECIG acute effects.

FUNDING: Federal

POS3-3

STUDY PROTOCOL FOR HELPING PREGNANT SMOKERS QUIT A MULTI CENTRE RCT OF ELECTRONIC CIGARETTES AND NICOTINE PATCHES

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Significance:

Smoking in pregnancy remains an unresolved issue. A number of interventions have failed to show efficacy. Electronic Cigarettes (EC) are used with increasing frequency by smokers wishing to limit or stop smoking. EC allow self-titration of nicotine intake and apart from nicotine, they also provide a degree of sensory-motor replacement and enjoyment. They are therefore a promising new option, with a realistic chance of providing practical help to pregnant smokers.

Methods:

In January 2018, we began recruitment for a large, multi-centre RCT comparing the efficacy of usual care (behavioural support and nicotine patches) with the same behavioural support accompanied instead by EC. The trial will aim to recruit 1,140 pregnant smokers seeking help to quit smoking, across 16+ maternity services in the UK. Women are randomised (1:1) to receive either EC or 15mg nicotine patches (for up to 8 weeks), alongside weekly behavioural support calls for 6 weeks. The primary

outcome of the trial is to compare prolonged abstinence rates at end of pregnancy between the two arms. Secondary outcomes include: changes in smoke intake and in nicotine intake indexed by salivary anabasine and salivary cotinine levels; self-reported quit rates at 4 weeks and at end of pregnancy and 3 months post-partum; 7-day point prevalence abstinence at end of pregnancy and 3 months post-partum; and use of NRT and EC throughout pregnancy. The trial is also collecting safety data by means of birth and maternal outcomes, and the incidence and severity of adverse events. **Results:**

As of September 2018, we have recruited 32% (N=364) of the target sample size. We propose to describe the study protocol, report on recruitment progress, and discuss the challenges and implications of this pivotal trial. **Funding:** This study is funded by the National Institute of Health Research HTA Programme

FUNDING: State; Nonprofit grant funding entity

POS3-4

EVALUATING THE EFFECT OF ALCOHOL ON THE ABUSE POTENTIAL OF ELECTRONIC CIGARETTES: A HUMAN LABORATORY STUDY

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Significance: Electronic cigarettes (e-cigs), like tobacco cigarettes, share a high rate of co-use with alcohol. If alcohol increases the subjective rewarding effects of nicotine delivered through an e-cig, this could lead to a greater risk for initiation of e-cig use, continued use, and dependence among individuals who use e-cigs when drinking alcohol.

Methods: A within-subject human laboratory study among healthy adult e-cig users who moderately drank alcohol (N=8). There were 3 test days conditions, counterbalanced between individuals: (1) alcohol beverage + nicotine e-cig ("Nic+Alc"); (2) alcohol beverage + e-cig without nicotine ("Alc only"); and (3) placebo beverage + Nicotine e-cig ("Nic only"). On each test day participants drank an alcohol or placebo-alcohol beverage and 20 min later took 10 puffs (over 4.5 min) from a KangerTech EVOD e-cig (with or without nicotine). Blood samples and subjective effects were measured using a standard protocol. The E-liquid matched participants preferred flavor with 0 mg/ ml nicotine or preferred concentration (range 3-12 mg/ml). Alcohol was administered as vodka in juice with dose adjusted for weight and gender (0.40 g/kg for men, 0.34 g/kg for women). The placebo beverage consisted of juice with 1 ml of vodka floating on top to provide a similar taste/ smell without pharmacological effects.

Results: There was no difference between the "Nic+Alc" and the "Alc only" for serum ethanol at 30 min post beverage (mean=46 mg/dl, SD=12). Plasma nicotine levels were highly varied between participants despite using a standardized vaping protocol. Participants reported greater "liking of drug effects" 2 min post vaping on the "Nic+Alc" day compared to either the "Alc only" day ($p=0.024$) or the "Nic only" day ($p=0.025$). Participants also reported feeling more "stimulated" 2 min post vaping on the "Nic+Alc" day compared to either the "Alc only" day ($p=0.011$) or the "Nic only" day ($p=0.049$).

Conclusions: This pilot study suggests that vaping nicotine e-cigs after drinking alcohol has greater subjective rewarding effects. Research informs the design of future human laboratory studies examining the combined effects of alcohol and e-cigs.

FUNDING: Unfunded; Federal

POS3-5

GENE-CENTRIC ANALYSIS OF SERUM COTININE LEVELS IN AFRICAN AND EUROPEAN AMERICAN POPULATIONS

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To date, most genetic association studies of tobacco use have been conducted in European American subjects using the phenotype of smoking quantity (cigarettes per day). However, smoking quantity is a very imprecise measure of exposure to tobacco smoke constituents. Analyses of alternate phenotypes and populations may improve our understanding of tobacco addiction genetics. Cotinine is the major metabolite of nicotine, and measuring serum cotinine levels in smokers provides a more objective measure of nicotine dose than smoking quantity. Previous genetic association studies of serum cotinine have focused on individual genes. We conducted a genetic association study of the biomarker in African American (N=365) and European American (N=315) subjects from the Coronary Artery Risk Development in Young Adults study using a chip containing densely-spaced tag SNPs in ~2100 genes. We found that rs11187065, located in the non-coding region (intron 1) of insulin-degrading enzyme (IDE), was the



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most strongly associated SNP ($p=8.91 \times 10^{-6}$) in the African American cohort, whereas rs11763963, located on chromosome 7 outside of a gene transcript, was the most strongly associated SNP in European Americans ($p=1.53 \times 10^{-6}$). We then evaluated how the top variant association in each population performed in the other group. We found that the association of rs11187065 in IDE was also associated with the phenotype in European Americans ($p=0.044$). Our top SNP association in European Americans, rs11763963 was non-polymorphic in our African American sample. It has been previously shown that psychostimulant self-administration is reduced in animals with lower insulin because of interference with dopamine transmission in the brain reward centers. Our finding provides a platform for further investigation of this, or additional mechanisms, involving the relationship between insulin and self-administered nicotine dose.

FUNDING: Federal

POS3-6

Biomarkers of Exposure Decrease in Smokers Who Switch to Electronic Nicotine Delivery System Products

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Electronic nicotine delivery system (ENDS) products have the potential to provide nicotine to tobacco consumers while reducing exposure to combustion-related toxicants. This randomized, controlled in-clinic confinement study evaluated changes in biomarkers of exposure (BOE) to combustion-related toxicants after smokers switched from their usual brand (UB) of non-menthol cigarettes to one of three ENDS products (two cigalike products and one closed tank system) or to abstinence. The toxicants evaluated are identified by the FDA as harmful or potentially harmful constituents in tobacco smoke and recommended in the *Premarket Tobacco Product Applications for ENDS* (Draft Guidance, May 2016) for analysis in e-liquids and aerosols. Subjects smoked their UB cigarette *ad libitum* for two baseline days, then were randomized to one of three ENDS products with a similar flavor profile for a 5-day *ad libitum* use or to smoking abstinence. Twelve urinary and one blood BOE were assessed at both baseline (Day -1) and Day 5. The percent change of mean from baseline to Day 5 for each BOE was calculated for all four cohorts. Results showed an overall decrease in BOE across the three ENDS products and abstinence cohorts. Urinary and blood biomarker levels decreased in all cohorts (52-96% for aromatic amines, 73-96% for metabolites of mercapturic acids, 52-90% for tobacco-specific nitrosamines, 42-79% for 3-hydroxy-benzo[a]pyrene, and 51-55% for blood carboxyhemoglobin). Smaller changes (5-30% decrease) in total nicotine equivalents (nicotine and five primary metabolites) were observed from baseline to Day 5 for each of three ENDS product cohorts versus a >95% decrease in the abstinence cohort. Nicotine levels within the ENDS product cohorts remained relatively stable throughout the study. In conclusion, exposure to tobacco smoke toxicants, as measured by urinary and blood BOE, was significantly reduced in smokers switched to an ENDS product. These reductions in BOE were of similar magnitudes as observed in the abstinence cohort.

FUNDING: Tobacco Industry

POS3-7

Tolerability of Combination Dextromethorphan-Bupropion (AXS-05), a Potential New Drug for the Treatment of Tobacco Use

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Significance: All FDA approved smoking cessation medications have potential side effects that impact adherence and treatment outcomes. The nicotine patch can cause skin irritation, nausea and insomnia; bupropion can cause dry mouth and insomnia; and varenicline can cause nausea, insomnia, and mood changes. Duke University is collaborating with Axsome Therapeutics, Inc. to test a new drug for tobacco use, AXS-05, a combination of dextromethorphan and bupropion. Dextromethorphan is a well-tolerated, over-the-counter cough suppressant. After ingestion, dextromethorphan is rapidly metabolized via the hepatic CYP2D6 enzyme into dextrorphan. Unlike dextromethorphan, which easily crosses the blood-brain barrier, dextrorphan does not cross the blood-brain barrier and has little effect on nicotine dependence. Bupropion, a potent CYP2D6 enzyme inhibitor, blocks the metabolism of dextromethorphan so that

it remains unaltered in the blood and crosses the blood-brain barrier. Within the brain, dextromethorphan binds to multiple receptors active in nicotine dependence (NMDA, serotonin, norepinephrine, sigma 1-R, and $\alpha 3\beta 4$ nicotinic acetylcholine), and has been associated with decreased nicotine self-administration in nicotine-dependent rats. There is a possibility that the combination of bupropion and dextromethorphan will have acceptable tolerability and will impact tobacco use in humans. **Methods:** We describe results from a phase-2 randomized controlled trial of 60 adult daily smokers with 1:1 allocation to AXS-05 vs. bupropion with assessment over a 4-week period. **Results:** There was adherence to study medication on 96% of study days. The following side effects were reported: "more energy," "less appetite," "dry mouth," "cigarettes tasted badly" and "dizziness." Efficacy outcomes are described elsewhere. **Conclusion:** In a small study sample, a new drug, AXS-05 (dextromethorphan-bupropion) appeared to be well-tolerated in adult smokers.

FUNDING: Industry Source

POS3-8

Impulsivity as an Indicator of Differential Smoking Cessation Outcomes in Black and White Smokers

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Significance: Impulsivity is strongly associated with smoking behaviors and predictive of smoking cessation outcomes. Trait impulsivity has been linked to greater nicotine withdrawal symptoms, increased cravings, and a shorter period of abstinence following treatment. While the relationship between impulsivity and treatment success has been well-documented, few studies have examined whether the relationship may differ across race. The aim of this study was to determine if impulsivity moderates the relationship between smoking reduction and race (Black vs. White). **Methods:** Participants were 500 adult smokers (322 black, 327 male) assessed across a 12-week intervention and three follow up time points. Participants were recruited from local correction facilities and treated with bupropion. Impulsivity measures were taken prior to treatment and included a self-report instrument and a continuous performance task (CPT II). **Results:** Both impulsivity measures were highly correlated with smoking cessation outcomes and ANOVA procedures indicated that white smokers displayed significantly higher impulsivity than black smokers on both measures. Moderation analyses revealed that the number of commission errors made during the CPT II significantly moderated the relationship between race and smoking reduction, with higher levels impulsivity predicting worse cessation outcomes for white participants. Furthermore, participants who were not medication adherent throughout the study showed marginally more impulsivity on the CPT II. Impulsivity, however, did not moderate the relationship between race and medication adherence. **Conclusion:** These results further highlight the growing need for smoking cessation programs that account for racial differences in smoking habits and cessation success. It additionally illustrates that objective cognitive measures of impulsivity may be more accurate than self-report measures in predicting cessation outcomes. Further studies investigating how the mechanisms of impulsivity can differ across race may benefit the development of future treatment programs. This study was funded by NIH/NIDA (1R01CA141663-01).

FUNDING: Federal

POS3-9

Acute Vascular Effects of Electronic Hookah Smoking Versus Perceived Risk

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Significance: Smoking is a major cause of cardiovascular morbidity and mortality worldwide. More recently, alternative forms of tobacco products have emerged, including electronic (e-) cigarettes and e-hookah bowls, with claims that they are safer alternatives to traditional cigarettes. Unlike e-cigarettes, e-hookah bowls are placed on traditional waterpipes allowing the vapor-containing nicotine, propylene glycol, glycerin, and flavorings—to pass through a water-filled base, cooling the vapor, before being carried through the hose into the user's mouth. While cigarette smoking causes acute vascular dysfunction, the comparative effect of e-hookah is unknown. **Methods:** To test if the acute vascular effects outweigh perceived risk, we asked healthy young adults chronic hookah smokers to rate effects of e-hookah smoking on vascular health on a scale from -10 (extremely unhealthy) to +10 (extremely healthy). Then, we measured heart rate, blood pressure, brachial artery flow-mediated dilation (FMD; a measure of



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vascular endothelial function) and inflammatory biomarkers (C-reactive protein (CRP) and fibrinogen) before, and after a 30-minute session of e-hookah smoking. **Results:** The major findings are two-fold: 1) Subjects (n=9; 25±3 years; BMI 24.4±2.9 kg·m⁻² mean±SD) rated e-hookah as having no effect on vascular health (-1.3±1.5), while rating cigarettes as extremely harmful (-8.2±1.1); yet, e-hookah smoking increased heart rate (Δ heart rate: +9±4 beats·min⁻¹, p=0.046) blood pressure (Δ SBP: +14±3 mm Hg; Δ DBP: +9±2 mm Hg, both p<0.003) and decreased FMD from 6.67±0.88 to 5.11±0.68 %Δ, p < 0.001, indicating impaired endothelial function. While fibrinogen levels increased from 214.14±6.10 to 224.71±5.15, p =0.008, CRP did not change. **Conclusion:** These data document striking discordances between perceived risk and acute vascular effects of e-hookah smoking. In contrast to the belief that e-hookahs are safe, the data herein show that each e-hookah smoking session constitutes a potent vascular toxin acutely impairing endothelial function and increasing coagulation state. Future studies are needed to elucidate the long-term effects of e-hookah smoking on vascular health, which overtime could accelerate the development of cardiovascular diseases.

FUNDING: Federal; Academic Institution

POS3-10

INVESTIGATING TOBACCO WITHDRAWAL IN SMOKERS WITH OPIOID DEPENDENCE AND OTHER VULNERABILITIES

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Individuals with substance use, socioeconomic, psychiatric or other disadvantages bear a disproportionate burden of smoking and related consequences. Although disadvantaged smokers may respond favorably to reductions in the nicotine content of cigarettes with reductions in cigarette demand and other measures of addiction potential, their severity of tobacco withdrawal has not been characterized. We examined withdrawal severity following acute exposure to cigarettes with varying nicotine content and its association with the characteristics widely associated with vulnerability to smoking. Opioid-maintained (OM; n=65) vs. non opioid-maintained (NOM; n=135) smokers completed 5 sessions in this within-subjects lab study. In each session, they smoked a single research cigarette varying in nicotine content (0.4, 2.4, 5.2, 15.8 mg/g) or their usual brand (UB) cigarette under double-blind, acute abstinence conditions. Participants completed the Minnesota Tobacco Withdrawal Scale (MTWS) before and every 15 minutes for one hour following smoking. Our primary aim was to examine the association between OM status and tobacco withdrawal in response to cigarettes varying in nicotine content. Our secondary aim was to characterize the contribution of individual characteristics often indicative of smoking risk (e.g., opioid dependence, depression, education, gender, nicotine dependence) to withdrawal in multivariable models. Changes in MTWS severity did not vary as a function of OM status in response to UB or cigarettes varying in nicotine content (p>.05). In multivariable models, cigarette dose, time, depression, nicotine dependence, education level, but not OM, significantly predicted tobacco withdrawal severity across all doses (p<.05). OM does not appear to significantly influence tobacco withdrawal. Other vulnerabilities, such as depression and nicotine dependence among others, best account for tobacco withdrawal severity in response to a range of nicotine levels. Overall, under conditions of acute exposure, OM smokers responded favorably to reduced-nicotine content cigarettes.

FUNDING: Federal

POS3-11

ONCOLOGY-RELATED SMOKING TRIGGERS EXPERIENCED BY PATIENTS IN A COMMUNITY CANCER CENTER: A STUDY OF INDIVIDUAL DIFFERENCES

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SIGNIFICANCE: Cigarette smoking can seriously impede cancer treatment and leads to poorer treatment response. Patients diagnosed with cancer often have elevated levels of distress, leading many of these smokers to rely on cigarette use as a coping strategy and for mood regulation. Fortunately, smoking cessation has significant benefits even for those with cancer. However, there have not been many successful well-controlled studies assessing risk factors for smoking in oncology settings. The present study aimed

to expand upon current literature by exploring sample characteristics and individual differences in oncology-related triggers in this understudied population. **METHODS:** Data were collected from 649 adult smokers at a Mid-South community-based cancer center. A measure of oncology-related triggers was developed and subjected to factor analysis. Subsequent measure scores were then used as the dependent variable in a General Linear Model to determine whether scale scores varied by ethnicity, gender, smoking level, and whether the participant was a cancer survivor or currently in treatment. **RESULTS:** The measure of oncology-related triggers demonstrated strong internal consistency and produced a single factor. Analyses identified one main effect of gender, but no statistically significant main effects among ethnicity, smoking level, or oncology patient status. Participants experienced low levels of perceived oncology-related triggers overall, but women were more likely than men to report experiencing triggers when faced with oncology-related stressors. **CONCLUSIONS:** Women in the current study experienced more smoking triggers than men in response to cancer-related situations. This finding is consistent with previous literature that has found women are more likely than men to experience cigarette cravings during times of distress, indicating a need for increased coping skills and support. However, it was unclear whether the higher level of triggers reported by women in the present study actually led to more smoking behaviors as a result of experiencing these triggers. Future directions should include estimates of scale test-retest reliability and performance with other samples of oncology patients, as well as determining if the higher frequency of oncology-related triggers reported by women leads to increased cigarette consumption.

POS3-13

SWITCHING TO PROGRESSIVELY REDUCED NICOTINE CONTENT CIGARETTES IN SMOKERS WITH LOW SOCIOECONOMIC STATUS

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Significance: Reducing the nicotine content in cigarettes is an FDA proposed regulatory strategy that could render cigarettes minimally or non-addictive. To understand the outcomes of such a policy, we evaluated the effect of a gradual reduction of nicotine in cigarettes on behavior and exposure. **Methods:** Smokers with low socioeconomic status (SES) as defined as those with less than a college Bachelor's degree and not planning to quit in the next 6 months were recruited for the study. Smokers consumed their usual brand cigarettes for one week after which they switched to usual nicotine content (UNC) (nicotine content=11.6mg/cigarette) SPECTRUM cigarettes for two weeks. Smokers were then randomized to either a UNC or RNC (reduced nicotine content) treatment group for a total of 18 weeks. In five, three week increments smokers in the RNC group gradually stepped down their nicotine levels (nicotine content= 7.4mg/cigarette, 3.3mg/cigarette, 1.4mg/cigarette, 0.7mg/cigarette, and 0.2mg/cigarette). Biological samples and questionnaires were collected at each visit. **Results:** A total of 245 participants were randomized (123 participants to UNC and 122 to RNC treatment groups). The mean (SD) participant age was 44.8 (SD=11.4) years, 47.8% were male, and mean baseline cigarettes per day (CPD) was 19.7 (SD=9.3). Mean plasma cotinine levels and CPD were significantly different between the two treatment groups at the end of randomization (p<0.0001 and p=0.0273). Smokers in the RNC group decreased their CPD by 11% (-2.6 CPD), exhaled CO by 13% (-4.1 ppm), and cotinine by 55% (-147 ng/ml) from baseline. Biological compliance estimated by the change in cotinine/CPD ratio at baseline and the end of randomization for the RNC group was 42%. Withdrawal symptoms were not significantly different between groups (p=0.87), but dependence (p<0.001) and smoking urges (p=0.01) were significantly lower in the RNC group. **Conclusion:** Smokers in the RNC group had reduced nicotine and smoke exposure compared to the UNC group. Before implementing a reduced nicotine mandate, scientific evidence must show benefits to smokers, including smokers with low SES who are commonly more cigarette dependent.

FUNDING: Federal

POS3-14

EFFECT OF EARLY SMOKING ABSTINENCE ON A MARKER FOR NEUROINFLAMMATION

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Significance: Microglia are the main immune cells in the central nervous system and participate in neuroinflammation. When activated, microglia express increased levels of the translocator protein 18 kDa (TSPO), thereby making TSPO availability a marker for neuroinflammation. Using positron emission tomography (PET) scanning, our group recently demonstrated that smokers in the satiated state had 16.8% less binding of the radiotracer [¹¹C]DAA1106 (a radioligand for TSPO) in the brain than non-smokers. We sought to determine the effect of overnight smoking abstinence on [¹¹C]DAA1106 binding in the brain. **Methods:** Forty participants (22 smokers and 18 non-smokers) completed the study (at one of two sites) and had usable data, which included images from a dynamic [¹¹C]DAA1106 PET scanning session (with smokers having been abstinent for 17.9 ±2.3 h) and a blood sample for TSPO genotyping. Whole brain standardized uptake values (SUVs) were determined, and analysis of variance was performed, with group (overnight abstinent smoker vs. non-smoker), site, and TSPO genotype as factors, thereby controlling for site and genotype. **Results:** Overnight abstinent smokers had lower whole brain SUVs (by 15.5% and 17.0% for the two study sites) than non-smokers (ANCOVA, $P=0.004$). The groups did not significantly differ in injected radiotracer dose or body weight, which were used to calculate SUV. **Conclusion:** These results in overnight abstinent smokers are similar to those in satiated smokers, indicating that chronic cigarette smoking leads to global impairment of microglial activation which persists into early abstinence. Other explanations for study results, such as smoking leading to reduced numbers of microglia or smokers having more rapid metabolism of the radiotracer than non-smokers, are also possible.

FUNDING: Federal; State

POS3-15

EFFECTS OF CIGARETTE SMOKING, E-CIGARETTE VAPING AND SMOKING CESSATION ON VASCULAR BIOLOGY: A HUMAN RESEARCH STUDY

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Inhaled toxicants present in tobacco smoke accelerate and exacerbate inflammation and oxidative stress. Over time, these processes increase the risk of developing respiratory and cardiovascular diseases (CVD). Developing alternative tobacco or nicotine products that reduce harm and risk for smokers is one approach to address these health concerns. The electronic cigarette (e-cigarette) is proposed as a potential reduced-risk product; however, its impact requires in-depth investigations. The goal of this human research study is to examine the biological networks and signaling profiles that drive vascular dysregulation and are perturbed by smoking, reversible upon smoking cessation, and largely unknown with respect to e-cigarette usage. Circulating blood cells and biofluids were obtained from smokers, former smokers, and e-cigarette users and compared with those of never smokers (~160 subjects). Our assessment of smoke and e-vapor exposure integrates biomarkers of exposure (BoEx) and biomarkers of potential harm measured in biofluids as well as multi-omics analysis, such as lipidomics and proteomics in serum/plasma and transcriptomics in isolated populations of peripheral blood cells. Our initial results show large difference in levels of BoE between smokers and non-smokers as expected. For CVD markers, our results confirm that smokers exhibit significant changes such as increased homocysteine, C-reactive protein, white blood cell count, and platelet aggregation and decreased high-density lipoprotein cholesterol. In former smokers who quit for at least two years, these markers tend to normalize to levels close to those observed for never smokers. Data are under investigation for e-cigarette users. All of the data sets are being analyzed to produce predictive models that will be leveraged in future clinical research. Further analysis considering demographic and smoking history covariates complemented with large-scale "omics" data will enable identification of new mechanisms and markers of vascular dysregulation associated with smoking as well as a greater understanding of the impact of smoking cessation and e-cigarette vaping on them.

FUNDING: E-cigarette/Alternative nicotine products Industry; Tobacco Industry

POS3-16

E-CIGARETTE QUIT ATTEMPTS AMONG DUAL/POLY USERS OF TOBACCO

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Significance: We sought to understand whether e-cigarette users are attempting to quit using e-cigarettes and which formal and informal strategies they used. **Methods:** Data from the Population Assessment of Tobacco and Health (PATH) Public Use Wave 1 Adult Questionnaire were used and wave 1 sample weights were applied to all analyses. The initial sample consisted of 1356 current or past year adult e-cigarette users who also endorsed using one or more other tobacco products. **Results:** The weighted frequency of adults who attempted to quit e-cigarettes either by quitting completely or quitting by cutting down was 14.7%. Hispanic adults were almost twice as likely to attempt to quit e-cigarettes (25.2%) compared to non-Hispanic adults (13.2%; Rao-Scott $F(df_1=1, df_2=99)=12.574, p=.001$). Race (Rao-Scott $F(df_1=1.931, df_2=191.199)=13.795, p<.001$) and household income (Rao-Scott $F(df_1=3.646, df_2=360.997)=4.237, p=.003$) were significantly associated with e-cigarette quit attempts. Black adults were more likely to have made a quit attempt (28.6%) than White adults (12.3%) and those identifying as another race (14.7%). Adults with a household income less than \$10k were almost twice as likely to have made a quit attempt (24.3%) compared to all other groups (\$10-25k=12.5%; \$25-50k=15%; \$50-100k=11.4%; \$100k or more=14.6%). Being a quit attempt was not significantly related to gender or age. Of adult e-cigarette users who made a quit attempt in the past year, an estimated 23.8% relied on family and friends for support, and 9.6% used counseling (e.g., in-person, telephone). Of e-cigarette users who endorsed ever use of nicotine replacement therapy, an estimated 27.5% reported using it to help quit e-cigarettes during their last quit-attempt. Of e-cigarette users who endorsed ever use of FDA approved cessation medication, an estimated 25.5% reported using it to help quit e-cigarettes during their last quit-attempt. **Conclusion:** Preliminary analyses suggest that many e-cigarette users are trying to quit using e-cigarettes and that they are taking advantage of treatment options, including social support, psychosocial interventions, and pharmacological treatments.

FUNDING: Unfunded

POS3-18

LEVEL OF HEALTH LITERACY EXHIBITED BY PATIENTS IN A COMMUNITY CANCER CENTER: A STUDY OF INDIVIDUAL DIFFERENCES

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SIGNIFICANCE: Smoking cigarettes negatively impacts both cancer treatment and long-term health outcomes. Health literacy may be of particular importance for oncology patients when trying to instill change and encourage cessation. However, there is a lack of research in this population about level of smoking-related health literacy. **METHODS:** The present study aimed to add to the current literature by exploring individual differences in health literacy in an understudied oncology population. Data were collected from 649 adult smokers at a Mid-South community-based cancer center. A measure of smoking-related health literacy was developed and subjected to factor analysis. Subsequent measure scores were then used as the dependent variable in a General Linear Model to determine whether scale scores varied by ethnicity, gender, smoking level, and whether the participant was currently in treatment or survivorship. **RESULTS:** The measure demonstrated strong internal consistency and produced a single factor. Analyses identified two main effects of ethnicity and smoking level, but no differences among gender or oncology patient status. Caucasians were more likely than African Americans to experience high levels of health literacy in terms of smoking-related oncology outcomes. Light and intermittent smokers were more likely than heavy smokers to be health literate in terms of smoking-related oncology outcomes. **CONCLUSIONS:** Health literacy levels were high overall, indicating that participants are aware of the health consequences of smoking. However, they continued to smoke even though they realized that they were less likely to have successful treatment outcomes. These results may indicate the need for motivational enhancement strategies to increase motivation to quit among African Americans and heavier smokers. Future directions should include further assessment of psychometric properties for the smoking-related health literacy scale that was developed in this study, as well as evaluating the outcomes of motivational enhancement on this population.

POS3-19

A MULTICENTER, MULTIREGIONAL STUDY ON BIOLOGICAL AND FUNCTIONAL CHANGES IN HEALTHY ADULT SMOKERS DURING ONE YEAR OF CONTINUOUS SMOKING ABSTINENCE

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Background. The harm from smoking results mainly from long-term exposure to harmful and potentially harmful constituents (PHPC) in cigarette smoke generated by the combustion of tobacco. Smoking cessation (SC) is the most effective way to reduce the harm and risk of smoking-related diseases. In most SC studies, the main focus is on the rate of successful quitting for the SC approach/treatment tested; only limited information on multiple short- to long-term functional/biological changes following SC is available in the literature. The overall study aim was to assess, over a one-year period of continuous smoking abstinence, the reversibility of the harm caused by smoking by assessing changes in clinical risk endpoints (CRE) linked to the pathophysiological pathways underlying the development of smoking-related diseases. **Methods.** This was a multicenter (42 sites), multiregional (U.S., Europe, Japan) SC study in healthy adult smokers planning to quit smoking within the next 30 days who were asked to continuously abstain from smoking during a one-year period in an ambulatory setting. **Results.** The study enrolled 1184 subjects (50.1% male), with 30% having successfully quit smoking for one year. The study showed favorable changes in several CREs linked to cardiovascular diseases (CVD), as indicated by a decrease from baseline in WBC, 11-DTX-B2, 8-epi-PGF_{2α}, and sICAM-1; a slight decrease in homocysteine and fibrinogen; and a slight increase in HDL-C. For some other CREs associated with CVD (Apo A1 and B, LDL-C, hs-CRP, platelets, Albumin, and HbA_{1c}) and respiratory functions, no major changes from baseline were observed after one year of smoking abstinence. Levels of all the biomarkers of exposure to PHPCs, including COHb and Total NNAL, were substantially reduced, ranging from -54.5% to -97.9%. **Conclusions.** These results indicate that continuous abstinence from smoking for one year leads to a substantial reduction in exposure to PHPCs and favorable changes in multiple mechanistic pathways and biological functions, such as lipid metabolism, inflammation, or oxidative stress, that are likely to contribute to the reduction of risk of developing smoking-related diseases.

FUNDING: Tobacco Industry

POS3-20

THE EFFECT OF LOW SOCIOECONOMIC STATUS ON PARTICIPATION IN LUNG CANCER SCREENING

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Introduction: Approximately 15% of U.S. adults currently smoke and many are at risk of developing lung cancer. There is now evidence that lung cancer screening in high-risk smokers decreases the risk of dying from lung cancer. The procedure is recommended by the US Preventative Service Task Force for high-risk smokers and covered by Medicare. Smokers are disproportionately economically disadvantaged and often face substantial barriers to obtaining medical services. Thus far, little is known regarding the engagement of economically disadvantaged smokers in lung cancer screening services.

Methods: We report data from a multi-site trial designed to assess patient engagement in lung cancer screening, distress related to lung cancer screening, and perceptions of provider-patient communication during and after referral to lung cancer screening. Data was collected through phone-based interviews. **Results:** Data was collected on 264 high-risk smokers referred for lung cancer screening. Results show that among smokers who were referred to lung cancer screening, those who had an income of under \$10,000 per year scheduled a lung cancer screening CT 71% of the time, whereas individuals making \$10,000 or more scheduled a lung cancer screening CT 84% of the time ($X^2 = 3.94$; $p = 0.047$; sig.). **Discussion:** Results of this study indicate that low socioeconomic status may predict lower participation in lung cancer screening CT scans by patients referred for screening. We explore various factors that may account for this finding, including challenges in transportation, health literacy, provider trust, physical and psychiatric co-morbidities.

FUNDING: Federal

POS3-22

CREATING A REPOSITORY FOR THE ASSESSMENT OF TOBACCO-RELATED BEHAVIORAL OUTCOMES: A CASE EXAMPLE

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Background. To date, there is no established database/repository, which would enable researchers to identify and select measures developed to assess tobacco-related behavioral outcomes, to consult up-to-date documentation related to the measures of interest, including scoring or available translations, or to locate their copyright holder. This paper presents the development and implementation of such a knowledge base in 2016 by Mapi Research Trust for Philip Morris International (PMI). **Methods.** The structure of the PMI Repository is based on PROQOLID™'s, the Patient-Reported Outcome and Quality of Life Instruments Database, developed in 2002, to provide health care researchers with an accurate, up-to-date and centralized source of information on Clinical Outcome Assessments (Emery et al. HQLO 2005 Mar 8:3:12). In both databases, available online through the ePROVIDE platform, the information displayed for each outcome measure comprises more than 10 categories ranging from names of developers, information on concepts/domains investigated, psychometrics, scoring, available official translations, literature references, contact details, copyright notice, and conditions of use. In addition to the measure-related information, the PMI Repository contains a study folder, which compiles all PMI-sponsored studies (identified by protocol number) and link them to the instruments used as study endpoints. **Results.** To date, the PMI Repository includes 105 measures, with two-third focusing on tobacco behavior. As part of the ABOUT toolbox (Assessment of Behavioral OUTcomes related to Tobacco and nicotine products), all instruments developed by PMI (e.g., perceived risk, dependence, product experience, use history, and health and functioning), are stored and will be made available to the scientific community through PROQOLID™. **Conclusions.** This unique initiative enables PMI researchers 1) to assess, select and use up-to-date and official versions (original and translations) of instruments in a standardized environment, and to transfer them to the study operation team during the study set-up phase; and 2) to share their own instruments with other researchers.

FUNDING: Tobacco Industry

POS3-23

THE ASSOCIATION OF SOCIODEMOGRAPHIC FACTORS AND PERCEIVED BARRIERS TO EXERCISE AMONG PREGNANT SMOKERS

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Significance: Smoking during pregnancy is one of the most modifiable risks for adverse pregnancy outcomes. Most prenatal tobacco cessation programs lack efficacy for long term success and few consider the impact of sociodemographic factors. Exercise has been proposed as a cessation strategy due to its positive association with initiation of quit attempts and abstinence; however, pregnant women report intrapersonal variables such as fatigue, lack of time, and pregnancy discomforts as barriers to exercise. The purpose of this study was to evaluate the association of sociodemographic factors and perceived barriers to exercise among a sample of pregnant smokers. **Methods:** A multisite prospective study of pregnant smokers (conventional and/or electronic cigarette use) in the first trimester was conducted (N=171). Participants indicated agreement or disagreement to nine statements of perceived barriers to exercise including 'I don't have the time', 'I am not sure what to do', 'I feel too tired/I don't have enough energy', and 'I do not feel exercise is important'. **Results:** Participants with partners reported overall more barriers to exercise ($p=0.049$), and higher agreement with being 'too tired/not enough energy' and 'too many time restraints' to exercise compared to non-partnered participants ($p=.003$; 0.04 respectively). Compared to participants with at least a high school degree, those with less education indicate exercise is not important, and have a medical condition that prevents exercising ($p=0.02$; <0.0001). When considering the impact of employment, employed pregnant smokers perceived overall more barriers to exercise ($p=0.002$), and reported being 'too tired/not having enough energy' and 'lack of gym membership/exercise equipment' as barriers to exercise ($p=0.003$; 0.026) compared to those not employed. **Conclusions:** Implementing effective smoking cessation models in pregnant women is critical to the health of the mother, fetus, and child. Cessation interventions must consider variables such as partner status, education, and employment when addressing perceived barriers to exercise.

FUNDING: Federal



POS3-24

PSYCHOMETRIC VALIDATION OF THE ABOUT-DEPENDENCE: A FIT-FOR-PURPOSE INSTRUMENT TO ASSESS GLOBAL DEPENDENCE ON TOBACCO AND NICOTINE PRODUCTS

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Background. Past research focusing on cigarette smokers has supported the position that nicotine dependence is a primary driver of tobacco use behavior. However, there is a dearth of widely accepted self-report instruments to measure dependence in a directly comparable way across the growing range of tobacco and nicotine-containing products (TNP). As part of the ABOUT Toolbox (Assessment of Behavioral Outcomes related to Tobacco and nicotine products) initiative, we developed a new instrument following best-practice scale development guidelines. **Methods.** The content of the ABOUT-Dependence instrument was constructed based on information from literature review, expert opinion, and qualitative interviews with TNP users. A first-draft version of the items was field tested in a cross-sectional survey (n=2,434) to guide scale formation and establish psychometric properties (e.g., reliability, construct, and concurrent validity). For both qualitative and quantitative studies, the sampling frame included equal numbers of single tobacco product users (e.g., balanced across cigarettes, cigars, e-cigarettes, smokeless tobacco, and other TNP) and poly-users. **Results.** Psychometric evaluation of the first-draft version led to a 16 and 12-item versions of ABOUT-Dependence instrument consisting of three main sub-concepts: urgency to use (two items), attitudinal evaluation (7/5 items) and behavioral evaluation (7/5 items). Findings also supported the summation of items to form a subscale score for each of the multi-item domains. Validity of the new instrument was supported by correlations with existing dependence measures (e.g., Fagerström Test for Nicotine Dependence) and discrimination between heavy and light users, indicative of known groups validity. Intra-class correlations showed very good test-retest reliability. Differential item functioning analysis confirmed the stability of the instrument across single and poly-users, types of tobacco products, and key socio-demographics. **Conclusions.** The ABOUT-Dependence is a psychometrically sound instrument that may be used in clinical and population-based studies to assess dependence on the whole spectrum of TNP products and users.

FUNDING: Tobacco Industry

POS3-25

FEASIBILITY AND ACCEPTABILITY OF A TELEPHONE-BASED SMOKING CESSATION PROGRAM FOR AN INPATIENT SMI VETERAN SAMPLE

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Significance: Over 60% of adults with serious mental illness (SMI) smoke. Many with SMI are hospitalized during their illness; psychiatric hospitalization represents a window of opportunity in which to deliver smoking cessation (SC) services. Without continued SC services, most who are abstinent while hospitalized will resume smoking after discharge. This poster will review the feasibility and acceptability of *StayQuit*, a SC intervention for SMI smokers that begins with 2-3 brief SC counseling sessions in the hospital, followed by 13 telephone counseling sessions after discharge. **Methods:** Thirty Veterans with SMI (85.7% male; mean age=49 years) were recruited on the psychiatric unit of a VA Medical Center. Participants completed a baseline assessment, participated in *StayQuit*, and completed a post-treatment assessment of smoking and quit attempts during the study period. Participants completed a qualitative interview to offer their perceptions of *StayQuit*'s strengths, weaknesses, and barriers to participation. **Results:** The sample was 85.7% male with a mean age of 49 years (sd=13.7). Participants smoked an average of 15 cigarettes/day at baseline (sd=10.4). Most (89.3%) reported wanting to quit smoking in the next 6 months; fewer (64.3%) were planning to quit in the next 30 days. Overall, 77% of the sample (n=23) completed at least 2 inpatient counseling sessions. 50% of participants (n=15) completed 1 telephone counseling session and 36.7% (n=11) completed 2 or more. While only 6.7% (n=2) reported smoking abstinence at post-treatment, others reduced smoking or made attempts to quit. Qualitative interviews were examined using rapid thematic analysis. Themes included valuing the support provided by *StayQuit*, not wanting SC services when smoking, and difficulty engaging in *StayQuit*

without access to a telephone. **Conclusions:** Locating SC programs as part of inpatient psychiatric services is feasible. Implementing telephone SC counseling is not feasible as many hospitalized Veterans did not have access to telephones. Veterans with SMI found *StayQuit* acceptable. Experiencing a high degree of SMI symptoms should not exclude individuals from participating in SC services.

FUNDING: Federal

POS3-26

A QUALITATIVE EXAMINATION OF A TELEPHONE AND TECHNOLOGY FACILITATED TREATMENT FOR YOUNG ADULT VETERANS WITH POSTTRAUMATIC STRESS DISORDER

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SIGNIFICANCE: Recent generations of military veterans are at high risk of tobacco initiation during combat service. Young veterans, particularly those with posttraumatic stress disorder (PTSD), are at especially high risk of poor treatment engagement in traditional Veterans Affairs (VA) clinics. The purpose of this qualitative investigation was to examine the acceptability of a novel telephone- and technology-facilitated smoking cessation intervention designed for young veterans with PTSD. The treatment includes: (1) a manualized cognitive behavioral treatment intervention, adapted to be delivered via video visit or telephone; (2) Stay Quit Coach, a VA smoking cessation mobile application (app); and (3) CoVita iCO, a portable mobile phone-compatible carbon monoxide (CO) monitor. **METHODS:** We conducted a 45-minute focus group with veterans ages 18-50 who self-identified as current or former habitual cigarette smokers. Participants were asked to review two sample sessions from the manual. Topics explored included: perceived helpfulness of the manual; the potential role of mobile technology, including both the app and CO monitor; and strengths and weaknesses of telephone, video, and office visits. Sessions were transcribed and data were coded and associations analyzed between specific codes and identified emerging themes. **RESULTS:** Eight veterans, mean age 36.25 +/- 5.44 years, participated (4 current smokers and 4 former smokers). Three overarching themes were identified: (1) interventions should emphasize convenience and access to care; (2) treatment that is personalized to each veteran's needs is desirable; and (3) mobile technology could enhance treatment, but felt that technology alone could not replace counseling. Participants identified strengths and weaknesses of each counseling delivery method, and felt that personal preference of the veteran should determine which method is selected. **CONCLUSION:** Young veterans may benefit from innovative, engaging smoking cessation treatment strategies that are personalized and flexible. These data provide insights for how treatment can be modified for this high-risk population using novel delivery methods.

FUNDING: State

POS3-27

PROACTIVE TOBACCO CESSATION TREATMENT IN A BEHAVIORAL HEALTH HOME

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Introduction: The majority of people with serious mental illness (SMI) smoke. Tobacco use is rarely addressed in mental healthcare. Proactive treatment models provide outreach to smokers to offer connections to cessation treatment. Behavioral health homes provide comprehensive care management for patients with SMI and may be a good venue in which to offer proactive tobacco treatment. **Methods:** The current study tests the feasibility, acceptability, safety and preliminary efficacy of proactive tobacco treatment (vs. usual care). Patients in a behavioral health home who smoke were invited to a smoking cessation study. Participants were randomly assigned to Usual Care (UC; N=11) or Proactive Care (PC; N=9). All participants were called for an end of treatment follow-up call 3 months post-randomization. **Results:** Of 70 eligible smokers, 20 (29%; 55% female, 60% Caucasian) enrolled. All patients in PC were reached for an outreach call and enrolled in telephone counseling. Eighty-eight percent (N=8) of the PC patients requested medications and, of those, 75% (N=6) received them. PC patients rated the treatment program as highly acceptable ($M = 26.44/32$ [SD=4.93]), and experienced no adverse events or mental health symptom exacerbation during treatment. PC patients



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compared to UC patients reported greater reductions in cigarettes per day (68% vs. 31% reduction), more quit attempts (78% vs. 36% attempts), and more cessation medication (56% vs. 27% used medications) and cessation counseling utilization (100% vs 0% used counseling). Conclusions: Proactive outreach for tobacco cessation is feasible in a behavioral health home, acceptable to patients, and may reduce smoking heaviness and promote quit attempts.

FUNDING: Nonprofit grant funding entity

POS3-28

THE EFFECTS OF INSOMNIA ON SMOKING CESSATION

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SIGNIFICANCE The CDC indicates 16% of American adults smoked cigarettes last year. Of that population, 36% had psychiatric comorbidities such as PTSD, depression and anxiety. Individuals with psychiatric comorbidities such as these are more likely to smoke and less likely to quit than non-afflicted smokers. Medications such as varenicline and bupropion have been developed to help smokers quit, but can induce adverse effects such as aggression, vivid nightmares, and anxiety. These may end up exacerbating already existing psychiatric comorbidities, notably insomnia. **METHODS** The effects of insomnia on smoking cessation, along with specific drug treatment was evaluated at a major cancer research institution in a case-control study. Over 6000 patient records in *Epic* were analyzed on the abstinence of patients with insomnia over 9 months. Statistical significance was then compared between groups using a chi-squared test. **RESULTS** Patients with insomnia significantly did worse at quitting and staying quit than patients without insomnia across the 9 month period. Clinically suggestive results indicate that varenicline helped patients with insomnia quit at higher rates than those prescribed bupropion. **CONCLUSION** These results indicate that patients with insomnia are at a disadvantage compared with patients without insomnia, and that additional forms of treatment must be sought out in order to not leave this group of smokers behind.

FUNDING: Federal

POS3-29

SMOKERS IN PAIN ARE MORE LIKELY TO REPORT LIFETIME USE OF E-CIGARETTES AND OTHER NICOTINE/TOBACCO PRODUCTS

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Rates of cigarette smoking are substantially higher among individuals with co-occurring pain, but the relationship between pain status and poly use of nicotine/tobacco products has not been studied. Nicotine has been shown to confer acute analgesia, and smokers readily endorse the use of nicotine/tobacco to cope with pain. The goal of the current study was to test whether daily smokers who endorsed past two-week pain (vs. no past two-week pain) were more likely to have also used other nicotine/tobacco products. Participants ($N = 301$; 69% male) completed an online survey and were asked to report on ever use of e-cigarettes, chewing tobacco, snuff, snus, cigars, cigarillos, pipes, and hookah. Results indicated that individuals with co-occurring pain ($N = 70$) smoked a greater number of cigarettes per day ($M = 22.90$ vs. $M = 17.30$; $p < .05$), and had used a greater number of other nicotine/tobacco products ($M = 2.30$ vs. $M = 1.30$; $p < .05$). Specifically, smokers who endorsed past two-week pain were approximately 4.5 times more likely to have used e-cigarettes ($OR = 4.61$; $p < .01$), greater than 9 times more likely to have used cigars ($OR = 9.44$; $p < .01$), nearly 3 times more likely to have used hookah ($OR = 2.80$; $p < .05$), and greater than 2 times more likely to have used cigarillos ($OR = 2.12$; $p < .05$) and pipes ($OR = 3.26$; $p < .05$). This is the first study to demonstrate a positive association between the presence of pain and a history of using e-cigarettes and other nicotine/tobacco products in addition to traditional tobacco cigarettes. Poly use of nicotine/tobacco products and co-occurring pain have each been linked with greater nicotine dependence and poorer cessation outcomes, and the regular use of nicotine/tobacco is a known risk factor in the development and progression of chronic pain. Smokers with co-occurring pain may be especially susceptible to increasing their total nicotine consumption over time, which in turn may contribute to the dysregulation of overlapping neural systems. Future research should examine current poly use of nicotine and tobacco in relation to pain reporting among more varied samples of tobacco cigarette smokers and nonsmokers.

FUNDING: Academic Institution

POS3-30

COMPARISON OF BASELINE CHARACTERISTICS AND LONG-TERM CESSATION OUTCOMES FOR SEXUAL MINORITY VERSUS NON-MINORITY SMOKERS IN A RCT OF TWO WEB-BASED INTERVENTIONS

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Significance: Very little research has focused on the treatment needs and outcomes of sexual minority (SM; lesbian, gay, or bisexual) smokers. In this secondary analysis of a RCT of two web-based interventions, we compared baseline characteristics and treatment outcomes of SM versus non-SM smokers to determine the extent to which SM smokers may differ in their treatment needs and outcomes. **Methods:** Treatment-seeking smokers were randomly assigned to receive one of two web-based smoking cessation interventions. Participants completed a survey to assess baseline characteristics, including self-identification as either SM (n=253) or non-SM (2,384). The primary cessation outcome was complete-case self-reported 30-day abstinence at 12 months post-randomization (88% outcome data retention). Use of the assigned web site was monitored using server-recorded page views. Use of cessation medications was assessed via self-report at 12 months. **Results:** Compared with non-SM smokers, SM smokers were younger and more likely to be male, racial/ethnic minorities, unmarried, and low-income and had a higher prevalence of all mental health symptoms and conditions assessed (all $P < .05$). However, they did not differ on smoking behavior, recent quit attempts, or psychological correlates of quitting (e.g., commitment). The only indication of differential treatment use was lower use of NRT among SM smokers (23% vs. 31%, $OR=0.67$, 95% CI=0.48-0.95). Thirty-day abstinence rates at 12 months did not differ for SM (24%) vs. non-SM (25%) smokers (adjusted $OR=0.91$, 95% CI=0.65-1.28). Results were not moderated by treatment group and were unchanged in a sensitivity analysis using the missing=smoking imputation. Quit rates for SM subgroups were: gay men, 19%; lesbian women, 26%; bisexual men, 29%; bisexual women, 23%. **Conclusions:** While there were substantial differences in the demographic and mental health characteristics of sexual minority smokers at baseline relative to their straight/heterosexual counterparts, these differences did not translate into differential quit rates in the context of a web-based intervention. Addressing their lower likelihood of using NRT may improve treatment outcomes for SM smokers.

FUNDING: Federal

POS3-31

E-CIGARETTE TOPOGRAPHY: STATE-OF-THE-SCIENCE ANALYSIS AND CONSIDERATIONS FOR HUMAN HEALTH RISK ASSESSMENT

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Quantifying the potential health risk associated with the use of electronic nicotine delivery systems (ENDS) is essential for product stewardship, product development, and regulatory submissions. The risk assessment process with regard to ENDS involves four primary steps: 1) Identifying the chemicals in ENDS liquids and aerosols and their potential health hazards; 2) Detailing the dose-response of these chemicals; 3) Quantifying the exposure of these chemicals to consumers; and 4) Assessing whether consumers experience chemical exposures that are associated with potential health risks. Gathering topography data is necessary for determining exposure from ENDS products and characterizing health risk. Accurate topography data can be utilized to design analytical product testing of ENDS relevant to consumer use conditions, and to determine appropriate dosing for non-clinical and clinical studies. Topography studies should be designed to gather appropriate information about consumer use patterns for predictions of health risk. This study involved the first systematic review of topography studies for ENDS. Our PRISMA guideline literature review identified 43 studies that examined ENDS topography. We evaluated the data derived from each study according to collection method (e.g. surveys, video surveillance or monitoring sensors), as well as several other parameters, including: liquid consumption, nicotine level, puff count, puff duration, puff volume, flow rate, peak flow, and inter-puff interval. Our analysis demonstrated that several factors (e.g., product, consumer, and environmental) influenced topography metrics and aerosol exposures. Specifically, nicotine level, device type, flavor, experience level, study conditions, and time of day and week altered topography parameters. Puff duration, puff frequency, and liquid consumption affected exposure to aerosol constituents. In conclusion, our analysis revealed several key metrics and study



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design features, which are useful to consider for clinical research of ENDS products, as well as assessment of benefit-risks of nicotine and harmful and potentially harmful constituents for the population of ENDS users.

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POS3-32

EXCLUSIVE CIGARETTE SMOKERS, EXCLUSIVE MARIJUANA SMOKERS, AND CO-USERS: CURRENT PATTERNS OF USE

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Background: This cross-sectional study compares daily tobacco smokers and weekly marijuana smokers on exhaled carbon monoxide (CO), tobacco use, and patterns and methods of marijuana use (eg., vape, blunts). **Method:** Adult co-users ($n = 31$), exclusive cigarette smokers (ES; $n = 21$), and exclusive marijuana smokers (EMS; $n = 23$) provided CO, and completed urinary drug and cotinine screens and questionnaires. Eligible co-users: smoked marijuana ≥ 1 /week; smoked ≥ 5 cigarettes/day (cpd) for the past three months ($M_{age} = 45.1$; $SD = 16.1$, 48.4% female). Eligible ES: negative urinary THC; denied marijuana use during the past three months; and smoked ≥ 5 cpd for the past three months ($M_{age} = 50.9$; $SD = 11.1$, 66.7% female). Eligible EMS: smoked marijuana ≥ 1 /week; denied tobacco use during the past three months; and had a NicAlert level <3 ppm ($M_{age} = 41.3$; $SD = 18.6$, 43.5% female). **Results:** Groups were similar in age ($F(2,72) = 2.06$, $p > .05$) and gender $\chi^2(1, N=75) = 2.64$, $p > .05$). Co-users ($M = 20.6$, $SD = 10.7$) and ES ($M = 17.5$, $SD = 8.7$) had significantly higher CO levels than EMS [$M = 5.0$, $SD = 2.9$; $F(2,71) = 22.80$, $p < .001$]. CPD were similar among ES ($M = 14.5$, $SD = 6.4$) and co-users ($M = 13.8$, $SD = 6.7$; $t = 0.41$, $p > .05$). Marijuana smoking days/week were similar between EMS ($M = 6.1$, $SD = 1.5$) and co-users ($M = 5.9$, $SD = 2.0$, $t = 0.43$, $p > .05$), as was total marijuana occasions/week [EMS: $M = 15.8$, $SD = 2.8$, co-users ($M = 16.0$, $SD = 10.9$; $t = 0.08$, $p > .05$). Among co-users, 8/31 primarily used blunts (25.6%); however, 12/31 (38.7%) had smoked a blunt in the last two weeks. During the previous two weeks, one participant used edibles, (one occasion; EMS group) and five vaped marijuana (three EMS, $M = 2.3$ occasions; two co-users; $M = 2.5$ occasions). The most common quantity of marijuana used/week was $\leq 1/16^{\text{th}}$ ounce (40.7% among co-users; 47.8% EMS). **Conclusion:** Co-users' patterns of use mimic those of EMS and ES for each respective substance. Due to additive use, co-users are likely exposed to higher levels of harmful chemicals. Given the high prevalence of co-use, more research is needed examining exposure to harmful chemicals among this group and it is vital that tobacco studies control for marijuana use.

FUNDING: Federal; Academic Institution

POS3-33

SMOKING AND ALCOHOL CONSUMPTION AS AN INDEPENDENT PREDICTOR OF POSTOPERATIVE REST PAIN SECONDARY ANALYSIS OF A RANDOMIZED CONTROLLED TRIAL ON PERIOPERATIVE HYPNOSIS THERAPY

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SIGNIFICANCE: Smokers undergoing major surgery may develop nicotine withdrawal and become more algesic. There is evidence for an increased consumption of analgesics in smokers after surgery (effects of smoking on pain) as well as vice-versa effects of pain on smoking [1]. Apart from analgesics, non-pharmacological interventions such as hypnosis may reduce reactions to painful stimuli [2]. **OBJECTIVE:** As smoking may influence the effect of hypnosis therapy in a peri-operative setting, the post-operative course of rest pain was compared between smokers and non-smokers undergoing major surgery. **METHODS:** Secondary analysis of the "Influence of Perioperative Hypnotherapy on Postoperative Improvement in Cognitive Performance" (HYPNOC)-study (ClinicalTrials NCT01523938), a randomized controlled pilot trial to test the efficacy of perioperative hypnosis on postoperative cognitive outcomes in patients undergoing heart and spine surgery. Multivariate analysis was by generalized linear mixed models. **RESULTS:** After ethical committee approval and written informed consent, 72 patients (mean age 62 +/- 10 years, 24 (34.8%) females, 55 (79.7) with severe systemic disease) participated. Of these, 69 (95.8%) had complete data on smoking status, harmful alcohol consumption (HAC defined as ≥ 5 points in the Alcohol Use Disorder Identification Test)

and all covariates. The 12 smokers (6 of them with additional HAC) compared with the 57 non-smokers (of these 10 with HAC) showed over the course of all together 8 pain visits significant higher rest pain scores on a visual-analogue scale (from 0 to 10 points): +1.43 points (95%-confidence interval (0.11 - 2.74), $p = 0.034$. This difference was evident independently of randomization status ($p = 0.41$), age ($p = 0.44$), gender ($p < 0.001$), severe systemic disease ($p = 0.07$), cardiac insufficiency ($p = 0.002$) and post-surgical pain therapy ($p = 0.87$). When adding an interaction term between randomization and smoking status, this term was not significant ($p = 0.34$). **CONCLUSIONS:** Smokers compared with non-smokers exhibit higher levels of post-operative rest pain up to 8 days post-surgery. References: [1] Ditre JW et al. Pain, Nicotine, and Smoking: Research Findings and Mechanistic Considerations. *Psychol Bull.* 2011; 137(6): 1065-1093. [2] Bataille A et al. Does a hypnosis session reduce the required propofol dose during closed-loop anaesthesia induction? *EJA.* 2018; 35(9):675-681.

FUNDING: Academic Institution

POS3-34

SMOKING CHARACTERISTICS AND PERFORMANCE ON COGNITIVE MEASURES AS PREDICTORS OF MEDICATION ADHERENCE IN A CRIMINAL JUSTICE POPULATION

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Significance: Tobacco use remains the primary cause of preventable death in the United States. Previous research has indicated that for individuals receiving pharmacotherapy, medication adherence is a critical component for achieving abstinence. Therefore, understanding factors that contribute to medication adherence is crucial for tailoring treatments that focus on increasing medication adherence and could in turn lead to improved quit outcomes. The current study examined how smoking characteristics and select cognitive factors relate to medication adherence. **Methods:** Participants were recruited from a community correctional facility in Birmingham, Alabama (N = 371). The study was a randomized clinical trial in which participants received 12-weeks of bupropion and brief physician advice to quit smoking. Additionally, half of the randomized participants also received four weeks of behavioral counseling. Questionnaires assessed demographics, smoking history, and smoking characteristics. Cognitive measures administered included Trails A & B, and the Stroop Task. Participants were considered medication adherent if they reported using $\geq 80\%$ of their scheduled medication each week. **Results:** A hierarchical logistic regression was conducted through SPSS to examine whether smoking characteristics (cigarettes smoked per day, number of previous quit attempts, difficulty of quit attempt) and performance on measures of cognitive function (Trails A&B, Stroop Task) predict medication adherence. Results of the analysis indicated that the overall model was statistically significant ($\chi^2(1) = 16.80$, $p = .019$). According to the Wald criterion, income level ($\chi^2(1) = 4.18$, $p = .041$, 95% CI [1.00, 1.07]) and the Stroop Task performance ($\chi^2(1) = 3.41$, $p = .045$, 95% CI [0.81, 1.06]) significantly predicted medication adherence. **Conclusion:** These results indicate that individuals with lower income levels and poorer ability to inhibit cognitive interference were less likely to be medication adherent. Developing behavioral interventions that focus on bolstering executive function deficits may be helpful for efforts to increase medication adherence. All authors report no conflicts of interest. Funding: NIH/NIDA (R01CA141663)

FUNDING: Federal

POS3-36

A CLINICAL MODEL UTILIZING NICOTINE PHARMACOKINETICS AND SUBJECTIVE EFFECTS TO ASSESS ABUSE POTENTIAL OF A MOIST SMOKELESS TOBACCO PRODUCT RELATIVE TO CIGARETTE AND NICOTINE GUM

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Assessment of abuse potential has been suggested by FDA as part of regulatory submissions for market authorization. We used an open-label, randomized, two-stage, three-way crossover study with $n = 24$ adult smokers to evaluate nicotine pharmacokinetics (PK), subjective effects, and product use behavior of a test moist smokeless tobacco product (MST) relative to subjects' usual brand cigarettes (CIG), and Nicotine® Polacrilex™ fresh mint chewing gum 4 mg (NG). During Stage 1, subjects were randomly assigned to 3 sequences (4-hour ad libitum use with one product per day over 3 days). Questionnaires on Smoking Urges-Brief, Modified Cigarette Evaluation and



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Use the Product Again were administered before and/or at the end of 4-hour product use. Following a one day wash-out, in Stage 2 subjects used the study products under controlled conditions (i.e., 2g MST for 30 min; 10-puff smoking of CIG; one 4-mg NG for 30 min). PK blood samples and responses (Visual Analogue Scale, VAS) to Tobacco/Nicotine Withdrawal and Direct Effects of Product questionnaires were collected at pre-determined time points during each product use. During Stage 1, a median of 2 quids of MST were used for ~39 minutes each; 7 CIGS were smoked, and 4 NGs were used over ~27 minutes each. The proportion of subjects who indicated they would use the product again were 42%, 83% and 63% for MST, CIG and NG, respectively. During Stage 2, plasma nicotine Cmax (geometric least squared mean, ng/mL) for MST (12.38) was slightly lower than CIG (14.10) but statistically significantly higher than NG (4.94). The maximum reduction from pre-use in "Urge to Smoke" VAS scores (least squared mean) for MST (38.51) was not statistically significantly different from either CIG (44.67) or NG (29.40). The maximum VAS scores in response to "Is the Product Pleasant Right Now" following the product use for MST (62.42) was statistically significantly lower than CIG (77.00) and statistically significantly higher than NG (59.00). We conclude that the abuse potential of the test MST product under the study conditions is lower than cigarettes and similar or higher than the nicotine polacrilex gum.

FUNDING: Tobacco Industry

POS3-37

COMPARATIVE PHARMACOKINETICS OF A 4 MG SUBLINGUAL NICOTINE TABLET VERSUS THE 4MG NICOTINE LOZENGE IN HEALTHY SMOKERS

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SIGNIFICANCE: A long-sought aim of nicotine replacement therapies has been to mimic the pharmacokinetics of nicotine uptake seen with smoking cigarettes. To that end we performed a pharmacokinetic comparison of a 4 mg sublingual (SL) nicotine tablet to the 4 mg nicotine lozenge (LOZ) in healthy smokers. **METHODS:** Open-label, pseudorandomized Latin Square administration of either a 4mg nicotine SL tablet or a 4mg nicotine LOZ in 24 smokers (13 males, 11 females) at the Rose Research Center. After obtaining informed consent and completing medical screening study participants were admitted on two separate occasions where either the SL tablet or the LOZ were administered. Blood samples (5 mL) were obtained at the following times: 45, 30, 15, and 0 minutes pre-dose and 3, 6, 9, 12, 15, 20, 30 60, 90, 180 and 240 minutes post-administration. Assessment of cigarette craving using Visual Analogue Scales (VAS) (Urge, Need to Smoke, Need Cigarette, Craving, and Total) was obtained prior to administration and at 1, 3, 7, 11, and 14 minutes post-administration. **RESULTS:** Median mouth dissolution times (and range) for the LOZ were 10.5 (6-31) minutes versus 3 (1-9) minutes for the SL tablet. Arithmetic mean for the ratio of the individual sublingual tablet/lozenge AUC₂₋₁₀ values was 60 % higher for the tablet, although the AUC₀₋₂₄₀ was only 87 % of that of the lozenge. Both dosage forms reduced VAS measured craving. The SL tablet produced a significantly greater reduction in craving at the 3 minute time point on the CRAVING VAS ($p = 0.027$). **CONCLUSIONS:** The SL tablet dissolved more rapidly in the mouth than the LOZ. Early nicotine plasma concentrations from SL dosing were significantly higher than corresponding LOZ concentrations and this observation was considered to be of clinical significance. Subsequently, the time scale of the nicotine plasma concentrations from the tablet closely resembled the LOZ but were lower for the SL tablet. The greater reduction in early craving scores seen with the SL tablet would need to be confirmed in a larger study with adequate power.

FUNDING: Federal

POS3-38

CARDIOVASCULAR EFFECTS OBSERVED WHEN USING THE TOBACCO HEATING SYSTEM 2.2 COMPARED WITH CONTINUED SMOKING

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BACKGROUND. Cigarette Smoke (CS) is causally linked to the development of CVD through different pathophysiological pathways, which include endothelial injury and dysfunction, oxidative stress, a procoagulatory status, inflammation, and an abnormal lipid profile, all contributing to development of atherosclerosis. Tobacco harm reduction, by

substituting cigarettes with less harmful products, is a complementary approach to the current strategies for smokers who would otherwise continue to smoke. The Tobacco Heating System (THS) 2.2 is a novel tobacco product that heats tobacco instead of burning it, never allowing the temperature to exceed 350°C, thereby preventing the combustion process from taking place and producing substantially lower levels of toxicants compared with cigarette smoke. **METHODS** Philip Morris International's (PMI) assessment program aims to demonstrate that switching to THS has the potential to reduce the risk of smoking-related diseases versus continued smoking. The program includes *in vitro/in vivo* toxicology testing methods that follow OECD guidelines, Good Laboratory Practice, a systems toxicology approach, and randomized, controlled clinical studies following the principles of Good Clinical Practice. **RESULTS.** The results of the THS translational assessment program demonstrated that cardiovascular toxicants are reduced by >92% in THS aerosol versus CS and that THS aerosol contains no solid carbon-based nanoparticles. The effects of THS aerosol on the adhesion of monocytic cells to human coronary endothelial cells *in vitro* are significantly reduced. Switching to THS halted the progression of CS-induced atherosclerotic changes in ApoE^{-/-} mouse *in vivo* studies. Clinical risk endpoints (CRE) linked to the development of smoking-related disease were analyzed following a six-month randomized, controlled clinical study with THS, which demonstrated a consistent improvement of CREs in different pathophysiological pathways leading to atherosclerosis. **CONCLUSIONS.** The evidence available to date thus indicates that switching to THS has the potential to reduce the risk of smoking related diseases, such as CVD. As a next step, PMI will be complementing its THS assessment program with health outcome studies intended to further support the clinical benefits of switching to THS, i.e. reduction in the risk of cardiovascular death, myocardial infarction, and stroke, as compared with continuous smoking.

FUNDING: Tobacco Industry

POS3-39

PERCEIVED RISKS OF QUITTING SMOKING IN A SAMPLE OF AFRICAN-AMERICAN AND HISPANIC ADULTS LIVING WITH HIV/AIDS

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Introduction: Persons living with HIV/AIDS (PLWH) smoke cigarette at high prevalences and experience HIV-related and non-HIV-related health consequences of smoking. Perceived risks of quitting smoking are associated with quit motivation, confidence, and outcomes in community samples, but little is known about these beliefs related to quitting smoking among PLWH. The purpose of this study was to examine the (1) perceived risks of quitting and (2) the relationship between perceived risks of quitting and quit motivation and confidence overall, by gender, and by race/ethnicity in a sample of African-American and Hispanic cigarette smoking PLWH. **Methods:** One hundred seven PLWH who reported current cigarette smoking completed measures of demographics, smoking, perceived risks and benefits of quitting smoking, motivation to quit smoking, and confidence in ability to quit smoking. **Results:** The highest endorsed risks of quitting smoking were cravings and weight gain and higher endorsement of craving risks was associated with lower confidence in the ability to quit smoking. With regard to gender, women endorsed overall risks and risks related to negative affect more highly than men. With regard to race/ethnicity, compared to African-American PLWH, Hispanic PLWH reported greater endorsement of overall risks and risks of negative affect, difficulty concentrating, social ostracism, loss of enjoyment, and cravings. Higher perceived negative affect was associated with higher quit motivation for Hispanic PLWH. Higher perceived cravings and loss of enjoyment were associated with lower quit confidence for African-American PLWH. **Conclusion:** In order to improve smoking cessation outcomes for PLWH, it may be useful to incorporate information about perceived risks of quitting smoking into treatment with consideration of gender and racial/ethnic differences in risk beliefs.

FUNDING: Federal



POS3-40

EXPERIENCES WITH SMOKING CESSATION PHARMACOTHERAPIES, MEDICATION ADHERENCE AND ASSOCIATED BARRIERS: FOCUS GROUP FINDINGS FROM HIV- POSITIVE CIGARETTE SMOKERS

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Background: The prevalence of smoking is disproportionately high among persons living with HIV (PLWH). HIV-positive smokers have lower quit rates than the general population, and some evidence suggests that conventional cessation interventions are less effective in this population. Little work has been conducted to develop tailored smoking cessation interventions among PLWH. We conducted focus group interviews with HIV-positive smokers to better understand experiences with smoking cessation pharmacotherapies and barriers to medication adherence. **Methods:** We conducted 5 focus groups (n=24) between January 2018 and March 2018 with male and female PLWH who were current smokers and currently engaged in HIV care. Interviews were transcribed verbatim and were analyzed using content analysis methods. **Results:** The sample was 38% female, 96% African American, and the mean age was 50.2 years. Most participants reported having experience using various forms of nicotine replacement therapy (e.g., nicotine patch, gum, inhaler), though they also reported unfavorable opinions of these modalities and having little success when using them during quit attempts. Fewer participants reported use of and familiarity with Chantix/varenicline; individuals who were familiar with it reported side effects, having heard negative things about the medication, and concerns about drug-drug interactions with their antiretroviral (ART) medications. Participants generally reported being adherent to their ART medications, but struggling with adherence to smoking cessation pharmacotherapies and other medications. Common barriers to adherence included side effects, forgetfulness, and pill burden. **Conclusion:** Individuals in the present sample reported prior experience with various smoking cessation pharmacotherapies, though experiences were largely unsatisfactory. HIV-positive smokers face numerous barriers to medication adherence, including those that are unique within the context of HIV and other chronic illness (e.g., pill burden, concerns about drug-drug interactions). Findings will aid in the tailoring of an intervention aimed at improving smoking cessation medication adherence among PLWH.

FUNDING: Federal

POS3-41

PLACEBO-CONTROLLED RANDOMIZED CLINICAL TRIAL TESTING THE EFFICACY AND SAFETY OF VARENICLINE FOR SMOKERS WITH HIV

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Background: People living with HIV/AIDS (PLWH) smoke tobacco at higher rates and have more difficulty quitting than the general population, which contributes to significant life-years lost. The effectiveness of varenicline, one of the most effective tobacco dependence treatments, is understudied in HIV. We evaluated the safety and efficacy of varenicline for smoking cessation among PLWH. **Methods:** In this randomized, double-blind, placebo-controlled, phase 3 clinical trial, 179 PLWH on antiretroviral therapy (ART) who were treatment-seeking daily smokers were randomized (1:1) to 12 weeks of varenicline (n=89) or placebo (n=90). All participants were offered six smoking cessation behavioral counseling sessions. The primary outcome was 7-day point prevalence abstinence, confirmed with breath carbon monoxide, at Weeks 12, 18, and 24. Continuous abstinence and time to relapse were secondary outcomes. Safety measures were treatment-related side effects, adverse events, and blood pressure, viral load, and ART adherence. **Results:** Of the 179 smokers, 81% were African American and 68% were male. Varenicline increased cessation at Week 12 (28.1% vs. 12.1%; OR=4.54, $P<.05$) and Week 18 (21.3% vs. 11.1%; OR= 3.12, $P<.05$). Continuous abstinence from Week 9 to 12 and 18 were higher for varenicline vs. placebo ($P<.05$). There were no differences between varenicline and placebo on safety measures ($P>.05$). **Conclusions:** The overall findings indicate that use of varenicline combined with behavioral counseling is safe and effective in the short-term for HIV-infected smokers, compared with behavioral counseling alone. Varenicline was not associated with adverse outcomes, including cardiovascular and psychiatric events, and significantly increased quit rates

at the end-of-treatment and through 6 weeks following end-of-treatment. These results provide important information for patients and clinicians as they engage in efforts to address smoking among PLWH and improve their quality of life.

FUNDING: Federal; Industry Source

POS3-42

FEASIBILITY AND PRELIMINARY EFFICACY OF A MOBILE- HEALTH INTERVENTION FOR CAMBODIAN SMOKERS LIVING WITH HIV

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Introduction. Cigarette smoking among people living with HIV (PLWH) represents a global public health problem. This problem is particularly concerning in Cambodia, where available data suggest that 65% of HIV+ men are current smokers. Although Cambodia has an outstanding infrastructure for the delivery of antiretroviral treatment (ART), which currently covers 81% of the approximately 71,000 Cambodian people living with HIV (PLWH), no efforts have been made to provide tobacco cessation treatment to the HIV+ population. Thus, complementing HIV treatment with efficacious tobacco cessation treatment offers tremendous potential to greatly improve the medical management of HIV and to prolong life for PLWH. The purpose of this pilot study was to assess the preliminary efficacy of a fully automated, smartphone-delivered intervention for smoking cessation among PLWH in Phnom Penh, Cambodia. **Methods.** Fifty PLWH receiving HIV-related clinical services at a large ART clinic located in Phnom Penh were recruited. Participants were randomized to one of two treatment groups: Standard Care (SC; n=25), or Automated Messaging (AM; n=25). Participants in SC received brief advice to quit smoking delivered by research staff and written self-help materials. Participants in AM received the SC components plus a fully automated and interactive smartphone-based treatment program. All participants were followed for 2 months. Self-reported smoking status was assessed weekly throughout the 2-month treatment period via smartphone ecological momentary assessments (EMA). Expired carbon monoxide levels were measured to biochemically verify smoking abstinence (in person) at the 2-month follow-up. **Results:** Feasibility was supported by high rates (81%) of weekly EMA completion and high retention (96%) through the 2-month follow-up. Biochemically verified abstinence rates at follow-up were 40% for the AM group and 8% for the SC group (relative risk: 5.0, 95% confidence interval: 1.2, 20.5). **Conclusion:** The smartphone-based AM smoking cessation intervention appears to be efficacious and has the potential for wide scale implementation in Cambodia and in other low-income countries.

FUNDING: Federal; State

POS3-43

DOES ABSTINENCE FROM E-CIGARETTES PRODUCE WITHDRAWAL SYMPTOMS?

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Nicotine withdrawal is an important feature of addiction potential, but whether e-cigarette users experience nicotine withdrawal upon abrupt cessation has not been tested. In a 2-week experimental study, adult former tobacco cigarette smokers who now use only e-cigarettes daily used their own e-cigarette during the first week, and then abstained completely from their e-cigarette plus all tobacco and nicotine products during the second week. To encourage compliance with abstinence, we used an escalating payment system with bonuses that has resulted in high compliance rates in our prior studies. Participants monitored symptoms of nicotine withdrawal via the Minnesota Tobacco Withdrawal Scale (MTWS) daily via an Interactive Voice Response system. They attended 3 laboratory visits/week to provide breath carbon monoxide and urinary cotinine samples to determine compliance. Among the 98 participants enrolled, 57 (58%) were biochemically-confirmed abstinent in the second week and completed the study; these 57 participants comprised the data analytic sample. The mean increase in MTWS scores with abstinence was 0.4 units (on a 4-point scale), paired t-test = 5.2, $p <0.001$. The increase in total MTWS scores due to stopping e-cigarettes appeared to be similar to that for withdrawal from tobacco cigarettes in our prior studies (0.4-0.5 units) using the same scale and the same data collection time points. Our findings indicate that daily use of e-cigarettes is addicting and, specifically, that daily use of



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e-cigarettes maintains physical dependence on nicotine, a known cause of inability to quit. That stopping e-cigarettes produces nicotine withdrawal upon abstinence should be conveyed in product labeling and factored into a risk/benefit assessment of e-cigarettes.

FUNDING: Federal

POS3-44

FLUCTUATIONS IN OVARIAN HORMONES INFLUENCE NEURAL RESPONSES TO SMOKING CUES

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Despite evidence suggesting that men smoke more than women, women have greater difficulty quitting smoking and suffer greater smoking-related health consequences. Thus, there is an urgent need to identify sex-specific risk factors for nicotine use disorder in order to develop individualized treatment strategies for women. Sex hormones play an important role in establishing and maintaining sex-specific brain structure and function, and as such, are primary targets for investigating sex differences in smoking-related behavior. In women, estradiol (E) and progesterone (P) are the two major sex hormones that affect brain and behavior. E and P concentrations fluctuate over the course of the menstrual cycle (MC) and influence nicotine's actions. Specifically, E elevates ventral striatal dopamine and accelerates both drug-cued and drug-primed reinstatement, an animal model of relapse, while P has opposing protective effects on drug-seeking behavior. Correspondingly, when women have high E levels (i.e. during the late follicular phase of the MC), they may find drugs more rewarding and drug-related cues more motivating, which could markedly undermine women's success in quitting smoking at that time. In order to examine the influence of fluctuating hormones on neural responses to smoking cues, ten naturally-cycling females who are chronic smokers completed three MRI scan sessions that included a BOLD scan during exposure to highly-appetitive smoking cues (SCs) and nonsmoking cues (nonSCs) over the course of three MCs. Scan sessions were timed to occur just prior to ovulation (high E), mid-luteal (high P), and during menses (low E and P). Analyses revealed that during high E, female smokers exhibited greater neural responses to SCs compared to nonSCs in reward-related regions (hippocampus and insula); whereas, during high P, female smokers exhibited greater neural responses in cognitive control-related regions (dorsolateral prefrontal cortex and dorsal anterior cingulate cortex). This is the first study to provide evidence of the influence of E and P on neural responses to SCs and highlights the importance of considering ovarian hormones during treatment planning.

FUNDING: Federal

POS3-45

SUBJECTIVE AND BEHAVIORAL RESPONSES TO E-CIGARETTE USE IN MALE AND FEMALE ADULT SMOKERS

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Among young adult smokers, passive exposure to a variety of ENDS products (cigarettes, vape pens, and mods) elicits smoking desire similar to that of combustible cigarette exposure, with similar sensitivity between men and women. However, devices in prior studies were gender-neutral in appearance, resembling a pen or an automobile part. In this study, we examined whether exposure to a female-marketed vaping product differentially affects smoking urge in women vs. men. The sample included N=64 adult smokers (age 28.2 (mean) \pm 4.4 (SD) yrs; 52% female; 8.9 \pm 4.7 cig/day; 4.0 \pm 1.9 FTND; 31% past month ENDS use). In a controlled laboratory paradigm, participants engaged in conversation with a female study confederate who first drank bottled water (control cue) and then vaped a jeweled, magenta-colored ENDS mod (active cue). Women and men showed similar sensitivity to the female-marketed mod cue; exposure to ENDS use increased cigarette and e-cigarette desire among both genders (cigarette desire increase (women vs men): +11.36 vs +11.26; e-cigarette desire: +6.06 vs +4.61; ps=ns). However, sex differences were observed in the post-cue smoking latency task on median latencies [0.17 min for men vs. 5.6 min for women (U=63.00, Z=-3.72, p<0.001)]; with 42% of men but only 6% of women choosing to smoke immediately [<1 minute; (X₂(1) = 11.5, p<0.008]. Finally, across all of our ENDS exposure studies in N=197 young adult smokers, e-cigarette desire increases in response to ENDS cues were significantly higher in women vs. men who never vaped (19% and 23%, respectively) (+9.96 vs +1.37, respectively; β (SE)=8.42, p=0.02). In sum, female-oriented mods surprisingly appear to be a robust smoking cue in both sexes but women with no vap-

ing history may be more sensitive than men to e-cigarette cues on their desire to use an e-cigarette. This may have implications for uptake and societal exposure to these rapidly increasing products in youth.

FUNDING: Federal; Academic Institution

POS3-47

SMOKING DURING PREGNANCY AS A RISK FACTOR FOR DEVELOPMENT AND SEVERITY OF NEONATAL ABSTINENCE SYNDROME AMONG NEWBORNS PRENATALLY EXPOSED TO OPIOIDS

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Opioid use in pregnancy can result in neonatal abstinence syndrome (NAS). Avoiding NAS or decreasing its severity in opioid exposed pregnancies is a recent focus, but much is unknown about which newborns will be affected and how. Research suggests other pregnancy substance use may play a role. The study goal was to examine pregnancy tobacco use as a risk factor for development of and increased severity of NAS in a population-based sample. Data were abstracted from electronic medical records of a regional hospital system with multiple delivery centers in two states. Over 5 years, 18,730 women gave birth, 2,639 with known pregnancy opioid use. Demographic and medical variables were available, including NAS diagnosis. Length of newborn hospital stay represented NAS severity. Drug exposure variables were constructed from self-report and biochemical testing. Of the 2,639 women who used opioids during pregnancy, 507 (19.2%) delivered an infant who developed NAS. NAS was significantly predicted by mother being unmarried, older, and infant being male (p<.05). Fetal tobacco exposure (TE) predicted NAS development: only 7.7% of opioid exposed newborns without TE developed NAS, while 31.6% of opioid exposed newborns with TE developed NAS (p<.001). TE also predicted NAS severity, with TE opioid exposed newborns diagnosed with NAS staying in the hospital significantly longer than those diagnosed but without TE (10.3 vs 7.2 days, p<.01). In regression analyses controlling for marital status, age, and gender, TE newborns were 5 times more likely to develop NAS (aOR=4.91, CI:3.88-6.23). Of those who developed NAS, TE newborns stayed in hospital 3.0 days longer than those not TE (p=.006). Further research is needed to rule out pregnancy tobacco use being a proxy for higher levels of opioid use or other factors that could impact NAS expression. However, women receiving prescription opioids during pregnancy, or who are unable to refrain from other opioid use, should be informed that eliminating tobacco use may lessen the likelihood/severity of NAS, and providers should offer appropriate advice and assistance to encourage smoking cessation.

FUNDING: State

POS3-48

A NAVIGATOR APPROACH TO REDUCE TOBACCO USE AMONG PREGNANT AND POSTPARTUM WOMEN WITH HIGHLY PREVALENT OPIOID USE DISORDER

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Despite the well-acknowledged harms of maternal smoking, there have been minimal reductions in rates of prenatal and postpartum smoking in the past decade. The majority of smoking cessation interventions for pregnant women focus on individual behavior change, often through enhancing motivation. However, women who continue smoking during pregnancy tend to have psychosocial issues or social disadvantages, such as low socioeconomic status, high stress, and co-occurring mental illness or substance use disorder. Tobacco treatment programs are needed that incorporate adequate supports to address these underlying psychosocial issues. We pilot tested a Perinatal Wellness Navigator (PWN) program for a group of high-risk pregnant and early postpartum patients (N=50) that consisted of: (1) one-on-one evidence-based tobacco treatment sessions; (2) comprehensive assessment to identify barriers to cessation; (3) linkage to clinical and social services. Several outcome measures related to smoking and smoke exposure, as well as psychosocial measures, were assessed at baseline and post-intervention for this program evaluation. Participants ranged from 19 to 41 years of age and were predominately white (98%) with a household income of less than \$20,000 per year (70%). Nearly half of the participants were single (46%). Approximately a third of the participants had a high school degree or a GED (34%) and 26% had less than a high school education. Most participants in this study (84%) were recruited from an OB



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clinic that provided comprehensive care for pregnant women with opioid use disorder. Participants reported smoking 10 fewer cigarettes per day ($p=0.05$) at post-intervention and were less dependent on nicotine ($p<0.01$). Expired carbon monoxide decreased post-intervention but not significantly ($p=0.53$). Mean postnatal depression scores decreased at post-intervention ($p=0.03$), as did perceived stress ($p=0.03$). All participants at baseline received at least one referral (n=106 total referrals) and ten participants received an additional 18 referrals to social/clinical services at post-intervention to address additional barriers to cessation.

FUNDING: Nonprofit grant funding entity

POS3-49

DEVELOPMENT OF A BEHAVIORAL ENHANCED PERINATAL INTERVENTION FOR CESSION (B-EPIC) IN WOMEN WITH OPIOID USE DISORDER

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Significance: Prenatal tobacco use increases the severity and duration of neonatal abstinence syndrome. Further, prenatal tobacco use is an independent risk factor for several adverse maternal and birth outcomes. The purpose is to (1) describe an innovative model to guide tobacco treatment for pregnant women with opioid use disorder; (2) report preliminary feasibility and efficacy of a Behavioral and Enhanced Perinatal Intervention for Cessation (B-EPIC) of tobacco use in women with opioid use disorder (OUD). **Methods:** Development of B-EPIC was based on a novel theoretical model, Model for Smoking Cessation in Women of Childbearing Age, that was generated from qualitative interviews from perinatal women who were able to maintain smoking abstinence for at least six months postpartum. An ongoing two-group randomized and controlled clinical trial (n =100) will test the feasibility and effectiveness of B-EPIC in an outpatient clinic providing MAT. B-EPIC incorporates four core components: 1) Individualized tobacco treatment with a certified tobacco treatment specialist, 2) Biomarker validation and feedback (urine cotinine and carbon monoxide), 3) Active engagement in adoption of healthy behaviors; and 4) Pharmacotherapy as needed. Health behaviors and outcomes are being collected via medical record review. **Results:** Key components of the model that guides B-EPIC include: Taking Action; Demanding Smokefree Environments, Replacement of Tobacco with Healthy Behavior, and Mindset. Nearly all women (92%) enrolled in the prenatal MAT clinic where B-EPIC takes place are concurrently using tobacco and other illicit drugs. The most common other illicit drug used is cannabis (27%). Study is ongoing and feasibly and effectiveness data will be available at time of symposia. **Conclusion:** Incorporation of narratives of women with proven tobacco cessation should be used to in the development of interventions with women with OUD. B-EPIC is a novel intervention designed to reduce tobacco-associated morbidity in infants and perinatal women. Improvement in tobacco cessation rates will likely improve birth outcomes for perinatal women with opioid dependence.

FUNDING: Federal

POS3-50

DEVELOPMENT AND PILOT EVALUATION OF AN MHEALTH APP FOR SMOKERS WITH DEPRESSION

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Background: Integrating Behavioral Activation Treatment for Depression (BAT-D) into smoking cessation interventions is a promising approach to address depression as a barrier to quitting. However, this approach has only been tested as a face-to-face intervention, which has low reach. The aims of the study were to develop a high-reach BAT-D mHealth app and determine its feasibility, acceptability, and preliminary effects on theory-based behavioral processes of behavioral activation and reduced depressive symptoms as well as smoking cessation. **Methods:** Following a user-centered design process consisting of competitive analysis, focus groups, and prototype testing, we conducted a single-arm pilot trial of Actify!—the BAT-D app for depressed smokers. Participants used SmokefreeTXT along with Actify to provide cessation content that had not yet been built into the app for this initial phase of pilot testing. Participants in the trial (n=17) were current, daily smokers with mild to moderate depressive symptoms. We examined process and cessation outcomes at 6 weeks post-enrollment for study completers (n=16; 94% retention). **Results:** Regarding acceptability, average number

of logins per participant was 20 (SD=16), and 63% reported being satisfied overall with the app. Post-treatment interviews identified some usability challenges—e.g., high perceived burden of activity scheduling and tracking. There was a decrease in depressive symptoms from baseline to follow-up (mean change in PHQ-9 scores= -4.5, 95% CI: -7.7, -1.3; $p=.009$). Additionally, CO-confirmed, 7-day point prevalence abstinence (PPA) at 6-week follow-up was 31% (5/16), and the 30-day PPA was 19% (3/16). **Conclusions:** Results demonstrate high engagement with Actify! and promising impact on theory-based change processes and cessation outcomes. Preliminary quit rates for this high-risk population of smokers compare favorably to both previous trials of smoking cessation apps for the general population (i.e., short-term, self-reported 30-day quit rates in the 8-18% range) as well as previous trial of face-to-face BAT-D for cessation (i.e., CO-confirmed, 7-day PPA rate of 17% at end of treatment).

FUNDING: Academic Institution

POS3-52

PILOT STUDY OF A SMOKING-SPECIFIC SELF-CONTROL TASK: FEASIBILITY, ACCEPTABILITY, AND CHANGES IN CIGARETTE SMOKING AND MOTIVATION TO QUIT

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Significance: Quitting smoking requires high and sustained levels of self-control. Practicing general self-control tasks can strengthen self-control and is associated with a greater time to smoking lapse during a quit attempt. This pilot study examined the feasibility and acceptability of a smoking-related self-control task compared to a general self-control task. Secondary aims were to examine changes in smoking and motivation to quit between self-control task groups. **Methods:** Fifty-three adult daily cigarette smokers (75% male) were randomly assigned to practice a smoking-specific self-control task (Delaying Smoking Task, n=27) or a general self-control task (Posture Task, n=26) every day for one week. Cigarettes per day (CPD), motivation to quit smoking, self-control, and task acceptability were assessed before and after self-control task practice. **Results:** Most participants completed both appointments with no difference between groups ($\bar{x}(1)=1.654$, $p=0.20$). Self-control task groups did not differ in effort put into practicing the task ($p=0.83$), task success ($p=0.82$), or self-control used to practice the task ($p=0.65$). Over the week, there was a significant increase across self-control groups in desire to quit smoking ($p<0.001$), expected success at quitting ($p=0.004$), quit motivation ($p=0.002$), and quit confidence ($p=0.007$). The time by task group interaction was significant for quit confidence ($p=0.03$) and approached significance for expected success at quitting ($p=0.06$) and quit motivation ($p=0.07$) with the Delaying Smoking Task group showing greater increases than the Posture Task group. Over the week, smoking decreased an average of 0.5 CPD overall with no difference between groups ($p=0.56$). **Conclusions:** It was feasible and acceptable to ask smokers to complete a smoking-specific self-control task. Practicing smoking-specific self-control led to greater increases in quit confidence than a general self-control task and changes in quit beliefs occurred in the absence of a significant decrease in CPD. Developing behavioral cessation treatments that include tasks that strengthen self-control may be useful for increasing motivation and quit outcomes.

FUNDING: Academic Institution

POS3-54

STACKED AGAINST THEM: THE BURDEN OF RISK FACTORS EXPERIENCED BY RURAL YOUTH

Megan E. Roberts, PhD, Brittney Keller-Hamilton, Amy K. Ferketich. Ohio State University.

The burden of tobacco use in Rural America is gaining increased attention, and it is well established that adults who live in rural areas have among the highest smoking rates in the country. Yet the status of youth living in rural areas of the U.S. remains understudied, particularly in regard to how the risk factors of rurality and youth intersect with other risk factors. To examine this issue, data will be presented from the Buckeye Teen Health Study, a prospective cohort study of 1,220 adolescent males who reside in rural Appalachian and urban areas of Ohio. Among these participants, use of cigarettes, smokeless tobacco, and e-cigarettes is more prevalent among the rural versus urban youth. This presentation will explore the multiple risk factors at play for the rural youth, including those factors at the family level (adult tobacco users in the home, family income) and community level (tobacco policies, tobacco retailer density, tobacco retailer marketing). Findings indicate that adolescents from rural areas have



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an elevated prevalence of multiple factors that put them at risk for tobacco use. For example, the prevalence of youth with an adult tobacco user living in their home at baseline was 22% for urban youth, but 40% for rural youth. Longitudinal analyses will present the pernicious impact of these multiple risk factors on tobacco-use trajectories over a two-year period. Further, in addition to demographic and behavioral data, we will present spatial autoregression analyses that indicate how the per capita density of tobacco retailers is greater in rural areas. This presentation will include discussion of rurality, poverty, and parent tobacco use as associated versus confounding factors. We will also discuss potential regulatory and preventive intervention approaches for reaching this vulnerable population.

FUNDING: Federal

POS3-56

RESPONSES TO CIGARETTE HEALTH WARNING LABELS, HARM PERCEPTIONS AND KNOWLEDGE IN A NATIONAL SAMPLE OF PREGNANT AND NON-PREGNANT WOMEN OF REPRODUCTIVE AGE

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Background: Little is known about the effectiveness of cigarette health warning labels (HWLs) among pregnant and non-pregnant women of reproductive age in the U.S. Our intent was to examine HWL responses by pregnancy status and their associations with perceived harm and knowledge of health effects from smoking. **Methods:** We conducted a cross-sectional analysis from the first (2013-2014) and second (2014-2015) Population Assessment of Tobacco and Health survey waves. The sample (N=19,095, weighted N=112,188,239) was representative of women age 18-44 years in the U.S. We examined three self-reported responses to HWLs currently on cigarette packaging (seeing HWLs, forgoing cigarettes because of HWLs (behavioral response), likelihood of quitting because of HWLs (cognitive response)). We also examined perceived harm from smoking, knowledge of health effects to fetuses, and knowledge of effects to others (smokers and non-smokers). Weighted logistic regression compared HWL responses by pregnancy status (currently pregnant, never-pregnant, ever-pregnant) and their associations with perceived harm and knowledge, adjusting for demographics, tobacco use, and wave. Results were presented as marginal predicted probabilities. **Results:** About half of the sample and 80% of smokers reported seeing HWLs, and 36% of smokers reported forgoing cigarettes, with no difference by pregnancy status. Pregnant smokers were less likely than never-pregnant smokers to report likelihood of quitting because of HWLs (57% vs 67%, p=0.020). Forgoing cigarettes and likelihood of quitting, but not seeing HWLs, were positively associated with perceived harm and knowledge. Pregnant smokers were less likely to have knowledge of fetal harm (83%) than ever-pregnant (91%, p=0.006) and never-pregnant (92%, p=0.003) smokers. However, pregnant smokers who reported likelihood of quitting were much more likely to have knowledge of fetal harm than those who did not (92% vs. 70%, p=0.028). **Conclusions:** New HWLs that elicit stronger behavioral and cognitive reactions are one regulatory action that could help improve knowledge and reduce tobacco use in pregnant women and women who may become pregnant in the U.S.

FUNDING: Federal

POS3-57

FINANCIAL INCENTIVES FOR SMOKING CESSATION IN PREGNANCY: FROM EVIDENCE TO PRACTICE

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Background: Two Cochrane Systematic Reviews concluded high-quality evidence suggests incentive-based interventions can reduce the number of women smoking in late pregnancy. A strong component of this evidence came from a phase II single centre RCT of financial incentives for smoking cessation in pregnancy (CPIT II) conducted by members of our team. CPIT II supported the efficacy of financial incentives for increasing cessation rates in pregnant women, with results showing 32% of those who engaged and set a quit date in the incentive group quit at 12 weeks (CO validated) and more than double the number of pregnant smokers offered incentives had quit in late pregnancy (34-38 weeks) compared to the control group (23% vs 9%). **Methods:** At the end of CPIT II the participating centre set-up a working group to develop an incentives programme as an adjunct to their current service model that provides face-to-face and telephone support to a materially deprived, inner city population. In parallel our research team secured funding for a Phase III multi-centre RCT of incentives for pregnant women (recruiting since Jan-18) that included a comprehensive 12-month process evaluation to

investigate key barriers and facilitators to implementing incentive schemes in different UK Stop Smoking Service structures and geographical populations. **Results:** In this session we draw together important findings from both the service development programme and phase III trial process evaluation. We highlight the key challenges faced by services in operationalising an incentives programme (e.g. securing funding, adapting trial eligibility criteria and data collection mechanisms to fit with current service models) and describe the importance of management style and structure, service approach to smoking cessation and role of staff consultation in the implementation of an incentives scheme.

FUNDING: Federal

POS3-58

PROVIDING BETTER TOBACCO DEPENDENCE TREATMENT DURING PREGNANCY – A QUALITATIVE EXPLORATION OF AUSTRALIAN GENERAL PRACTITIONERS' KNOWLEDGE, ATTITUDES AND PRACTICES

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Background: Smoking during pregnancy remains a significant problem. Health providers report lacking knowledge and skills. Barriers include fear from harming the relationship with the patient, lack of confidence in advising nicotine replacement therapy (NRT) use during pregnancy (safety concerns), and lack of time and resources. Qualitative studies are sparse, and none have been previously undertaken in Australia with general practitioners (GPs). The aim was to explore GPs thoughts on the management of smoking in pregnancy, and what would enable them to provide better care. **Methods:** Participants were recruited from a sample of GPs that participated in a national survey on managing smoking during pregnancy; and through a national GP conference. Semi-structured interviews were recorded and transcribed. The interview and analysis were guided by the theoretical domains framework, covering previously reported barriers, and specific components of care that were lacking, such as using NRT. Analysis used a general thematic approach. **Results:** Out of 122 GPs contacted, 19 participants agreed to be interviewed. Participants reported not knowing 'how to have that conversation' with the women, focusing on 'providing information on the harms of smoking' instead of support for quitting. All of the GPs reported using the 'stages of change' model to guide their decision to provide treatment, hence not discussing treatment options with all pregnant patients, unless the patient reported interest in quitting. To overcome their safety concerns for using NRT, GPs wanted clear detailed clinical guidelines, with visual resources they could use to discuss treatment options with patients. **Discussion:** Australian GPs report lack of knowledge and skills to treating pregnant patients who smoke. Focusing their time on providing information on the harms of smoking, while not offering treatment options to all pregnant patients who smoke, may be contributing to low cessation rates. Training to address GP learning needs and explicitly showing 'how to have that conversation', with practical protocols on prescribing NRT, may help GPs to better support pregnant patients who smoke.

FUNDING: Academic Institution

POS3-59

PREVENTING RETURN TO SMOKING POSTPARTUM (PRES STUDY) – AN EVIDENCE BASED COMPLEX INTERVENTION FOR RELAPSE PREVENTION

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Background: Many women quit smoking during pregnancy, which can be considered a 'teachable moment' for smoking cessation. However, the proportion of women re-starting smoking by six months postpartum is high. There is no routine support to prevent relapse due to lack of evidence-based interventions. We present our theory driven intervention, developed following MRC guidelines. **Methods:** Phase 1: Review of systematic reviews of smoking cessation in pregnancy and relapse prevention interventions to identify potentially effective behaviour change techniques (BCTs) as promising intervention components. Phase 2: Qualitative intervention development with pregnant and post-partum women, partners and health professionals via focus groups and interviews. Phase 3: The prototype intervention was refined and developed with individual postpartum women using a person-based approach. **Results:** 32 RCTs were included in the review. 45 BCTs were coded. Analysis of frequency and saliency resulted in a list of 6 most promising BCTs associated with long-term effectiveness. A logic model was developed. From this, we developed draft intervention components. Detailed feedback was gathered from 34 women, 5 partners and 12 health professionals in focus groups and interviews. Midwives



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were suggested as credible sources for introducing the intervention. A tailored approach to information giving throughout pregnancy and into the postpartum period, including partner support, was important. Objective evidence-based advice on medication for relapse prevention, including the use of e-cigarettes is needed. The person-centred phase gathered insightful detailed feedback supporting the use of a tailored text message support system postpartum, linked to a website/app with health information that could be tailored to individual needs and provided access to social support. Conclusions: We present an evidence-based prototype intervention, developed from review evidence and iterative qualitative research including person-based co-production. The complex intervention will be trialled within the UK, combining a mixture of clinical, behavioural and social support delivered by multiple routes.

FUNDING: Federal

POS3-60

EXPLORING DISCRIMINANT CAPACITY OF URINARY CEMA AS COMBUSTION MARKER IN TOBACCO USERS - A POPULATION PHARMACOKINETIC APPROACH

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Background Population pharmacokinetics (PK) analysis was performed to characterize the concentration-time profile of urinary 2-cyanoethylmercapturic acid (CEMA), a marker of exposure to acrylonitrile, which is present in tobacco smoke but not in aerosol from uncombusted tobacco, such as the IQOS® heat-not-burn tobacco product. **Methods** Data from four studies, assessing exposure reduction to harmful and potentially harmful constituents (PHHC) following IQOS use compared with PHHC exposure from smoking, were pooled for analysis. Modeling and simulations were conducted using the nonlinear mixed-effect method. Goodness-of-fit diagnostics and posterior predictive checks were used to evaluate the adequacy of the model fit and prediction. The potential of CEMA as a diagnostic marker to distinguish between smoking and non-combustible tobacco use was explored by means of receiver operating characteristics (ROC) analysis. **Results** A total of 632 subjects, 322 training and 310 validation datasets, were available for analysis. CEMA was best described by a two-compartment linear dispersion with first-order absorption for product use. In the final PK model the elimination rate increased with increasing baseline CEMA and in subjects outside the U.S. region; the inter-compartmental rate constant was lower in smoking. Following single use, the levels of absorption of CEMA from IQOS were 1.3% of those absorbed from smoking. Model simulations were conducted assuming an average consumption of 13 sticks or cigarettes. The area under the ROC curve was 94% and 97% using simulated and observed CEMA values, respectively. A threshold of 40 [ng/mg creat.] resulted in a discriminant accuracy of 90% (false positive rate 2%; false negative rate 26%). **Conclusions** The population PK model characterized the kinetics of CEMA adequately. Exploratory analysis showed an excellent performance for CEMA to discriminate between smoking and IQOS use.

FUNDING: Tobacco Industry

POS3-61

A RANDOMIZED CONTROLLED TRIAL OF VARENICLINE FOR ADOLESCENT SMOKING CESSATION: MAIN FINDINGS

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Significance: While advances have yielded efficacious pharmacotherapies to complement smoking cessation counseling in adults, far less progress has been made in addressing tobacco use in adolescence. The objective of this trial was to evaluate the efficacy and safety of varenicline for adolescent smoking cessation. **Methods:** In a two-group randomized placebo-controlled double-blind intent-to-treat clinical trial, a volunteer sample of treatment-seeking adolescent cigarette smokers (N = 157, ages 14-21) were randomized to receive a 12-week course of varenicline (target dose 1 mg twice daily [0.5 mg twice daily in those weighing 55 kg or less], n = 77) or placebo (n = 80), added to weekly smoking cessation counseling. **Results:** While the varenicline and placebo groups did not differ in urine cotinine-confirmed 7-day point prevalence abstinence (PPA) at the end of treatment (Relative risk [RR] 1.01; 95% confidence interval [CI], 0.30-3.63; p=0.993), the varenicline group achieved 7+ day PPA earlier in treatment (Hazard ratio 1.93; 95% CI, 1.13-3.29; p=0.021), and demonstrated higher rates of weekly abstinence over the full course of treatment (RR 1.81; 95% CI, 1.10-

2.99; p=0.019) and post-treatment follow-up (RR 1.87; 95% CI, 1.03-3.41; p=0.041). Treatment-emergent adverse events did not differ between groups. **Conclusions:** When added to weekly cessation counseling for adolescent cigarette smokers, varenicline, compared to placebo, is well-tolerated, hastens abstinence during treatment, and yields improvements in post-treatment abstinence outcomes.

FUNDING: Federal; Industry Source

POS3-62

OUTCOMES OF A TECHNOLOGY-BASED INTERVENTION FOR FOSTER YOUTH CIGARETTE USE

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Vulnerable populations, such as foster youth, have not experienced the overall decline in cigarette use seen in recent decades. Indeed, nearly one-third of youth in foster care smoke daily. Despite these high rates, little attention has been paid to screening and intervention for this group of young people; low rates of advice from health practitioners and case managers represent a significant missed opportunity for health promotion. Accessible and engaging interventions must be created that decrease this health disparity. Study aims were to test feasibility, acceptability, and pilot efficacy of a computer- and mobile phone-based smoking cessation intervention among weekly smokers. Within a two-arm trial, feasibility was evaluated through eligibility and enrollment rates, and retention and intervention reach rates at the 1-, 3-, and 6-month interviews. Acceptability was measured through a 7-item satisfaction measure. We also assessed cigarettes per day, quit attempts, length of quit attempts, days of smoking, and 7-day point prevalence abstinence at each interview. Intervention arm participants also reported weekly readiness to change their smoking. Trial feasibility was excellent: 66 youth (81% of smokers) were eligible, of whom 51 (77%) enrolled. Retention was very good, averaging 90% over the follow-up periods. Acceptability was strong, as over 85% of participants: liked the program; liked its animated narrator; thought it was easy to use; found it interesting; could understand everything; and felt it was respectful/non-judgmental. Although intervention participants reported decreases in all smoking outcomes, these were not significantly different than the control group. Readiness to change did, however, increase over time ($t = 2.25$, $p < .05$) for the intervention group. Technology-based interventions may be attractive to youth exiting foster care and offer a link to health care that this vulnerable population may not otherwise seek. Coverage for smoking cessation under the Affordable Care Act and through Medicaid, and trends toward FDA approval of technology-based interventions offer promising opportunities to impact cessation rates among this population.

FUNDING: Federal

POS3-63

ORGANIZATIONAL PRIORITY, FEASIBILITY, AND ACCEPTABILITY OF OFFERING EVIDENCE-BASED SMOKING CESSATION SUPPORT DURING ROUTINE LUNG SCREENING

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An estimated 8.7M U.S. adults are eligible for lung cancer screening, and up to half of screening patients are current smokers. Evidence-based strategies exist but willingness and capacity to offer cessation support in the outpatient imaging setting is unknown. We conducted a survey of organizational priority, feasibility, and appropriateness of offering evidence-based cessation support in 28 lung imaging settings as part of NCIs Smoking Cessation at Lung Examination (SCALE) Collaboration. 63% of respondents stated that smoking cessation is top priority at their lung screening site. At least 75% report that the following services are being offered all or most of the time during the lung screening visit: asking about smoking and advising patients to quit. On the other hand, up to 50% of the screening sites engage in the following evidence-based strategies: documenting cessation support, referring patients to quitlines, referring patients to onsite cessation programs, offering cessation counseling, recommending NRT or prescribing pharmacotherapy. In 19 imaging facilities that were asked about feasibility and acceptability of offering evidence-based cessation support, more than 75% of respondents say they agree/strongly agree that these and other cessation support



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strategies are both feasible and appropriate to deliver within the context of lung cancer screening. Although respondents from lung cancer screening sites report that providing cessation services are a priority and are both feasible and appropriate, we found that few evidence-based cessation support strategies are currently being offered in lung cancer screening settings.

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POS3-64

BASELINE CHARACTERISTICS OF SMOKERS WHO ENROLL AND DECLINE SCALE TRIAL PARTICIPATION

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With leadership and grant support from the NCI's Tobacco Control Research Branch, 9 clinical trials testing methods to integrate tobacco treatment with lung cancer screening (LCS) have formed the Smoking Cessation at Lung Cancer Examination (SCALE) Collaboration. The goal of SCALE is to facilitate data sharing, peer feedback, and maximization of the knowledge gained from the clinical trials. Current smokers participating in SCALE trials are of interest because they may have unique characteristics compared to both the general population of smokers, and the population of smokers eligible for LCS, including being older. The goal of the SCALE trials is to accrue a representative sample of smokers who are eligible for LCS. The objective of this analysis was to describe baseline demographic and smoking characteristics of SCALE RCT participants, and compare them to smokers who are eligible for the trials, but decline to participate. Preliminary data from 4 of the 9 trials (n=915 participants) show the mean age of participants to be 63 years (range 50-80). Fifty-eight percent (529/915) of participants are male. Eighty-eight percent (801/915) of SCALE participants are White, and 5% (47/915) are Hispanic. On average participants smoke 18.4 cigarettes per day. The majority (74%) of participants smoke within 30 minutes of waking, suggesting a high level of nicotine dependence. Early data suggest minimal differences in age or gender distribution between those enrolled and those who decline enrollment. These early findings suggest RCT results will be generalizable to the general population of current smokers seeking LCS. Additional demographic and tobacco-related data from SCALE sites will be presented at the time of the conference. Monitoring eligibility and enrollment while trials are still recruiting may allow improvement of the reach to the target population during the remainder of these trials, and contribute to strategies for implementation of successful trial interventions. The SCALE RCTs will contribute important data about the efficacy of tobacco treatments in an older high-risk population of current smokers, with a long history of heavy tobacco use.

FUNDING: Federal

POS3-65

TOBACCO TREATMENT UTILIZATION AMONG VETERANS RECEIVING LUNG CANCER SCREENING THROUGH THE VETERANS HEALTH ADMINISTRATION, 2014-2018

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Implementation of effective smoking cessation interventions in lung cancer screening has been identified as a high-priority research gap by multiple stakeholders. Prospective trials of cessation interventions are underway (e.g., those included in the SCALE Collaboration), but data to guide practice and policy will not be available for several years. To address current data gaps, we conducted an observational analysis of use of evidence-based cessation interventions (pharmacotherapy and intensive [>10min] counseling) among Veterans undergoing lung cancer screening in the Veterans Health Administration (VHA). Administrative data from the VHA National Corporate Data Warehouse were used to evaluate cessation treatment utilization among Veterans who received low-dose CT (LDCT) for lung cancer screening between 2014 and 2018 and were identified as current smokers using Health Factors data in the medical record. To assess screening-related tobacco treatment, we only examined treatment occurrences within the window of 30 days before and 30 days after the LDCT test. For Veterans who were screened multiple times, only the first screening was included in this analysis. Of

the 67,494 Veterans (95% male) identified as current smokers at the time of screening, 13% received cessation pharmacotherapy only, <1% received counseling only, <1% received pharmacotherapy plus counseling, and 86% received neither counseling nor pharmacotherapy. Exploration of trends over time in proportion receiving counseling and/or pharmacotherapy showed a decrease from 2014 to 2018 (from 18% to 13%, p<.001) while screening volume increased from 175 current smokers/month to over 2600/month during the same time period. Less than 1% of smokers undergoing LDCT in VHA received the most effective form of tobacco treatment: a combination of pharmacotherapy and behavioral intervention. Behavioral treatment was particularly underused. Use of any tobacco treatment decreased over time as screening volume increased. Efforts to increase utilization of effective treatments are needed to support cessation and improve the value of lung cancer screening in VHA.

FUNDING: Federal

POS3-66

POTENTIAL IMPACT OF JOINT SCREENING AND CESSATION PROGRAMS ON SMOKING, LUNG CANCER AND OVERALL MORTALITY

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Annual lung cancer screening with low-dose computed tomography (LDCT) is recommended for adults aged 55-80 with 30 pack-year or more smoking history who currently smoke or quit within 15-years. Since 50% of screen-eligible individuals currently smoke, cessation interventions at the point of screening are recommended. However, there is limited information about the short and long term effects of different intervention approaches. We apply a well-tested simulation model to project the potential impact of joint screening and cessation programs on smoking, lung cancer and overall mortality. We used the University of Michigan lung cancer natural history model and the Cancer Intervention Surveillance Modeling Network (CISNET) Smoking History Generator to project the impact of LDCT screening and cessation programs at the point of screening for the 1950 birth-cohort. Two million individual smoking and life histories were generated. Simulated individuals were screened annually according to current guidelines and different assumptions of coverage/uptake. We then simulated a cessation intervention at the time of the first screen, under different assumptions of efficacy (probability of quitting). Point-of-screening cessation interventions reduce lung cancer and overall mortality compared to screening alone. E.g., under a 40% screening uptake scenario, the model predicts that for the 1950 birth-cohort, screening would prevent 473 per 100K lung cancer deaths and lead to 6,670 life-years gained (LYG) per 100K. Adding a cessation intervention at the time of first screen with a 10% success probability, would increase these gains to 528 lung cancer deaths prevented per 100K (12% increase) and 10,617 LYG per 100K (59% increase). Effective cessation interventions at the point of screening could greatly enhance the impact of LDCT screening programs. The NCI SCALE (Smoking Cessation at Lung Examination) Collaboration is conducting several RCTs to provide evidence about the most effective approaches for this unique setting and population. These and other emerging data should be integrated into impact analyses as they become available.

FUNDING: Federal

POS3-67

NICOTINE PHARMACOKINETIC AND PHARMACODYNAMIC EFFECTS OF P4M3 COMPARED WITH SUBJECTS' OWN ELECTRONIC CIGARETTE

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Background. P4M3 is an e-cigarette developed as an alternative product for smokers with the potential to reduce the risk of smoking-related diseases. This study investigated the nicotine pharmacokinetic (PK) and pharmacodynamic (PD) effects of four P4M3 variants compared with subjects' own e-cigarette. **Methods.** This was a single-center, open-label, concentration-ranging study to evaluate the nicotine PK profile and PD effects (puffing topography, craving and sensory assessment, product evaluation) in healthy adult users of e-cigarettes and using P4M3 (1.7%, 3%, or 4% e-liquid nicotine concentration) or their own e-cigarette (mean e-liquid nicotine concentration 3%). Subjects used all products with a fixed puffing regimen (12 puffs) and *ad libitum* for 60 minutes.



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Fifteen subjects were randomized to one of two sequences to cross-over the use of P4M3-1.7% variants. The study was registered at www.clinicaltrials.gov (NCT03379740). **Results.** Following the fixed puffing regimen, there was a nicotine concentration-dependent increase in mean maximum nicotine concentrations (C_{max}) for P4M3 variants from 5.1 to 12.0 ng/ml, while mean C_{max} for subjects' own e-cigarette was 5.4 ng/ml. Median time to C_{max} was 7-10 minutes for all products. Nicotine exposure, assessed as area under the curve over four hours (AUC_{0-4h}), for P4M3 variants increased for higher nicotine concentrations from 7.0 to 13.6 h \times ng/mL, while mean AUC_{0-4h} for subjects' own e-cigarette was 7.8 ng/ml. Craving reduction and mean puff volume were comparable for all products. Following *ad libitum* use, there was a nicotine concentration-dependent increase in mean AUC_{0-4h} for P4M3 variants from 28.6 to 52.8 h \times ng/mL, while mean AUC_{0-4h} for subjects' own e-cigarette was 33.8 h \times ng/mL. Product evaluation subscale scores were higher for subjects' own e-cigarette. Mean total puff volume was 2050 mL for subject's own e-cigarette and 1930 mL for P4M3-4% but higher for other P4M3 variants, ranging from 2600-2950 mL. **Conclusions.** Nicotine exposure increased with increasing nicotine concentrations of P4M3 variants and was comparable to or exceeding subject's own e-cigarette. There were no safety signals observed.

FUNDING: Tobacco Industry

POS3-68

DECREASED LEVELS OF BIOMARKERS OF EXPOSURE IN SMOKERS SWITCHING TO CARBON HEATED TOBACCO PRODUCT 1.2: A RANDOMIZED, CONTROLLED, OPEN-LABEL 90-DAY EXPOSURE STUDY

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Background In addition to smoking cessation (SC) programs, tobacco harm reduction strategies include switching from cigarettes to reduced-risk alternatives in smokers who wish to continue to smoke. The Carbon Heated Tobacco Product (CHTP) 1.2, similar in appearance to a cigarette, replicates the smoking ritual while generating a nicotine-containing aerosol by heating tobacco instead of burning it and is currently being assessed for its harm reduction potential compared with cigarettes. **Methods** We conducted a randomized, controlled, open-label, two-arm parallel group study in 120 healthy adult European smokers who either switched from cigarette smoking to CHTP 1.2 (CHTP 1.2 group; N=80) or continued to smoke cigarettes (cigarette group; N=40) for five days in a confined setting followed by 85 days in an ambulatory setting. The study aimed to demonstrate reduction in the exposure to 14 harmful and potentially harmful constituents and to evaluate the effects on clinical risk endpoints (CRE) indicative of mechanistic pathways underlying the development of smoking-related diseases and the safety profile between the two groups. **Results** Significant reductions in all biomarkers of exposure (BoExp) were observed in the CHTP 1.2 group on Day 5 (40.2% to 94.9%) and sustained throughout the 85-day ambulatory period (36.3% to 92.9%) when compared with the cigarette group. In addition, changes in CREs involved in lipid metabolism, inflammation, endothelial dysfunction, and platelet activation were favorable in the CHTP 1.2 group, consistent with those observed in the literature upon SC. Lung function parameters exhibited no differences between the two groups, as lung function changes require a longer period. CHTP 1.2 was well accepted and delivered satisfactory nicotine levels. Most of the adverse events were assessed as mild or moderate; none led to discontinuation of the randomized subjects. **Conclusions** Switching from cigarettes to CHTP 1.2 resulted in significant reductions in BoExp levels that were associated with favorable changes in some CREs. These results provide evidence that CHTP 1.2 likely reduces the risk of developing smoking-related diseases compared with cigarettes.

FUNDING: Tobacco Industry

POS3-69

CHANGES IN USE PATTERNS AMONG SMOKERS AND DUAL USERS

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Background: Dual use of electronic nicotine delivery systems (ENDS) and combustible cigarettes is a growing use pattern; more than half of ENDS users are dual users. However, there is little understanding of the course of dual use; what is the likelihood

that it is sustained, or that dual users transition to sole use of combustible cigarettes or ENDS, or neither. This research examined changes in smoking and ENDS use patterns.

Methods: Adult daily smokers and dual users (daily smokers who also vape at least once/week) participated in a longitudinal, observational study (N=322 of the 422 initial sample [76% retention], 51.2% women, 62.7% white, mean age=42.27 [SD=14.05]). Participants did not intend to quit using cigarettes or ENDS in the next 30 days at baseline and completed measures of demographics and smoking and vaping history. Participants reported daily cigarette and ENDS use via timeline follow-back assessment for 1 year; 30-day self-reported point-prevalence abstinence at 1-year post-study entry captured ENDS and cigarette abstinence. **Results:** At Year 1 follow-up, 2.6% of baseline smokers and 7.3% of baseline dual users had quit smoking. Among baseline dual users, 43.9% were smoking only, 48.8% continued dual use, 5.9% were vaping only, and 1.4% abstained from both products. Among baseline smokers, 92.3% continued smoking only, 5.1% reported dual use, 0.9% were vaping only, and 1.7% abstained from both products. Baseline dual users who continued ENDS use vs stopping were more likely to be white and report: greater reduction in cigarette craving due to dual use; higher e-cigarette dependence, self-reported addiction, and vaping days per week. Continuers were also less motivated to quit vaping or confident in their ability to do so. Gender, education, psychiatric history, and cigarette dependence were not related to Year 1 use patterns. **Conclusions:** In this community sample, dual use of ENDS and cigarettes was unstable with only half of dual users continuing to use both products for a year. Slightly more dual users quit smoking than smokers, but attrition compromises strong conclusions. Sustained ENDS use was related to baseline ENDS dependence.

FUNDING: Federal

POS3-70

A RANDOMIZED TRIAL OF DISTRESS TOLERANCE TREATMENT FOR WEIGHT CONCERN IN SMOKING CESSATION AMONG WOMEN

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Significance: Many women who smoke report that concern about weight gain is a barrier to initiating and maintaining abstinence. **Methods:** We conducted a randomized controlled trial (RCT) in which we compared a distress tolerance-based intervention that specifically targeted concerns about post-cessation weight gain (DT) to a smoking health education (HE) comparison intervention. DT skills included acceptance and defusion of distressing thoughts and feelings related to weight gain and body image, increasing attention toward values and values-oriented behavior, increasing awareness of hunger and satiety cues and using these cues to guide eating behavior (vs. emotions and external triggers), and mindful eating. DT and HE were matched on duration (9 weeks) and format (a 60-min individual session followed by 8 weekly 90-min group sessions; quit date at group session 4). Also, both DT and HE included identical elements of cognitive-behavioral therapy (CBT) for smoking cessation and 8 weeks of nicotine patches. **Results:** Participants (N = 61 who attended at least one group session) were M = 49.1 (SD = 12.7) years old and smoked M = 15.9 (SD = 7.0) cigarettes per day. Groups ranged from 4-11 women. Attendance did not differ significantly in DT (M = 5.8 sessions) vs. HE (M = 5.7 sessions), $p = .78$. Program effectiveness, usefulness of skills, and understanding of content were rated on 5-pt scales (5 = highest). DT and HE did not differ on effectiveness or usefulness, but understanding was slightly lower in DT ($M = 4.29$) than HE ($M = 4.71$), $p = .04$. CO-verified 7-day point-prevalence abstinence rates (unadjusted for group clustering) at end of treatment were 17% (5/29) in DT vs. 25% (8/32) in HE (OR = 0.63, 95% CI [0.18, 2.19], $p = 0.46$) and at 1-month post-treatment were 14% (4/29) in DT vs. 16% (5/32) in HE (OR = 0.86, 95% CI [0.21, 3.58], $p = 0.84$). Among abstinent participants, DT and HE did not differ in mean weight gain ($p > .05$). **Conclusion:** These results suggest that the DT intervention did not improve outcomes relative to standard treatment and quit rates were low overall. Continued innovation in treatment development for weight-concerned smokers is needed.

FUNDING: Federal



SRNT

POS3-72

PATIENT EXPERIENCE OF QUIT LINE REFERRALS

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Significance: Electronic referrals to state Quit Lines for tobacco-using patients are a promising strategy for addressing smoking cessation on a large scale. However, prior research has indicated that patient contact rates are below 50%. The purpose of this study is to understand the e-referral process from the patient's perspective. **Methods:** We audio-recorded in-depth interviews with 55 primary care patients who agreed to be contacted by the Quit Line. Interviews were based on a semi-structured guide designed to explore the experiences of patients who 1) were successfully enrolled, 2) declined enrollment or 3) were unreachable. Analysis was guided by a phenomenological approach designed to identify emergent themes. **Results:** Participants had a median age of 53, with the majority being female (75%), African American (58%) and non-Hispanic (93%). Those enrolled in the Quit Line reported valuing the personal connection to Quit Line counselors, the specialized support, and the text messages of reminders and tips. Reasons for declining enrollment included lack of confidence to quit and expectations about services that differed from what was offered. Those who were never reached by the Quit Line reported a wide variety of experiences, including inconvenient timing of the phone calls, a practice of not answering 1-800 numbers, and having already quit on their own. A significant number of those who were categorized as unreachable were still interested in Quit Line services. **Conclusions:** The potential for Quit Lines to reach and support the population of smokers is significant, but hindered by an array of issues including unmet expectations, poor timing, and ambivalence about quitting. Strategies for improving Quit Line enrollment rates are described.

FUNDING: Federal

POS3-73

CHOICE OF E-CIGARETTE NICOTINE DOSE AND FLAVOR IN VETERANS WITH CO-MORBID DISORDERS

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Significance: Electronic cigarettes (EC) may aid some smokers in reducing combustible tobacco use. Smokers with mental health co-morbidities tend to have higher nicotine dependence and worse outcomes, so may particularly benefit from alternative cessation aids. EC characteristics like nicotine level and flavor may influence EC's appeal to smokers and nicotine level may impact EC's efficacy in reducing combustible cigarette use. **Methods:** Non-treatment-seeking cigarette smokers with medical/psychiatric co-morbidities rated 'liking' of ECs varying in nicotine level (12mg, 24mg) and flavor (menthol, tobacco ('slim', 'burley')), during an open-label Choice Procedure. Participants (N=43) chose ECs for a 4-week take-home trial, during which they used e-cigarettes and/or combustible cigarettes as they wished. Analyses examined ratings and choice by nicotine level and flavor, and the relationship between choice of 12mg versus 24mg for the 4-week trial with baseline demographic/smoking characteristics, and outcomes (combustible cigarette use, nicotine intake, motivation to quit smoking (0—10 scale)) during the 4-week trial and one-month follow-up. **Results:** Participants were mostly men, with a mean age of 57 (SD=8), and smoked on average 17 cigarettes/day at baseline. Individuals who subsequently chose menthol or tobacco flavor or 24mg nicotine for the first take-home week 'liked' these conditions more than alternative options. Groups who chose 12mg (N=15) versus 24mg (N=19) throughout the take-home trial did not significantly differ on demographic or baseline smoking-related variables, or smoking-related outcomes within the take-home trial, however, motivation to quit smoking increased by 2 points (95% CI 0.05, 3.96) more from baseline to one-month follow-up in choosers of 24mg. **Conclusions:** Associations between subjective ratings and subsequent choice support feasibility of open-label choice-procedures in EC trials. Access to 12mg or 24mg nicotine ECs reduced smoking in individuals with medical/psychiatric co-morbidities.

FUNDING: Federal

POS3-74

IDENTIFYING SMOKING-RISK ENVIRONMENTS FROM EVERYDAY IMAGES WITH DEEP LEARNING

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Significance: Environments associated with smoking elicit craving and may provoke lapses following a quit attempt. In this work, we determine whether everyday images (i.e. the world as viewed by the smoker) can be used to predict smoking risk, thus providing a basis for just-in-time, situation-specific interventions. **Methods:** Images of everyday smoking (N=2457) and nonsmoking (N=2445) locations were photographed by 169 smokers. Participants were instructed not to photograph people and to remove proximal smoking cues (e.g. cigarette packs). Images not meeting these criteria were removed. The images were then used to develop a probabilistic classifier that predicts the location type (smoking/nonsmoking), thus relating everyday objects/settings to smoking risk. The classifier was developed by combining a deep convolutional neural network (CNN) with an interpretable logistic regression model, and was trained and evaluated via nested cross-validation partitioned by participant (i.e. out-of-sample prediction). To contextualize results, model performance was compared to manual classification by four smoking cessation experts on a subset of photographs (N=732). To test the relationship between craving and model-predicted smoking risk, participants reported their craving after viewing images of 8 common but unfamiliar environments. **Results:** The final model discriminated smoking/nonsmoking environments with 0.827 AUC and 75.3% accuracy. Models trained on geographically distinct subgroups performed equally well when evaluated on the same data ($p>0.05$), suggesting good model generalizability. Only one expert's performance was a statistically significant improvement over the classifier ($\alpha=0.05$). Median self-reported craving was significantly correlated with model-predicted smoking risk ($r_s=0.894$, $p=0.003$). **Conclusion:** Smoking risk and craving can be predicted consistently across participants based on environmental objects and settings (i.e. not including people or proximal smoking cues). Computer vision can identify environmental features associated with smoking, predict risk and craving associated with any image of everyday life, and trigger just-in-time, situation-specific smoking interventions.

FUNDING: Federal

POS3-75

COMPARATIVE EFFECTS OF COMBINATION NICOTINE REPLACEMENT THERAPY OR VARENICLINE VERSUS PATCH MONOTHERAPY ON CANDIDATE MEDIATORS OF EARLY ABSTINENCE

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Background: Examining the differential effects of varenicline and nicotine replacement therapy on candidate psychological mediators of abstinence may help to identify reasons for treatment effects or failure (e.g., failure to affect mediators, weak mediator-abstinence relations). **Method:** Secondary analyses of a 3-arm randomized clinical trial of nicotine patch, varenicline and combination NRT (C-NRT; patch and mini-lozenge) were conducted. The trial showed no difference in abstinence rates by medication condition among adult daily smokers (N=1086) given 6 sessions of counseling. Smoking status and mediator ratings were assessed via ecological momentary assessment from 1 week pre-quit to 4 weeks post-quit. The outcome was CO-confirmed 7-day point-prevalence abstinence 4 weeks post-quit. Multilevel models tested the effects of varenicline and C-NRT (vs. patch) on candidate mediators (e.g., craving, positive affect, negative affect, cessation fatigue, and positive smoking expectancies) and logistic regression models tested associations between mediators and abstinence 4 weeks post-quit. **Results:** **Treatment-Mediator:** Varenicline suppressed craving, positive affect, and positive smoking expectancies pre-quit while C-NRT suppressed pre to post-quit increases in craving, negative affect, and positive smoking expectancies but it prolonged negative affect post-quit vs. patch. **Mediator-Abstinence:** Lower craving, negative affect, and positive smoking expectancies and higher positive affect predicted greater odds of abstinence. **Mediation:** Significant mediated effects were observed for varenicline via reduced pre-quit craving and accelerated pre-quit declines in positive smoking expectancies and for C-NRT via reduced post-quit positive smoking expectancies vs. patch. **Conclusion:** Varenicline improves pre-quit craving and smoking expectancies while C-NRT has positive effects



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on these targets and affect post-quit. These targets are predictive of later abstinence, and some mediated effects are significant, suggesting differential treatment effects on mediating pathways despite the lack of differences in abstinence.

FUNDING: Federal

POS3-77

A PILOT STUDY ADDRESSING POSTPARTUM SMOKING RELAPSE AMONG LOW INCOME WOMEN

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Significance. Maternal smoking during pregnancy can have dire consequences for both baby and mother and low-income women smoke at particularly high rates during pregnancy. While many women quit smoking during pregnancy, many relapse postpartum. This randomized control trial tested the effect of adding postpartum assistance to an existing smoking cessation program designed for low-income women, the First Breath program. **Method.** The Wisconsin Women's Health Foundation's First Breath program consists of brief prenatal smoking cessation counseling based on the Public Health Guideline's 5As. For this study, one additional prenatal counseling visit, up to three in-home postpartum counseling visits, up to three postpartum counseling calls, an opportunity to earn up to \$100 for participation and abstinence, and availability for help to other smokers in the home was added to the First Breath program. The primary outcome was biological confirmed abstinence six months postpartum. Ninety-four women were randomly assigned to the standard First Breath program (control); 91 to the enhanced program (treatment). **Results.** Six-month follow-up with biochemical confirmation was completed on 51.9% of participants. Of those who completed the study, abstinence was significantly greater for the intervention group compared to the control group (35.9% vs. 12.5%, respectively) ($p=.011$). Calculated on an intent to treat basis, the intervention group abstinence rate was greater than the control group, although not statistically so (15.4% vs. 7.6%, respectively) ($p=.11$). **Conclusion.** Extending smoking cessation postpartum decreased relapse, although the difference was not statistically significant in this small sample-size pilot study. However, more than doubling of abstinence rates among intervention participants suggests a clinically meaningful difference that should be confirmed in a study with greater power.

FUNDING: Federal; Academic Institution

POS3-78

EIGHTEEN YEARS OF HELPING LOW INCOME PREGNANT WOMEN QUIT SMOKING; LESSONS LEARNED FROM THE FIRST BREATH PROGRAM

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Significance. Maternal smoking during pregnancy can have dire consequences for both baby and mother. In 2000, the Wisconsin Women's Health Foundation (WWHF) developed the First Breath program to address this challenge, particularly among those with low incomes. Over the past 18 years, the First Breath program has evolved to pursue improved outcomes and in response to healthcare delivery system changes. **Methods.** In the original First Breath program (2000 - 2016), prenatal care providers for low-income women, typically county health workers, delivered brief pre-natal smoking cessation counseling. Over 16,000 pregnant women were treated. While effective, postpartum relapse was high and influenced by environmental factors in the home. These findings highlighted the importance of extending First Breath counseling into the postpartum period, including home visits and offering support to others in the home who smoke. An additional challenge was created by the increasing job demands on the county healthcare workers who provided First Breath program. This contributed to a reduction in enrollment starting in 2012. In response, the First Breath program evolved so that counseling is now provided by dedicated tobacco cessation counselors employed by WWHF. These changes in program components were evaluated in a pilot studies. **Results.** Over 19,000 women have now received help through the First Breath program. Outcomes are improving as a result of extending the First Breath program into the postpartum period. The new delivery method has already added 53 new community enrollment sites since its statewide expansion in 2018. **Conclusion:** Sustaining

a valuable tobacco dependence intervention program serving a vulnerable population requires both continuous improvement built on research and responding to changes in the healthcare delivery system. Over 18 years First Breath has evolved to do just that, helping over 19,000 pregnant women in Wisconsin who smoke to quit.

FUNDING: Unfunded; State; Academic Institution; Nonprofit grant funding entity

POS3-79

THE EFFECTIVENESS OF A VIDEO-LED SMOKING CESSATION INTERVENTION IN HELPING CHINESE MALE SMOKERS WHOSE PARTNERS GOT PREGNANT TO QUIT: A RANDOMIZED CONTROL TRIAL

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Background: More than one-third of males whose partners got pregnant are smokers in China. About 73% of them do not recognize the hazards of smoking to their reproductive function and to the health of pregnant women, fetus and newborns. Providing related knowledge can motivate these smokers to quit. However, the traditional methods to deliver smoking cessation information has persistently demonstrated to be not effective. There has been an increase in the use of video to enhance the information delivery. This study examined the effectiveness of a video-led intervention in helping male smokers whose partner got pregnant to quit smoking.

Methods: A three-armed cluster randomized controlled trial was conducted. Male smokers whose partner got pregnant and exhaled carbon monoxide level > 4ppm were eligible for this study. A total of 1018 male smokers were recruited and randomly allocated into a video-led intervention group (n= 322) to receive four videos focusing on the smoking hazards to pregnant women, fetus and newborns via smartphones, a text message intervention group (n=323) to receive text information related to the smoking hazards to pregnant women, fetus and newborns via smartphone, and a control group (n=363) to receive a leaflet on smoking cessation. The primary outcome was self-reported 7-day point prevalence of abstinence at 6-month follow-up. The secondary outcome was biochemically validated quit rate at 6 months. Intention-to-treat analysis was employed.

Results: The result of multivariate binary logistic regression analysis revealed that self-report point prevalence 7-day abstinence at 6-month follow-up in the video intervention group was significantly higher than that in the text message intervention group (25.0% vs. 17.4%, OR=0.63, 95% CI: 0.42-0.96) and control group (25.0% vs. 15.7%, OR=0.75, 95% CI: 0.60-0.93). Significant differences were found in biochemically validated quit rate between the video intervention and text message intervention groups (19.5% vs. 13.4%, OR=0.64, 95% CI: 0.42-0.97), and between video intervention and control groups at 6-month follow-up (19.5% vs. 9.2%, OR=0.65, 95% CI: 0.52-0.81).

Conclusions: The video-led smoking cessation intervention is effective in helping male smokers whose partners got pregnant to quit smoking. Healthcare professionals can consider using this method to deliver smoking cessation information so as to help smokers in other settings to quit smoking.

POS3-80

SMOKERS DESIRE PERSONAL GENETIC TESTING AND GENETICALLY EFFICACIOUS MEDICATION

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Significance: A recent Cochrane review and meta-analysis showed that some smoking cessation pharmacotherapies may indeed be more advantageous for smokers with certain genetic makeups. The clinical translation of genetic research on nicotine dependence and treatment response requires acceptance of genetic testing by smokers. This study determines (1) which current smokers are receptive to genetic susceptibility testing for nicotine dependence and (2) to what potential extent smokers motivated to quit desire to take smoking cessation medication when hypothetical genetic results predict their pharmacogenetic medication response.

Methods: A total of 1515 current smokers were surveyed on their hypothetical interest in seeing genetic testing results related to risk of nicotine dependence. A group of smokers (N=474) motivated to quit were assessed for their hypothetical interest in receiving genetically efficacious cessation pharmacotherapy.

Results: Most current smokers (84.8%) reported high interest in receiving genetic testing results. Factors associated with high interest included age greater than 40 years, having a college degree, and a positive medical history (≥ 1 medical condition). In the ongoing smoking cessation trial, current smokers motivated to quit were surveyed on their desire to take smoking cessation medication given hypothetical



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below or above average pharmacogenetic responses to the medication. When the hypothetical medication response changed from below to above average, significantly more smokers reported a desire to take medication (from 61.0% to 97.5%, $p < .0001$). **Conclusions:** These findings suggest that genetic testing for personalized smoking cessation treatment is well-received by smokers and that a positive hypothetical pharmacogenetic response increases desire to take smoking cessation medication among current smokers motivated to quit. This work suggests the potential use of genetic information in increasing smokers' motivation for treatment.

FUNDING: Federal

POS3-81

A TEXT MESSAGING INTERVENTION TAILORED TO PRIMARY CARE PATIENTS' READINESS TO QUIT WITH MEDICATION ADHERENCE SUPPORT: A PILOT RANDOMIZED TRIAL OF GETREADY2QUIT

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SIGNIFICANCE: Text messaging shows promise as an aid to help smokers, but it is unclear how to integrate it effectively into primary care settings. We developed and are testing a text messaging program with 2 novel elements: messages for smokers not ready to set a quit date and nicotine replacement therapy (NRT) adherence messages. Here we present preliminary feasibility and efficacy results for patients who have completed 12 weeks of a pilot trial. **METHODS:** In a pilot RCT, we recruit adult daily smokers from a primary care network using proactive telephone outreach and a study website. Randomization is stratified by clinic and plan to quit within 30 days, to 1 of 4 groups: brief advice about treatment options and local services (BA), brief advice + text messages (TM), brief advice + 2-weeks of NRT by mail (NRT), or brief advice + TM + NRT (TM+NRT). Patients are surveyed by phone/email at 1-, 2-, 6- and 12-weeks. **RESULTS:** Of 1,266 potentially eligible patients approached, we reached 819 (65%). Of these, 489 (60%) declined, 203 (25%) were ineligible and 127 (16%) have been randomized. Of 68 patients who completed 12-weeks to date, 62% are women, mean age 53 years, 75% white, 12% African-American, 9% Hispanic, 4% other and 53% have Medicaid. Overall, 30% screened positive for alcohol use disorder, 16% for other substance use, 28% for depression (PHQ-2) and 53% for anxiety (GAD-2). The 12-week response rate is 97%. So far, there are no differences compared to BA in self-reported quit attempts (BA:69%, TM:88% $p=0.22$, NRT:89% $p=0.21$, TM+NRT:71% $p=0.99$) or in 7-day point-prevalence abstinence (BA:13%, TM:18% $p=0.99$, NRT:33% $p=0.23$, TM+NRT: 12% $p=0.99$). NRT use is common (BA: 50%, TM: 71% $p=0.30$, NRT: 78% $p=0.15$, TM+NRT: 88% $p=0.03$) with no difference in adherence over the first 2 weeks between NRT only (3.7 days of NRT use) or NRT+TM (3.1 days, $p=0.67$). **CONCLUSION:** In this pilot study, we proactively recruited and retained smokers, many with comorbid substance use and mental illness, by coordinating with but not burdening PCPs. Interim analysis shows a high response in the BA arm and no differential benefit yet from other interventions. Full results will be presented in February 2019.

FUNDING: Federal; Academic Institution

POS3-82

SYSTEMS SCIENCE TO INFORM SYSTEMS INTERVENTION: IMPROVING DELIVERY OF HOSPITAL SMOKING CESSATION TREATMENT

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Significance: Smoking prevalence remains high among those entering hospital settings, presenting an opportune time to promote cessation. However, use of standardized approaches to ensure consistent and timely delivery of effective and high-reach smoking cessation treatments is rare in inpatient settings. The goal of this project is to generate systems understanding of hospital-based smoking cessation treatment to guide implementation of stakeholder-informed interventions to ensure that all inpatients who smoke receive evidence-based treatment support. **Methods:** To inform a systematic approach to delivering evidence-based cessation care for hospitalized patients, we conducted a mixed methods study including a series of in-depth group model building sessions using a community-based system dynamics approach with practitioners (n=28) and patients (n=22). These qualitative data informed

the design of a quantitative online survey of hospital practitioners (n=308) and a structured interview protocol administered at the bedside to patients who smoke (n=205).

Results: Qualitative and quantitative findings demonstrated that inpatient smoking contributed to major workflow problems, with 80% of practitioners reporting that patients frequently leave the floor to smoke. Key disconnects were also found between patients and practitioners; patients reported much lower rates of receiving cessation medication (29%) as compared to practitioner reported delivery (64%, $p < .001$). Further, 92% of practitioners cited patient interest as a key barrier to smoking cessation treatment, yet only 4% of patients indicated no interest in quitting or smoking less. Patients and practitioners agreed that point-of-care treatment support was important and feasible in inpatient settings.

Conclusions: Workflow problems and stark mismatches between patient and practitioner reports of treatment highlight the need for systematic interventions to facilitate consistent delivery of high-reach, effective cessation care. This can be achieved through standardized electronic health record-enabled smoking cessation treatment, featuring simplified decision support and practitioner feedback to guide point-of-care smoking cessation care in hospital settings.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

POS3-83

A HEALTH SYSTEM AND QUITLINE PARTNER TO CREATE A CONTINUUM OF CESSATION CARE FOR HOSPITALIZED SMOKERS

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Significance: Bedside tobacco cessation interventions, with at least one month of post-discharge supportive contact, increase cessation rates. The current study tested this model in a real-world setting by capitalizing on one of the most robust, state-funded Quitlines. Delaware's comprehensive Quitline services include telephonic and in-person, cessation counseling; one of the seven FDA-approved cessation medications at no charge; and unlimited re-enrollment, allowing tobacco users to quit at their own rate with a dedicated quit coach and free cessation medication. **Methods:** In this "opt-out" program, tobacco users admitted to one of 12 inpatient units in a large hospital were automatically referred to tobacco cessation services. A tobacco treatment specialist (TTS) visited patients using the "5 A's" (ASK-ADVISE-ASSESS-ASSIST-ARRANGE) tobacco dependence treatment model. Ready-to-quit tobacco users were offered post-discharge e-referral to a telephonic Quitline coach or in-person Quitline coach at the hospital. All admitted tobacco users, whether visited or not, received automated, interactive follow-up calls at day 3, 14, and 30 to assess tobacco use and connect them to Quitline services. **Results:** Between Sept 1, 2017 and May 1, 2018, 1547 tobacco users were enrolled in the program. The sample was 57% male, 74% white, with a mean age of 55 years (SD=14). Of the 1010 tobacco users who were visited in the hospital, 879 (87%) accepted bedside counseling from a TTS. Of the 879 who were counseled at the bedside, 303 (42%) were ready to quit and e-referred to telephonic (34%) or in-person (8%) Quitline counseling. Sixty-two percent (964/1547) received cessation support at the bedside or via post-discharge follow-up calls. Of those reached within 30 days, 38% (244/650) reported not using tobacco (44% for those who did, and 27% for those who did not, receive bedside counseling). The intent-to-treat quit rate was 16% (244/1547). **Conclusion:** This study demonstrated that a partnership between a healthcare system and a state Quitline can provide a feasible and effective continuum of cessation care, from the bedside back to the community.

POS3-84

THE EFFECTS OF VARENICLINE, BUPROPION, NICOTINE PATCH, AND PLACEBO ON CESSATION AMONG SMOKERS WITH RECURRENT AND SINGLE EPISODE MAJOR DEPRESSION

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SIGNIFICANCE: Smokers with recurrent major depressive disorder (MDD) appear to have more difficulty quitting smoking than their counterparts who experienced a single



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depressive episode. Evaluating the comparative effectiveness of smoking cessation aids in recurrent and single episode MDD subgroups may provide useful information on treatment selection. **METHODS:** The current study is a secondary analysis of the EAGLES trial (Anthenelli, et al., Lancet, 2016) in which 8144 smokers were randomized to 12 weeks of daily doses of varenicline 2 mg (VAR), bupropion 300 mg (BUP), nicotine replacement therapy (21 mg patch; NRT), or placebo (PBO). The present (n = 6653) sample was comprised of those with No current or history of psychiatric disorders (N; n = 4028); those with recurrent MDD (R; n = 1282); and those with single episode MDD (S; n = 1343). Using logistic regression we evaluated the group by treatment interaction for continuous abstinence at the end of treatment (EOT; week 9-12) and at 6 months (week 9-24) and tested simple effects using a Tukey adjustment for multiplicity. **RESULTS:** No overall group by treatment differences were noted at EOT ($F[6, 6640] = 0.70$; $p = 0.6460$). In group N, VAR demonstrated greater abstinence than BUP, NRT, and PBO; BUP and NRT out-performed PBO, but failed to demonstrate a difference with each other. Among participants in depression group R, VAR out-performed BUP, NRT, and PBO; BUP and NRT outperformed PBO, but failed to demonstrate a difference with each other. In depression group S, each active condition demonstrated superiority to PBO, with no evidence that any active treatment differed from each other. Similar findings were noted for the interaction and individual treatment simple effects at 6 months ($F[6, 6640] = 0.64$; $p = 0.6992$). **CONCLUSIONS:** Results suggest that while all active treatments differ from placebo for continuous abstinence, among those with recurrent MDD, VAR out-performs BUP and NRT at EOT and at 6 months.

FUNDING: Industry Source

POS3-85

SMOKING CESSATION MEDICATIONS ARE RARELY USED AMONG SMOKERS UNDERGOING SURGERY

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Significance: Hospitalization for surgery represents an opportunity for smokers to quit and, as such, the American College of Surgeons recommends that all smokers receive an intervention, which may include smoking cessation pharmacotherapy (SCP). However, little is known about how often SCP is utilized in the peri-operative period. **Methods:** Using billing data and ICD-10 codes from a diverse group of hospitals participating in Premier Inc. database in 2016, we examined how often nicotine replacement (patch, gum, lozenge, inhaler) and varenicline were administered to current smokers hospitalized for a surgical procedure. To assure a need for SCP and adequate time to prescribe, we excluded surgical procedures with an expected hospital length of stay of less than 3 days. We also examined patient, surgical, and hospital factors associated with use of SCP using hierarchical multivariable modeling. **Results:** At 466 hospitals, we included 165,335 current smokers (mean 63.7 years, 51.8% male, 78.1% white, 42.8% orthopedic surgery.) Overall, 4583 (2.8%) of patients received a SCP at any point during their hospitalization. Key patient factors associated with higher SCP were younger age, Medicaid insurance, the presence of chronic lung disease, psychiatric disease, and alcohol or drug abuse. Patients undergoing emergent/urgent (vs. elective) surgery and those having surgery for malignant neoplasms were more likely to use SCP [OR 1.57 (95% CI 1.46 to 1.69) and OR 1.38 (95% CI 1.19 to 1.57), respectively.] Additionally, there was variation between hospitals with a median hospital use rate of 2.3% (IQR: 1.2- 4.4%). Just 1% of hospitals achieved a 15% or higher SCP use rate while 85 (18%) hospitals did not prescribe SCP to a single patient. **Conclusions:** In a large sample of smokers hospitalized for a surgical procedure, we found that only a small minority received any SCP. Given that more than 10 million operations are performed each year on smokers, and that smoking is an important risk factor for delayed wound healing and other post-operative complications, our findings appear to reflect a major missed opportunity to improve the surgical care and outcomes of patients who smoke.

FUNDING: Federal; State; Academic Institution

POS3-86

CIGARETTE DEVALUATION AS A STRATEGY FOR FACILITATING SWITCHING TO ELECTRONIC CIGARETTES

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SIGNIFICANCE: Electronic cigarettes (e-cigs) offer a promising strategy for tobacco harm reduction but continued use of combustible cigarettes (CCs) will attenuate the health benefits of switching. Previously we have found that the subjective rewarding effects of CCs are attenuated when pre-smoking nicotine levels are elevated by wearing a nicotine patch. Here we tested whether using an e-cig right before each CC would reduce CC reward, and whether e-cigs used after a period of abstinence would become more rewarding over time. **METHODS:** Six healthy adults who smoked 5 to 15 CCs per day on a regular basis for at least one year were recruited from the Raleigh and Durham, North Carolina areas. After initial screening and enrollment, each subject attended one lab session after overnight abstinence (12+ hours) in which they were asked to smoke *ad libitum* one of their usual brand CCs on two occasions, separated by 60 minutes. In counterbalanced order, subjects smoked their usual brand CC either: 1) immediately preceded by paced e-cig puffs (ten puffs over 5 minutes of a commercially available e-cig) or 2) not immediately preceded by e-cig use. Each product was rated for rewarding and aversive effects. Following the lab session, subjects were provided with a one-week supply of e-cigs and instructed to use them immediately prior to smoking their usual brand CCs. Daily ratings of satisfaction with each product were collected by text messaging. **RESULTS:** In the lab session, satisfaction ratings (1-7 scale) for CCs when smoked after the e-cig were significantly lower than when smoked after abstinence (4.0, SD=1.3 versus 5.5, SD=1.2). Over the week-long exposure period, satisfaction ratings were initially higher for CCs, but there was a trend for CCs to be rated less satisfying than the e-cig by the end of the week. Day 1 ratings of satisfaction for the e-cig were 4.0 (SD=1.1) versus 4.7 (SD=1.0) for the CC; by day 7, the e-cig ratings were 4.2 (SD=1.5) and the CC ratings were 4.0 (SD=1.6). **CONCLUSIONS:** Cigarette devaluation is a promising strategy for enhancing the relative rewarding value of e-cigs versus CCs and should be explored in longer-term switching studies.

FUNDING: Other

POS3-87

SMOKING BEHAVIOR FOLLOWING EXPOSURE TO A TANK BASED ELECTRONIC NICOTINE DELIVERY SYSTEMS ENDS CUE

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While passive exposure to the use of electronic nicotine delivery systems (ENDS) has been shown to increase desire to smoke in young adult smokers, it is unknown whether they also induce smoking behavior. In the current study, we examined the effect of passive exposure to tank-based ENDS use on the latency phase of the Smoking Lapse Paradigm (McKee, 2006). Twenty minutes after exposure to a confederate using a tank-based e-cigarette device, each participant underwent a 50-minute smoking choice task whereby they would be awarded \$.20 for every 5 minutes that they chose not to smoke. Latency to smoke was the main dependent measure as well as reasons for smoking (i.e., novelty, monetary reasons, exposure to smoking, etc.) assessed at the end of the session. Participants (N=77, 47% female) were young adult ($M=27.9 \pm 4.5$ SD yrs) daily smokers ($M=9.4 \pm 4.9$ cig/day, 74% past year e-cigarette use). Results showed a range of smoking behavior, with 35% of participants smoking in the first 5 minutes of the task, 30% smoking between 6-45 minutes, and 35% refraining from smoking. The median latency to smoke was 10.4 minutes (interquartile range: 1.3-50.0). This is comparable to prior data by our group examining responses to a combustible cigarette cue, with median latency of 9.0 minutes (interquartile range: 0.4-49.1; $U=424.0$, $z=-.47$, $p=.64$). Among those participants who chose to smoke, the most highly cited reasons were "I wanted to smoke" (53%) and "I saw someone else smoking/vaping" (34%). Shorter latency to smoke was associated with higher increases in the desire for a regular cigarette after cue ($p = .33$, $p=.02$) as well as higher agreement that the monetary reinforcement was "not worth it" ($p = -.32$, $p=.02$). In sum, a tank-based vaping cue appears to be as potent as a combustible smoking cue in inducing smoking behavior in young adults. As ENDS continue to be the most widely used tobacco product in youth, an increased understanding of the effects of passive exposure will be increasingly important.

FUNDING: Federal



SRNT

POS3-88

THE IMPACT OF THREE WEEKS OF PRE-QUIT VARENICLINE ON CIGARETTE CRAVING AND REINFORCING VALUE IN A LABORATORY CHOICE PROCEDURE

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Varenicline is a front-line smoking cessation medication, and it may be more effective among women. As a partial nicotinic agonist, varenicline is theorized to attenuate tonic and cue-specific craving and the reinforcing value of smoking. However, the mechanisms of therapeutic action remain unclear, as most studies employ only retrospective subjective evaluations and/or non-treatment-seeking samples. Here we report preliminary evidence of the impact of 3 weeks of pre-quit varenicline on craving (subjective) and reinforcing value (spending) among 35-treatment-seeking smokers (12 female; mean CPD at baseline = 20). Two overnight-abstinent visits (CO-verified) were completed; the first prior to starting varenicline or placebo (randomized, double-blind; Visit 1) and the second during the third week of varenicline/placebo (Visit 2; ~1 week prior to quitting). At each visit, participants completed a 36-trial laboratory choice procedure (i.e., Choice Behavior Under Cued Conditions) wherein on each trial, a lit cigarette, food item, or cup of water (12 of each; order randomized) was presented. Participants reported craving and the amount of actual money they were willing to spend to have a chance to sample (puff, bite, sip) the cue (from \$.01 [5% chance] to \$.25 [95% chance]). Compared to the placebo group, participants in the varenicline group had marginally greater declines in cigarette craving from Visit 1 to Visit 2 across all cue types, Group x Visit $F(1,31) = 3.2$, $p=.08$, $\eta_p^2 = .09$. Extending recent evidence that pre-quit varenicline is more efficacious for women than men; the impact of varenicline on spending was moderated by sex. Specifically, among women but not men, three weeks of varenicline reduced spending for cigarettes and food more than placebo, Gender x Group x Session x Cue (cigarette and food vs. water), $F(1,31) = 4.5$, $p=.04$, $\eta_p^2 = .13$. These preliminary laboratory data from treatment-seeking smokers support the role of select treatment mechanisms, namely reduced tonic cigarette craving and, at least among women, reduced reinforcing value of cigarettes.

FUNDING: Federal

POS3-89

CHAT-BASED INSTANT MESSAGING SUPPORT COMBINED WITH BRIEF ADVICE AND ACTIVE REFERRAL FOR SMOKING CESSATION IN PROACTIVELY RECRUITED COMMUNITY SMOKERS: A PRAGMATIC, CLUSTER RANDOMIZED CONTROLLED TRIAL

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SIGNIFICANCE: Mobile instant messaging tools (e.g., WhatsApp, Facebook Messenger) are widely used but under-studied as a mHealth modality for tobacco dependence treatments. We developed and evaluated a chat-based cessation intervention delivered through mobile instant messaging for community smokers. **METHODS:** We conducted a two-arm, pragmatic, cluster randomized controlled trial in which 1185 adult daily cigarette smokers (mean [SD] age=43.4 [15.4] years; 79.7% men) were proactively recruited from and cluster randomized by 68 community sites throughout Hong Kong. Subject in the intervention group ($n=591$) received a brief advice to quit plus an option of being referred to a preferred smoking cessation service (active referral) at baseline, and three months of chat-based, personalized cessation support grounded in behavioral change theories through instant messaging. The control group ($n=594$) received very brief advice to quit and a self-help booklet at baseline. The primary outcomes were self-reported past 7-day point prevalence abstinence (PPA) at 3- and 6-month after baseline. Secondary outcomes included abstinence validated by exhaled carbon monoxide (<4ppm) and salivary cotinine (<10ng/ml) at 3- and 6-month. **RESULTS:** Overall follow-up rates were 75.4%, 70.0% and 69.2% at 1-, 2- and 3-month, respectively, with no significant between-group differences ($p=0.60-0.90$). By intention-to-treat, the intervention group had higher PPA than the control group at 1- (10.7% vs 7.7%; $p=0.082$), 2- (14.4% vs 9.1%; $p=0.005$) and 3-month (15.2% vs 10.1%; $p=0.008$). The results were corroborated by biochemical-validated abstinence at 3-month (7.6% vs 4.0%; $p=0.009$) and did not change materially after adjusting for imbalanced baseline factors and clustering effect.

Subgroup analyses showed stronger intervention effect in men, older smokers and those with higher nicotine dependence at baseline (p for interaction <0.05). **CONCLUSION:** A three-month chat-based instant messaging support program combined with brief interventions was effective to promote abstinence in proactively recruited community smokers in Hong Kong. **TRIAL REGISTRATION:** ClinicalTrials.gov NCT03182790.

FUNDING: Nonprofit grant funding entity

POS3-91

IMPROVING ACCESS TO TOBACCO-DEPENDENCE TREATMENT THROUGH IVR AND TELEHEALTH

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Background: Tobacco-use is a major cause for cancer, and an important factor affecting response to cancer treatments after a diagnosis of cancer. Unfortunately, the consistent delivery of smoking cessation to cancer patients is suboptimal. Herein, we describe how telehealth tobacco treatment coupled with an Interactive Voice Recognition (IVR) system was implemented in an attempt to improve the delivery and acceptance of a tobacco-dependence treatment service (TSTS). **Methods:** In January 2017, the Hollings Cancer Center (HCC), Medical University of South Carolina, had already implemented an automated system that identified patients who smoke cigarettes upon every visit and cold-called them through an IVR system to offer a referral to the TSTS. In mid 2017, the service was improved to include a "live" phone call from a tobacco treatment specialist (TTS) offering free treatment and medications. This study compared the rates of responding to calls and accepting treatment, before and after live calls were incorporated into the service. Intent-to-treat (ITT) proportions were reported. **Results:** Between January 2017 and June 2018, there were 39517 unique new and follow-up adults patients seen at HCC among whom 3858 were smokers (10%). Before the inception of live calls (January-June 2017), 42% responded to IVR calls and 15% accepted treatment. After the addition of the live calls, the reach increased to 62% and treatment acceptance increased to 20%. Both, the reach (Prevalence Ratio = 1.47, 95% Confidence Interval = 1.35-1.59) and acceptance of tobacco-dependence treatment (Prevalence Ratio = 1.33, 95% Confidence Interval = 1.21-1.58) increased after adding live calls to patients. **Conclusion:** Adding a live person follow-up phone calls to the already existing IVR referral process to a TSTS at a cancer center increased both, the reach and the uptake of treatment. Data on quit rates will be available by January 2019.

FUNDING: Federal

POS3-92

NICOTINE PROFILE ACROSS A RANGE OF E-CIGARETTE USER CONDITIONS: VALIDATION OF A PHARMACOKINETIC MODEL

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Electronic nicotine delivery systems (ENDS) have gained worldwide popularity as an alternative to conventional tobacco cigarettes. Understanding the health impacts of these products is complicated by constantly evolving device technology. Open tank systems with variable power settings can increase ENDS output of vapor/aerosol (delivery of nicotine) and be used with any of the thousands of e-liquids currently available to consumers. Product design features and consumer use patterns (puffing topography) can influence the nicotine profile and the potential for abuse liability. To characterize the nicotine profile across a range of ENDS user conditions, a physiologically-based pharmacokinetic (PK) model for nicotine was calibrated/validated with existing published nicotine PK data collected from individuals using a range of ENDS products and e-liquid nicotine concentrations under standardized and ad libitum device usage conditions. Accounting for delivered dose, nicotine retained, and a plausible range of body weights and renal clearance rates, the area-under-the-curve (AUC), Cmax, and tmax were predicted and found to have reasonable agreement with the upper and lower bounds of PK metrics reported in available ENDS PK studies. The model predictions were comparable to available PK data across a range of ENDS types and e-liquid nicotine concentrations. Self-titration to a desired nicotine level, which influences the consumer puffing profile, is commonly reported among ENDS users. Thus, the PK model was used to assess the ENDS puffing topography profile that would achieve a nicotine dose equivalent to one pack of cigarettes in a day for the scenario of low versus high nicotine e-liquid



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concentration/ENDS delivery. Not surprisingly, the number of puffs required to achieve the target nicotine dose associated with a pack of cigarettes increased with decreasing nicotine e-liquid concentration/ENDS delivery. In conclusion, the validated nicotine PK model is a useful tool to evaluate the public health impacts of ENDS by predicting the nicotine profile across a range of plausible ENDS and user conditions associated with varying consumer topography patterns.

FUNDING: Unfunded

POS3-93

COMPARISON OF MEASUREMENT METHODS FOR ELECTRONIC CIGARETTE TOPOGRAPHY

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Background: Measurement of electronic cigarette (ECIG) puff topography allows for an understanding of how product characteristics and user behavior affect nicotine delivery. The eTop computerized device is available for this purpose, but requires the use of a mouthpiece that may affect natural puffing behavior. The purpose of this ongoing study (estimated completion 08/31/18) is to compare ECIG topography as measured by mouthpiece-based and mouthpiece-free methods. **Methods:** ECIG-naïve cigarette smokers (n= 9 of planned 30) and ECIG-experienced users (n=19 of planned 30) puffed on an ECIG either via the eTop device or conventionally, and all sessions were videotaped. The ECIG device consisted of a 3.3 volt eGo battery, a 1.5 ohm dual coil cartomizer, and 1 ml of unflavored liquid with 70:30% propylene glycol/vegetable glycerin. Following overnight tobacco abstinence, participants experienced one directed (10 puffs, 30 sec IPI) and two *ad libitum* puffing bouts. **Results:** Interrater reliability for video measurements was strong ($r = 0.94$, $p < .001$), and correlations between eTop and video methods were moderate-strong (most $r's \geq .50$, $p < .01$). No significant differences were observed for measurement of puff number, duration, or IPI between eTop and video methods ($p's > .05$), except for puff number for the directed bout [mean (SD) = 10.4 (0.7) eTop vs. 10.1 (0.4) video; $p < .05$]. Participants rated the subjective item of "reduce enjoyment" higher for eTop than for video ($p < .05$), though ratings for all other items were comparable (e.g., "alter behavior", "making puffing more difficult"). **Conclusions:** Results suggest that this mouthpiece-based device measures ECIG topography precisely as when no mouthpiece is used, and interferes minimally with participants' subjective experience of ECIG use. Reliable and valid ECIG topography measurement methods are an important regulatory tool, as they can be used to predict how ECIG users will respond to various product configurations to extract nicotine.

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POS3-94

WHAT INDIVIDUAL-LEVEL FACTORS PREDICT ELECTRONIC CIGARETTE NICOTINE DELIVERY?

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Significance: The ability of an electronic cigarette (ECIG) to deliver nicotine effectively varies greatly across models. Differences may be due to device features such as power, liquid nicotine concentration, and PG/VG ratio. Even when device features are held constant, however, users' nicotine exposure can differ based on their puffing behavior. The purpose of this secondary analysis of data is to examine puff topography, liquid concentration, and other individual characteristics as predictors of ECIG nicotine delivery. **Methods:** Four studies (Ns = 13, 30, 64, 23) were combined, in which ECIG-naïve cigarette smokers (N = 67; 66% men; 54% white) and ECIG-experienced users (N = 63; 89% men; 75% white) took 10 puffs from an eGo-style ECIG (~7.3 W) filled with liquid that had a nicotine concentration of 18, 25, or 36 mg/ml. Blood was sampled before and after use, and puff topography was measured. Data were analyzed using a General Linear Model with plasma nicotine level (change from baseline) as the outcome and puff duration, puff volume, liquid nicotine concentration, pre-session nicotine level, nicotine dependence score, gender, and race as the predictors for (1) both populations (2) ECIG-naïve, cigarette smokers only, and (3) ECIG-experienced users only. One study had participants use both 18 and 36 mg/ml nicotine concentrations; analyses from this study were separated by nicotine concentration so that only one concentration for these participants was included in any analysis at any given time. **Results:** Across population

sub-groups, the most consistent predictor of nicotine delivery was puff duration, with puff volume and nicotine concentration sometimes predicting delivery ($p < .05$). For cigarette smokers only, predictors were puff duration and nicotine concentration ($p < .05$). For ECIG users only, predictors were pre-session nicotine level and sometimes puff duration and volume ($p < .05$). **Conclusion:** Under these conditions, puff duration was the most consistent predictor of nicotine delivery. If regulators want to limit the nicotine delivery associated with ECIGs, puff duration is a possible target. **Funding:** P50DA036105, 2U54DA036105

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POS3-95

SCALING TOBACCO CESSATION TREATMENT FOR ALL CANCER CENTER PATIENTS: USING A NATIVE EHR TOOLKIT TO AUTOMATE REFERRAL UPON FIRST CANCER VISIT

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Although referral to tobacco dependence treatment is considered standard of care for patients with cancer, half to two-thirds do not receive formal support for smoking cessation. We wondered whether electronic medical records systems could be used to develop a systematic approach to identify tobacco-using cancer patients and automatically connect them to appropriate cessation services. The University of Colorado Cancer Center (UCCC) received a National Cancer Institute (NCI) grant to develop and implement a systematic approach to tobacco cessation treatment. Informal focus groups with medical and radiation oncologist explored existing barriers to tobacco cessation referral and assessed acceptance of an automated referral solution. Oncology providers were highly supportive of both tobacco cessation treatment and automated tobacco cessation treatment referrals. We then explored options within Epic (a widely used electronic health record system) that would not require customization. In coordination with our institution's Population Health Management team, we identified Healthy Planet, an existing Epic toolkit, as a mechanism to 1) provide a list of cancer patients eligible for tobacco cessation services, and 2) track tobacco cessation outreach and treatment activities. This report identifies all patients with a new UCCC appointment within the prior two weeks who are current some- or every-day- smokers. The report provides tobacco treatment specialists (TTS) with patient appointment schedules, contact information, and preferred method of contact to allow the TTS team to identify the best timing and approach for outreach. In summary, our work demonstrates that a native Epic tool can be adapted to identify and manage tobacco cessation services and that this approach is scalable to a large academic medical center's NCI-designated comprehensive cancer center.

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POS3-96

USING A FAMILY SYSTEMS APPROACH TO TREAT TOBACCO USE AMONG CANCER PATIENTS: A QUALITY IMPROVEMENT STUDY

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Significance: Higher rates of smoking in a patient's social network decrease cessation attempts and increase risk of early relapse. Integrating patients' social contacts into tobacco use treatment (TUT) is critical, especially among cancer patients. However, more research is needed to determine how to achieve this integration. We report outcomes from a quality improvement study incorporating a social support system intervention into TUT with patients at the North Carolina Cancer Hospital (NCCH). **Methods:** Tobacco treatment specialists (TTS) were trained to use a family systems approach when delivering TUT. Documentation protocols were established to track the number of family systems counseling sessions delivered. Workflow for documenting and delivering TUT to social contacts separate from cancer patients was created. Data from the Electronic Health Record (EHR) was gathered to examine 1) the number of family systems interventions delivered, 2) quit rates of patients receiving solo treatment and those with social contacts integrated, and 3) the number of social contacts receiving TUT whose relative with cancer had already quit. **Results:** In the first four months of



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implementation (April-July 2018), social contacts were present in TUT sessions 31% (n=72) of the time and, when present, were integrated into the patient's treatment plan 85% (n=61) of the time. We compare quit rates between patients receiving solo treatment and those with social contacts integrated. We discuss two case studies involving TUT delivered to social contacts whose relative with cancer had already quit. **Conclusions:** Incorporating social contacts into TUT delivered in cancer treatment settings is critical, but the path towards doing so is not straightforward. Lessons learned include how to train staff in family systems interventions, how to tailor family counseling interventions for social contacts' tobacco use status, and how to document and prescribe tobacco cessation medications for social contacts. Further investigation is needed to determine effective ways to engage social contacts who are not present during TUT sessions.

FUNDING: Federal

POS3-97

RESPONDING EMPATHICALLY TO PATIENTS: A COMMUNICATION SKILLS TRAINING MODULE TO REDUCE LUNG CANCER STIGMA

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Most lung cancer patients report perceiving stigma surrounding their diagnosis, with 48% reporting perceiving stigma specifically from their clinicians. The adverse effects of lung cancer stigma on patients include negative psychological outcomes, delaying and underreporting of symptoms, misreporting of smoking behaviors, and avoidance of help-seeking. As such, it is critical to focus on identifying effective strategies for reducing patient experience of lung cancer stigma. One potential intervention target is empathic communication because of high rates of "missed" empathic opportunities reported in lung cancer patient-clinician interactions. This abstract describes the conceptual model, development, and preliminary evaluation of a clinician-targeted empathic communication skills training to reduce patient's experience of stigma. The goal of this training module is to recognize or elicit and respond to lung cancer patients' empathic opportunities to communicate understanding, alleviate stigma and distress, and provide support. This goal is achieved through use of seven communication strategies: agenda setting, history taking, recognizing or eliciting a patient's empathic opportunity, shared understanding of the patient's emotion/experience, empathic responding, coping and connection to social support, and closing the conversation. Participants learn specific communication skills such as provide a rationale, normalize, acknowledge, prepare patients for recurring smoking questions, and encourage expression of feelings to achieve a given strategy. The 2-hour training is delivered to thoracic clinicians using a brief didactic (30 min) with exemplary videos, followed by experiential role play (90 min) with standardized patients. We examined preliminary efficacy by assessing participant evaluation of the training modules and their self-efficacy(N=15). Overall, participants reported favorable evaluations of the training, with 93% participants agreeing or strongly agreeing to all the 12 items assessing reflectiveness, novelty, and training program perceptions. Self-efficacy to communicate empathically with lung cancer patients increased significantly, $t(14)=-4.09$, $p<.001$ from pre- ($M=3.53$, $SD=.74$) to post-training ($M=4.47$, $SD=.52$). Overall, results indicate that the empathic communication skills training module was well received by thoracic clinicians and demonstrated improvements in self-efficacy from pre- to post-training. Examination of patient outcomes is needed.

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POS3-98

A DOUBLE BLIND RANDOMIZED CONTROLLED TRIAL OF REDUCED NICOTINE CIGARETTES IN SMOKERS WITH MOOD AND ANXIETY DISORDERS

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Significance: FDA can set standards for cigarettes that could include reducing their nicotine content. Such a standard should improve public health without causing unintended

serious consequences for sub-populations. This study evaluated the effect of progressive nicotine reduction in cigarettes on smoking behavior, toxicant exposure, and psychiatric symptoms in smokers with mood and/or anxiety disorders. **Methods:** 188 adult smokers who were **not** planning to quit in the next 6 months were randomized across two sites (Penn State and Mass General). All met criteria for a current or lifetime unipolar mood or anxiety disorder based on the Mini-International Neuropsychiatric Interview. After a week of smoking their own cigarettes, participants received two weeks of Spectrum research cigarettes with usual nicotine content (11.6 mg). Participants were then randomly assigned to continue smoking Spectrum research cigarettes containing either (a) Usual Nicotine Content (UNC); or (b) Reduced Nicotine Content (RNC): nicotine content per cigarette was progressively reduced from 11.6 mg to 0.2 mg over 18 weeks. The primary outcome measure was plasma cotinine. Secondary outcomes included exhaled carbon monoxide, psychiatric symptoms, smoking behavior and dependence. **Results:** 144 (77%) of randomized participants completed the randomized phase of the trial (visit10, 74% RNC, 79% UNC). Mean plasma cotinine levels decreased in a stepwise manner in the RNC group, but remained stable in the UNC ($p<0.001$ for between group comparison). Cigarette consumption, exhaled CO and measures of nicotine dependence also reduced significantly in the RNC group, relative to the UNC group ($p<0.05$). There were no significant differences between the two groups on key measures of anxiety (OASIS), depression (QIDS) or mental distress (K6) throughout the trial. **Conclusions:** Smokers with mood or anxiety disorders given progressively reduced nicotine content cigarettes have reduced nicotine exposure, cigarette consumption, exhaled CO and dependence without exacerbation of depression or anxiety symptoms.

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POS3-99

CIGARETTE SMOKING INCREASES THE EXPRESSION OF ATHEROSCLEROSIS AND PLATELET AGGREGATION GENES IN WHOLE BLOOD OF ISCHEMIC STROKE PATIENTS

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Smoking exerts a detrimental effect on the vascular system by inducing aberrant blood coagulation and predisposing to atherosclerosis, which are also causes of ischemic stroke (IS). Though previous studies suggested that cigarette smoking-related genes may be linked to IS, no specific biomarkers have been identified in whole blood for patients who suffer IS and who also smoke. In this study, we hypothesized that smoking affects platelet aggregation and atherosclerosis, resulting in an increased risk of clotting and IS. To address this, we performed a whole genome mRNA expression study on Affymetrix HTA 2.0 microarrays using whole blood from 219 subjects (including 42 IS current smoker patients, 68 IS never smoker patients, 23 control smokers, 86 control never smokers). The significantly regulated genes were identified using ANOVA with p -value < 0.005 and fold change $> |1.2|$. The functional pathways associated with the identified genes were analyzed using Exploratory Gene Association Networks (EGAN) software. The data showed 63 (51 up and 12 down) genes were significantly altered in IS smoker patients vs IS never smoker patients, and 58 (48 up and 10 down) genes significantly altered in control smokers vs control never smokers. We also found three genes (GPR15, LRRN2 and CLDND1) associated with IS smoker patients that overlapped with non-IS control smokers. Based on up-regulated genes associated with smoking and IS, the significantly related functional pathways included chemokine signaling pathways, T-cell receptor signaling pathways, cytokine-cytokine receptor pathways, and others. The significantly changed genes associated with functional pathways included inflammatory genes that promote atherosclerosis (CD3E, CD3G, CD69, IL2RA, CCR4 and CCR8) and genes that enhance platelet aggregation (PRKCQ, CCR4 and CCR8). In summary, the results showed the alteration of atherosclerosis and platelet aggregation genes may provide direct evidence for explanation of increased IS in those individuals who smoke.

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POS3-100

NICOTINE METABOLISM BY RACE IN PREGNANT WOMEN

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Significance: Nicotine metabolism plays an important role in nicotine addiction. Pregnant smokers metabolize nicotine and cotinine faster than non-pregnant women, which may be due to increased activity of CYP2A6. Different races have also been observed to metabolize nicotine differently, possibly due to genetic and environmental differences. This study examines how race impacts nicotine metabolism in pregnant women. **Methods**



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78 pregnant smokers provided serum samples during ad libitum smoking and following overnight abstinence. Race was self-reported and could include one or more of 6 racial categories. Nicotine metabolism ratio (NMR) measurements were calculated from the 3-hydroxycotinine:cotinine. A linear regression model was fit with the outcome of log NMR and predictors for each race category (allowing for multiple races for each person) with adjustment for weight, cigarettes per day, weeks pregnant, progesterone and estradiol levels, and use of menthol cigarettes. This model was fit separately for the NMR data collected during ad libitum smoking and following overnight abstinence. **Results** Of the 78 participants, 11 identified with more than one race. The sample includes, 12 women who identified as American Indian, 25 as Black, 52 as White, and 6 as another race (Asian, Native Hawaiian, or Hispanic). After adjustment, there was a significant association between race and NMR during ad libitum smoking ($p=0.04$) and following overnight abstinence ($p=0.001$). American Indian women tended to have 51% higher NMR (95% CI: 12-102% higher) during ad libitum smoking and 55% higher NMR (95% CI: 18-104% higher) following overnight abstinence than those who did not identify as American Indian. Following overnight abstinence, women who identified as Black had 31% lower NMR (95% CI: 7-49% lower) than those who did not. **Conclusions** During periods of ad libitum smoking and following overnight abstinence, pregnant women of different racial categories had significantly different rates of nicotine metabolism. The mechanisms underlying these findings should be further investigated.

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POS3-101

DIFFERENCES IN URINARY CADMIUM LEVELS IN AFRICAN AMERICAN AND CAUCASIAN SMOKERS

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African American (AA) smokers are at higher risk for developing lung cancer than White (WH) smokers. Nicotine intake and metabolism are important contributors, but do not fully explain this discrepancy. Furthermore, while cigarette smoking is a major risk factor for lung cancer, only 11-24% of smokers develop the disease. Differences in exposure to lung carcinogens from sources other than cigarette smoke could potentially contribute to inter-individual variations in lung cancer risk among smokers. In our study, we focused on cadmium (Cd), a constituent of cigarette smoke and a widespread environmental and industrial pollutant, which is a human lung carcinogen (IARC Group 1). We compared the levels of urinary Cd, a validated biomarker of cumulative Cd exposure, between AA and WH smokers and investigated the potential effect of tobacco use history, socio-demographic characteristics, employment status, and other factors on the levels of this biomarker. Urinary Cd was measured in 24-hour urine collections from 165 smokers ($n=84$ AA and $n=81$ WH) by inductively coupled plasma mass spectrometry. Total cigarette smoke intake was also assessed by measuring urinary total nicotine equivalents (TNE). Univariate analysis showed that AA smokers had significantly higher ($p<0.001$) geometric mean (GM) Cd levels (0.38 ng/mL; 95%CI: 0.33-0.44) than WH smokers (0.25 ng/mL; 95%CI: 0.21-0.30). After adjustment for age, sex, and TNE, GM urinary Cd levels remained significantly higher ($p=0.001$) in AA (0.36 ng/mL; 95%CI: 0.32-0.40) as compared to WH smokers (0.27 ng/mL; 95%CI: 0.24-0.30). Gender-specific analysis showed significantly higher urinary Cd levels in AA women than in WH women ($p<0.001$); however, the difference was not statistically significant in men ($p=0.186$). In addition, urinary Cd levels were higher among those currently unemployed versus employed, after adjustment for age, sex, race and TNE ($p=0.031$), suggesting the potential role of environmental, dietary, or other sources of exposure to this lung carcinogen among smokers. Collectively, our study indicates that Cd exposure may contribute to the observed racial differences in lung cancer risk among smokers.

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POS3-102

MOUTH LEVEL EXPOSURE TO NICOTINE AND TOBACCO SPECIFIC N NITROSAMINES IN AFRICAN AMERICAN AND WHITE SMOKERS

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BACKGROUND: African-American (AA) smokers have higher risk for smoking-associated cancers than White (WH) smokers. Studies suggest that the intensity of smoking and the rate of nicotine metabolism may be important factors responsible for these

discrepancies. Our goal was to directly assess the intensity of smoking in AA and WH smokers by analyzing nicotine and the carcinogenic tobacco-specific nitrosamines NNN and NNK in their spent cigarette filters. **METHODS:** Smokers (49 AA and 31 WH) provided a 24-hour urine sample and all spent filters from cigarettes smoked over the same period. Filters were analyzed for nicotine, NNN, and NNK, and urine was analyzed for respective biomarkers. Nicotine metabolite ratio (NMR) was determined as an indicator of nicotine metabolism rate. T-tests and linear regression models were used to evaluate and compare constituent levels in spent filters and examine their correlations with biomarkers. **RESULTS:** After adjustment for gender, nicotine levels were 28% lower in filters of AA than in WH smokers ($p = 0.004$). Per-filter levels of NNN and NNK did not differ; however, when expressed per mg of nicotine, NNN was significantly higher in filters of AA than WH smokers ($p = 0.009$). Despite fewer reported cigarettes per day (CPD) by AA smokers ($p=0.09$), urinary biomarker levels were similar between the two groups. The daily mouth-level exposure values (CPD multiplied by the filter constituent levels) significantly correlated with the corresponding urinary biomarkers for all three constituents. After adjustment for race and gender, NMR inversely correlated with NNN and NNK in spent filters. **CONCLUSIONS:** Lower levels of nicotine in spent cigarette filters of AA than WH smokers in our study do not support the hypothesis that AA smokers smoke cigarettes more intensely. Other factors, such as deeper inhalation of the smoke and differences in metabolism, are likely contributing to the higher 'per cigarette' urinary biomarker levels in AA than WH smokers. Given the higher 'per mg nicotine' NNN levels in filters from AA smokers in our study, the role of NNN exposure in the observed racial discrepancies in cancer risk should be further investigated. This research was supported by NIH grants P01 CA-138338 and R01 CA-179246.

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POS3-103

IMPACT OF A BRIEF MOTIVATIONAL INTERVENTION ON SMOKING OUTCOMES AND NRT BELIEFS IN AFRICAN AMERICAN SMOKERS

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Compared with Caucasian smokers, African Americans (AA) are disproportionately burdened by smoking related health problems, such as lung cancer, heart disease, and stroke. In some low-income minority communities, smoking rates are as high as 40-60%, *i.e.*, 2-3 times the national rate. To address this disparity, we developed a brief motivational and culturally-tailored smoking feedback intervention for AA smokers. Non-treatment seeking AA smokers ($n=196$) were recruited via a large multiethnic epidemiologic study in the Chicago area and catchment area referrals. We reduced participant expectancy by describing several health feedback options they may receive (*i.e.*, nutrition, substance use, or smoking). However, participants were randomized to either Treatment As Usual (TAU; self-help smoking cessation materials) or Enhanced Care (EC; TAU materials, counseling, and an optional one-week nicotine replacement therapy (NRT) starter kit). All participants completed a follow-up interview 1 month after their initial (100% retention). Participants' average age was 53.9 years (± 8.7 SD), 52% were female, and 76% did not work (*i.e.*, unemployed, retired, or disabled). They smoked an average of 8.7 cigarettes per day, and 95% smoked menthol cigarettes. At one month follow-up, participants in EC vs. TAU reported a significant reduction in cigarettes smoked per day (4.7 EC vs 7.7 TAU; $F=14.6$ $p<.001$) with a higher frequency of making a past-month quit attempt for 12 or more hours (57% vs 34%, respectively; $\chi^2(1)=10.02$ $p<.01$). Compared with TAU, EC also increased uptake in NRT usage and showed improved NRT knowledge, such as endorsing that NRT does not cause cancer (baseline to follow-up: 34% vs 62% EC; 34% vs 30% TAU) and that use of NRT is not a sign of weakness (71% vs 91% EC; 63% vs 72% TAU; all $p<.001$). In sum, brief motivational and culturally-tailored smoking feedback is an effective intervention for AA smokers and can improve smoking outcomes versus the usual population-wide approach of distributing self-help pamphlets without counseling or feedback. Consideration of this approach may help with tobacco control in underserved smokers.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

POS3-104

RACIAL DIFFERENCES AND SMOKING URGES ON CIGARETTES SMOKED PER DAY OVER THE FIRST MONTH OF TREATMENT

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Smoking remains the leading cause of preventable deaths and smoking cessation outcomes often reflect racial disparities. Previous research has documented that African American smokers have a lower rate of successful cessation compared to Caucasian smokers despite reporting more frequent quit attempts. Within the U.S. criminal justice system, there is an overrepresentation of ethnic minorities. This disadvantaged group of smokers report high smoking rates (70%) and a paucity of health insurance coverage. Few studies have examined smoking cessation interventions among smokers within the criminal correctional system (i.e., parole and probation). The purpose of this study was to examine how cigarette urges and racial differences effect smoking reduction over the first month of treatment. Five hundred smokers within criminal corrections were treated using bupropion medication and assessed weekly to determine smoking characteristics and smoking reduction over the course of treatment. Multilevel modeling was used to assess factors associated with smoking reduction across the first month of treatment. Multilevel model comparisons were conducted utilizing full maximum likelihood estimates (FML) to include both fixed and random effects. Results revealed racial differences between African American and Caucasian smokers such that Caucasian smokers demonstrated a steeper smoking reduction trajectory; however, these racial effects weaken over the course of treatment. Significant differences also emerged when examining the effect of cigarette urges on reported CPD among smokers. However, these demonstrated differences within cigarettes urges on CPD were not due to examined racial differences among African American and Caucasian smokers. Overall, these results indicate that the need for racially tailored smoking cessation interventions may only be necessary in the initial weeks of the treatment. Further research is needed to better understand the differential effect that cigarette urges have on treatment outcomes over time between Caucasian and African American smokers under community corrections supervision. Funding provided by NIH/NIDA (R01CA141663).

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POS3-105

LOZENGE VS PATCH: WHICH IS MORE ACCEPTABLE IN AFRICAN AMERICAN SMOKERS?

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African American smokers have lower quit rates than Caucasians and other ethnic minority groups. One reason for this disparity may be that compared with Caucasians, African American smokers are less likely to use nicotine replacement therapy (NRT). In this study, non-treatment seeking African American smokers (n=101) participated in a brief motivational counseling study. They were recruited via a multi-ethnic epidemiological study in Chicago as well as catchment area referrals. To reduce expectancy and sample bias, the study was described as receiving several possible health feedback options (e.g., smoking, nutrition, exercise). Participants received motivational and culturally-tailored smoking feedback and were offered an NRT starter kit with a one-week supply of nicotine patches, lozenges, or both. The final 55 participants were encouraged to try NRT in the session. All participants completed a follow-up interview 1 month after their initial visit. The average age was 52.9 years (± 8.7 SD), 51% female, and 76% did not work (i.e. unemployed, retired, or disabled). They smoked an average of 8.3 cigarettes/day, and 93% smoked menthol cigarettes. More than half the sample (53%) reported they were not prepared to quit smoking, scoring ≤ 5 on the smoking stage of change ladder. Overall, 95% of participants accepted lozenges and 93% accepted patches. Of the 55 participants prompted to try NRT in session, lozenge was chosen more frequently than the patch (49% vs. 13% respectively, $\chi^2(1)=16.99$ $p<.0001$). In-session trial use of lozenge or patch was similar between those prepared to quit (48%) and those not prepared to quit (52%; $\chi^2(1)=.54$ $p=.46$). At one month follow up, those who tried NRT in session were 5.7 times more likely to continue using NRT than those who did not (72% vs 31% respectively, $p=.01$). In sum, incorporating nicotine replacement samples within the context of a brief smoking feedback is acceptable and feasible for African American smokers. In particular, lozenges may be a better alternative to patches; the common dissemination of patches by quitlines and other community-based treatments may not be the most effective for underserved populations.

FUNDING: Federal; Academic Institution; Nonprofit grant funding entity

POS3-106

SUBJECTIVE RESPONSE TO NICOTINE EXPOSURE FOLLOWING OVERNIGHT ABSTINENCE IN PREGNANT AND NON-PREGNANT SMOKERS

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Introduction: Sex hormones have been shown to modulate smoking behavior. Progesterone levels increase steadily as pregnancy progresses. The objective of this study was to examine smoking-related symptomatology in pregnant and non-pregnant women using the Subjective State Scale (SSS) in response to nicotine exposure following overnight abstinence. We hypothesized that the pregnant women with increasing levels of progesterone would experience less symptom change in response to nicotine. **Methods:** This lab-based study following overnight abstinence examined symptomatology using the SSS in three groups of women (2nd and 3rd trimester and nonpregnant) prior to and following nicotine exposure via nicotine nasal spray. The SSS questionnaire examined 24 symptoms, grouped into 5 categories: positive affect, negative affect, craving, physical symptoms, and withdrawal. Women reported symptomatology on a scale of 0-7 for each of the 24 symptoms. Change from pre- to post-nicotine exposure in SSS responses were compared between groups using linear mixed models. **Results:** Women in the combined pregnancy group were significantly older and more nicotine dependent. Pre-nicotine exposure, there were no differences in any of the SSS categories between all three groups. When comparing the mean change from pre- to post-nicotine exposure for all 5 categories, the three groups of women had similar change: positive affect ($p=0.09$), negative affect ($p=0.42$), craving ($p=0.07$), physical symptoms ($p=0.96$), and withdrawal ($p=0.94$) after adjustment for age and nicotine dependence. **Conclusion:** Contrary to our hypothesis we found that pregnant women, who tend to have higher levels of progesterone, had similar changes in symptomatology following nicotine exposure when compared to non-pregnant women who tend to have lower levels of progesterone. Multiple factors associated with pregnancy could have played a role. Further research is needed on women who have quit smoking during pregnancy.

FUNDING: Federal; Nonprofit grant funding entity

POS3-107

A SYSTEMATIC REVIEW OF COPD, SMOKING, AND PSYCHIATRIC COMORBIDITIES

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Introduction: Sixteen million adults in the United States have Chronic Obstructive Pulmonary Disease (COPD) with millions more estimated to be undiagnosed. A strong causal link exists between cigarette smoking and COPD, and cigarette smoking is associated with depression, anxiety and other psychiatric disorders. However, less is known about the links between COPD, smoking, and psychiatric comorbidities. This study reviewed existing research to 1) identify what is known about psychiatric disorders among current or former cigarette smokers with COPD, and 2) identify potential targets for future research. **Methods:** A systematic review of five databases (Embase, Medline, NLM, PsychINFO, Pubmed) was conducted using keyword terms related to COPD, smoking, and psychiatric conditions. The review included peer-reviewed research reports that examined associations between COPD, smoking, and psychiatric diagnoses. Case reports, articles without a full text (e.g., a conference abstract), and articles not in English were excluded. All identified references were reviewed by two authors. **Results:** The initial five-database query yielded 3152 results. After removing duplicates and non-eligible references, 220 articles were selected for full review. Studies were conducted across a variety of American, European, and Asian-based countries; were predominantly cross-sectional surveys of patient populations; and used a variety of biological and non-biological diagnostic criteria for COPD. Depression and anxiety were the two psychiatric comorbidities with the greatest research attention. Among patients with COPD, current smoking was associated with higher depressive and anxiety symptoms compared to former smoking or non-smoking. **Conclusions:** Observational data has captured an association between current smoking and elevated mood symptoms among patients with COPD. There is a need for research that examines other psychiatric comorbidities (e.g. personality disorders, trauma, eating disorders) among



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patients with COPD. Areas for future research include tracking symptom changes over time and developing targeted interventions for COPD patients who smoke and endorse affective comorbidities.

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POS3-108

MODELING THE EFFECTS OF INCREASING PREFERENCE FOR REDUCED OVER NORMAL NICOTINE CONTENT CIGARETTES ON OVERALL CIGARETTE CONSUMPTION

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Significance: Cigarette preference can be experimentally shifted to a less preferred product by increasing the response cost of obtaining the more preferred product. However, it is unclear how such preference shifts impact overall consumption, which could be particularly relevant when examining a nicotine reduction policy. The aim of this study is to examine how total consumption is impacted by a response cost-manipulated shift in cigarette preference. **Methods:** Participants were 169 established smokers (> 5 cigarettes-per-day for a year) from a parent study examining populations vulnerable to tobacco addiction. After double-blind exposure to cigarettes varying in nicotine content, participants completed two types of concurrent choices tasks in which normal nicotine content (NNC) (15.8mg/g) and very low nicotine content (VLNC) (0.4mg/g) cigarettes were concurrently available. First, participants completed a task in which both cigarette types were available at an equal, low fixed-ratio cost of 10 computer mouse clicks. Next, participants completed a second task in which the VLNCs remained available at the same low cost of 10 mouse clicks but the NNCs were now available at a progressive-ratio cost wherein the # of mouse clicks required to obtain NNCs increased after each time that option was chosen (i.e. 10,160,...8400 mouse clicks). Preference for the NNCs in each task type was compared with repeated measures ANOVA. Total number of choices of either option (i.e. total consumption) in each task was compared using paired samples t-tests. **Results:** Preference was shifted from the NNCs to the VLNCs when cost for the former was increased ($p < .001$). Moreover, the preference shift to the VLNCs was accompanied by an overall reduction in the number of times participants chose to smoke either option compared to sessions where participants preferred the NNC ($p < .0001$). **Conclusion:** These results suggest that a marketplace wherein VLNCs and NNCs were both available, but the latter was more costly either in effort required to obtain them or monetarily would be expected to increase preference for VLNCs and decrease overall cigarette consumption.

FUNDING: Federal

POS3-109

EFFECTIVENESS OF BEHAVIOURAL AND MOOD MANAGEMENT INTERVENTIONS FOR SMOKING CESSATION IN PEOPLE WITH DEPRESSION: IMPACT OF VARIATION IN FUNCTIONS AND DELIVERY

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Introduction: People with depression are twice as likely to smoke and find it harder to quit than those without depression. A Cochrane review of smoking cessation treatment for smokers with current/past depression found that adding mood management to usual care improved quit rates (van der Meer, 2013). With the aim of informing future interventions, we examined if variation in mood management delivery or behaviour change functions impacted treatment effectiveness, and if smoking cessation treatment alters depression symptoms. **Methods:** PROSPERO ID: CRD42017070741. Randomised controlled trials (RCTs) were previously identified by Cochrane by searching CENTRAL, MEDLINE, EMBASE, PsycINFO, other reviews, and expert input. We included RCTs in adult smokers with current depression. We used meta-regression to determine: 1) the association between variation in delivery of mood management (i.e. Template for Intervention Description and Replication checklist) and treatment effect (risk difference, RD), 2) the association between behaviour change functions (i.e. Taxonomy of Behaviour Change techniques) and RD, and 3) the standardised mean difference (SMD) in change in depression between treatment arms from baseline to follow-up. **Results:** We included 16 RCTs of behavioural and/or medicinal treatments. There were insufficient

data to determine the impact of variation in mood management delivery. We found no evidence for an association between behaviour change functions and treatment effect ($F(6,5)=0.78$, $P=0.62$). There was some evidence that smoking cessation treatment improved depression vs control, SMD -0.09 (95%CI: -0.19 to -0.00, $P=0.04$); subgroup analyses suggested that the effect was not associated with treatment type ($X^2=8.64$, $P=0.19$), or presence of mood management ($X^2=5.04$, $P=0.08$). **Conclusions:** Many studies did not provide sufficient details about treatment content or delivery, thus limiting our analyses. Based on details that were available we found no evidence for an association between behaviour change function and treatment effect. In studies that provided enough data to calculate SMDs, we found that smoking cessation treatment led to a small improvement in depression symptoms.

FUNDING: Nonprofit grant funding entity

POS3-110

RECONFIGURING IDENTITY POSTPARTUM AND SUSTAINED ABSTINENCE OR RELAPSE TO TOBACCO SMOKING

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Significance: For women who quit tobacco smoking for or during pregnancy, risk of relapse to smoking postpartum is high. This may be due to many factors, including the physiological return of cravings to smoke, and the subjective experience of stress, with smoking perceived as a coping response. Identity change may also be significant, as women adjust to a new Mother identity, and simultaneously struggle to leave behind a previous smoker identity. This may be heavily and positively invested in. **Methods:** Secondary qualitative analysis of combined datasets from the PReS Study (MRC grant Ref: MR/P016944/1) and Project HATCH (CRUK grant ref: C54889/A25592), both exploring health behaviors of women postpartum. The combined dataset of 43 postpartum ex-smokers (both continued abstinent and relapsed) was analysed taking a constructivist grounded theory approach. The analysis was informed by a theoretical treatment of the concept of identity as presenting a cohesive narrative in life course development. 'Disruptions', such as the abrupt change to identity of new motherhood, or the shift from smoker to non-smoker, present challenges to the cohesion of identity. **Results:** Analysis revealed loss as a central theme. Although many women were delighted to enter Motherhood, they simultaneously experienced ambivalence and loss of their previous identity prior to parenthood. Smoking for many was an integral part of this previous identity, thus relapse was positioned as part of regaining the previous 'lost' identity. Inductively derived themes were interpreted to inform a narrative theory of postpartum identity, illuminating the process of identity change and disruption. **Conclusions:** This qualitative analysis suggest that interventions to support postpartum relapse prevention must critically include support for women in adjusting to a new identity as a non-smoking Mother. Identity change for new Mothers is a central challenge to identity development, with disruption that must be integrated. Interventions that do not acknowledge the struggle of managing disruption to the narrative flow of identity formation may be less effective.

FUNDING: State; Nonprofit grant funding entity

POS3-111

TOBACCO USE CESSATION INTERVENTIONS AMONG AMBULATORY SURGICAL PATIENTS

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The need for surgery could serve as a teachable moment to address tobacco dependence and improve surgical outcomes. Prior formative work with registered nurses (RNs) in three outpatient surgery centers showed that although they had favorable attitudes towards interventions, several barriers to implementation precluded consistent delivery. The purpose of this pilot study was to develop and test a RN-led tobacco intervention protocol for outpatient surgery clinic. Baseline work using focus groups and survey of practices, attitudes, and beliefs were done with RN's at three sites (A, B, C). Themes identified included the importance of tobacco cessation interventions (with subthemes of education/teaching, tobacco effects, and professional responsibility) and feasibility, with subthemes of time constraints and implementation barriers. Subsequently, a brief intervention, including advice, assessment of exhaled carbon monoxide, and the offer of referral to treatment services was designed. The intervention was implemented at site A only. Surveys were repeated at one year post implementation at all sites to determine how implementation affected practices, attitudes, and beliefs in site A, with sites B and C serving as controls. Baseline responses were similar among all sites.



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At one year after implementation in site A, RNs at this site (n=25) were more likely to report frequently or almost always assessing tobacco use compared with the other sites (n=32) (80% vs. 50%, p=0.03). They also reported higher rates of providing advice and assistance, although these differences were not statistically significant. Site A RNs also reported significantly greater self-efficacy for counseling and referring. Other survey items assessing attitudes and beliefs were not different among sites, excepting the paradoxical finding that site A RNs were less likely to believe that tobacco interventions were effective after implementation. This work demonstrates the feasibility of implementing brief RN-led tobacco use intervention in the outpatient surgical setting. Future studies should evaluate the impact of this intervention on referrals to tobacco treatment and abstinence outcomes.

FUNDING: Academic Institution

POS3-112

EARLY PREDICTORS OF DUAL USE OF CIGARETTES AND CANNABIS IN YOUNG ADULTS

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Significance. Although daily cigarette use has declined in the US, it remains higher among cannabis users than non-users, and among individuals with Cannabis Use Disorder (CUD). Dual use of cigarettes and cannabis has been linked to increased toxicant exposure, respiratory disease, and psychosocial problems. It is important to identify early predictors of dual use to improve tobacco control efforts by targeting campaigns for youth at the greatest risk of dual use. **Methods.** Young adult participants (M age = 22.8 years, range = 21-26 years) from a prenatal cohort reported on their cigarette and cannabis use. Data were available on many early risk factors, including prenatal cigarette and cannabis exposure, maternal postnatal smoking and cannabis use, childhood IQ, impulsivity, behavior problems and substance use. Bivariate analyses were used to compare dual daily users to daily cigarette-only and daily cannabis-only users. Predictors of dual daily use of cigarettes and cannabis (any/none) were identified using a logistic regression analysis. **Results.** Dual daily users were more likely to be Black, male, prenatally exposed to cannabis, and later initiators of cigarette use than daily cigarette-only users. Compared to cannabis-only users, dual daily users were more likely to be White, later initiators of cigarette use, less likely to pursue post-secondary education, and more likely to be dependent on tobacco, alcohol, and cannabis. Prenatal cannabis exposure and errors of commission on a Continuous Performance Task at age 14 were bivariately associated with dual daily use but were not significant predictors in the final regression model. In the final multivariate model, male sex, Black race, initiation of cannabis by age 14, and externalizing behavior problems at age 14 predicted dual daily use of cigarettes and cannabis among young adults. **Conclusion.** Early initiation of cannabis (but not cigarettes) was a risk factor for adult dual use of cigarettes and cannabis. In a climate of growing acceptance of cannabis use and increasing legalization, the results of this study highlight the role of cannabis use as a barrier to tobacco control.

FUNDING: Federal

POS3-113

ALCOHOL AND OTHER DRUG HEALTHCARE PROVIDER AND THEIR CLIENTS PERCEPTIONS OF ELECTRONIC CIGARETTE USE, SAFETY, AND HARM REDUCTION

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Significance: Tobacco smoking rates are as high as 84% in alcohol and other drug (AOD) treatment settings. Electronic cigarettes (e-cigarettes) containing nicotine e-liquid may potentially assist cessation in a heavily dependent population with high relapse and tobacco-related burden. Given staff attitudes are important determinants of client provision of care it is important to understand their perceptions regarding e-cigarettes. This study aimed to examine AOD treatment staff perceptions regarding nicotine elec-

tronic cigarette safety, use and recommendation. **Methods:** A cross-sectional survey was conducted with AOD healthcare providers and their clients from 32 AOD services in Australia between September - October 2016. Healthcare providers were asked whether they believed e-cigarettes could help smokers quit tobacco, whether they believe e-cigarettes are safer than tobacco smoking and whether they would recommend e-cigarettes to clients who are interested in quitting smoking from a list of "Yes/No" options. AOD clients were asked whether they had ever heard of e-cigarettes, whether they had ever used an e-cigarette, and if they do, whether it contained nicotine, and their reason for using e-cigarettes from a list of "Yes/No" options, and finally whether they currently use e-cigarettes. **Results:** One hundred and twenty healthcare providers and 427 AOD clients responded. Nearly half (48%) of all healthcare providers reported agreeing with the statement that ENDS could help smokers quit tobacco and that ENDS were safer than tobacco smoking (55%). However, only 29% reported that they would recommend ENDS to clients. Most AOD clients (93%) reported awareness of ENDS, and 39% reported ever use however, only 7% reported current use. Of those reporting ever use, 52% used an END containing nicotine. The most common reasons for END use were "wanted to try" (72%) and "help cut down smoking" (70%). **Conclusion:** Both AOD healthcare providers and clients are aware of ENDS and the potential for smoking cessation but are cautious in continuing use and recommending their use. This may be due in part to the highly restricted context of e-cigarettes in Australia. More data on e-cigarette safety and efficacy is needed.

FUNDING: Federal

POS3-114

FLAVOR RESTRICTIONS REDUCE E-CIGARETTE DEMAND IN FORMER SMOKERS WHO HAVE TRANSITIONED TO E-CIGARETTES, BUT NOT IN DUAL CIGARETTE/E-CIGARETTE USERS

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Behavioral economic demand indices provide measures of tobacco product valuation and may be used to examine the effects of potential regulatory restrictions on the likelihood that a given tobacco product will be used. E-cigarette flavor is one product characteristic eligible for regulation; however, little is known about the effects of flavor availability on demand for e-cigarettes. In the present study, web-based samples of dual cigarette smokers/e-cigarette users (n = 198) and former smokers who have transitioned to e-cigarette use (n = 198) completed e-cigarette purchase tasks when access to e-cigarette flavors was both unrestricted (i.e., broad range of flavors available) and restricted (i.e., only tobacco flavors available). We observed a significant interaction between flavor condition and group ($p < .001$), in which restricting flavor access decreased intensity of e-cigarette demand in former smokers who have transitioned to e-cigarette use ($p < .001$) but not in dual cigarette/e-cigarette users ($p > .250$). This selective effect suggests that former cigarette smokers may be differentially affected by possible e-cigarette flavor regulations and highlights the need to consider multiple population types when designing tobacco regulatory policy. Future studies should examine whether e-cigarette flavor restrictions may increase the likelihood that former smokers who have transitioned to e-cigarette use will return to cigarette smoking.

FUNDING: Federal

POS3-115

PILOT TRIAL OF NICOTINE REPLACEMENT THERAPY SAMPLING IN A DENTAL CARE SETTING

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Significance: Smoking has profound negative effects on oral health. Nicotine Replacement Therapy sampling (NRTS) refers to providing all smokers, regardless of motivation to quit, with free samples of over-the-counter NRT. NRTS has been shown to increase quit attempts, motivation and self-efficacy, and positive attitudes toward NRT. Dental care settings could be an ideal fit for NRTS because providing free samples (e.g., toothbrush) is routine and universal in these settings. **Methods:** The aim of this study



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was to conduct a pilot trial of NRTs in a dental care setting. Participants (N = 30, 60% female, Mage = 42.8) were adult smokers of at least 5 cigarettes per day (M = 18.6) who were recruited during a routine visit to a federally qualified health center dental clinic. During their visit they completed a baseline survey and were randomized to either receive or not receive NRT (2-week supply of both 14 mg nicotine patches and 4 mg nicotine lozenges) in a 3:1 ratio. All participants received print materials about the effects of tobacco on oral health and treatment options (pharmacotherapy and quitline brochure). We reached 87% (26/30; 19 NRT, 7 No NRT) of participants for a follow-up survey by phone or online 4 weeks after their dentist visit. Results: At follow-up, 74% (14/19) of the NRT group reported that they used the NRT provided (5 patch only, 1 lozenge only, 8 both) and 32% (6/19) said they used more NRT obtained on their own. In the No NRT group, only 1 of 7 (14%) reported using NRT. No patients reported past week abstinence, but 53% (10/19) of the NRT group vs. 29% (2/7) of the No NRT group reported making a quit attempt lasting longer than 24 hours since their dentist visit. Also, the NRT group averaged a 56% reduction in cigarettes per day between baseline and follow-up (18.0 to 8.0), compared to a 24% reduction (15.7 to 11.9) in the no NRT group. No significant differences were found between baseline and follow-up in quitting importance, motivation, or confidence, or in attitudes toward NRT. Conclusions: Overall, these data demonstrate that NRTs is feasible in dental care settings and that patients will use these samples and make quit attempts.

FUNDING: Academic Institution; Nonprofit grant funding entity

POS3-116

A PROCEDURE TO STANDARDIZE PUFF TOPOGRAPHY DURING EVALUATIONS OF ACUTE TOBACCO OR ELECTRONIC CIGARETTE EXPOSURE

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Isolating specific factors that influence differential sensitivity to acutely inhaled nicotine products requires carefully controlling the amount of product exposure ("dose"). Validating a convenient procedure by which to control such exposure may aid the interpretation of results from studies on factors influencing acute sensitivity of responding to fixed amounts of exposure. We evaluated consistency of puff volume from intermittent acute exposures to smoked Quest 1 and Quest 3 tobacco cigarettes (Study 1, n=45) and to 36 mg and 0 mg nicotine vaped electronic cigarettes (Study 2, n=27 naïve to e-cigs) in adult dependent non-treatment seeking smokers. All were administered different nicotine levels in each product under blind conditions, one per session using within-subject designs. In both studies, participants followed an automated instructional procedure on a computer monitor that standardized the specific timing and amount of exposure to each product during a given trial (6 puffs for tobacco, 10 puffs for electronic), with 4 trials per session, each separated by 20 mins. Puff volume per trial (via CReSS) was the primary dependent measure to determine consistency across trials via Intraclass correlations (ICC). Control over topography with both inhaled products was demonstrated by highly significant ICCs for puff volume across trials (0.80 for Quest 1 and Quest 3 tobacco; 0.90 and 0.59 for nicotine vs placebo e-cigarettes, resp.). As intended, the reliability of puff volume generally did not differ by menthol preference or sex in either study, but ICCs tended to be lower for 3 of the 12 men when using the placebo e-cigarette (ICC=0.85 when those 3 excluded). This instructional procedure allows substantial control over amounts of acute exposure to tobacco or electronic cigarette use, potentially aiding the validity of research into differential sensitivity to these products so findings can be attributed to the factors of interest and not to variable amounts of exposure. Further study is needed to determine this procedure's utility with other inhaled products among experienced users and when comparing different products in between-groups analyses.

FUNDING: Federal

POS3-117

PREDICTING ENGAGEMENT IN A DIGITAL CESSATION INTERVENTION: MESSY BUT POSSIBLE

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SIGNIFICANCE. Digital interventions for smoking cessation are effective and have broad reach. Tailoring content to individuals' needs and preferences increase engagement and abstinence rates. We tested the acceptability of a short battery of 6 questions assessing psychosocial constructs at baseline via text message, and evaluated its utility for prospectively predicting engagement with other intervention components on the web.

SETTING. Participants (N=447) were smokers seeking treatment on BecomeAnEX, a free digital cessation program run by Truth Initiative. Users register on the web and can opt-in for companion text messages. All new users who opted-in for text messages during the study period were enrolled in the study. METHODS. We adapted 3 items from the Abstinence Related Motivation to Engage scale, measuring (1) excitement, (2) vigilance, and (3) cognitive effort. Other items measured (4) smoker identity, (5) confidence to quit, and (6) smoking by important others. Responses were multiple choice on a 4-point scale. Items were asked sequentially; terminated after nonresponse. Bivariate relationships with 2 clickstream engagement metrics were assessed: pageviews (log transformed) and visiting the community (Y/N). Linear trends were tested with GEE and logistic regression. RESULTS. Most participants (71.8%) answered all six items. Few participants (13.2%) answered zero items. Item responses were well distributed. Several bivariate relationships with engagement were observed. They were often nonlinear. The most consistent relationships were observed for excitement, smoker identity, and smoking by others. A 4 point composite measure of monotonic "risk" for low engagement was constructed from those variables. Higher risk scores predicted fewer pageviews (median 11 vs. 22; p=0.02) and lower likelihood of visiting the community (26% vs. 50%, p<0.01). CONCLUSIONS. The questions were acceptable to most participants. Responses prospectively predicted engagement with the intervention. Future research will evaluate the utility of these data for predicting abstinence outcomes.

FUNDING: Federal

POS3-118

NICOTINE OR EXPECTANCIES? USING THE BALANCED-PLACEBO DESIGN TO TEST IMMEDIATE OUTCOMES OF VAPING

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SIGNIFICANCE: Likely contributors to the maintenance of e-cigarette use include reinforcement from nicotine, sensorimotor similarities to smoking, and cognitive expectancies. Both drug delivery and expectancies have been found to drive the use of substances (e.g. alcohol and combustible cigarettes), and both factors can influence the immediate outcomes of substance use. The purpose of this study was to evaluate the independent and synergistic influences of nicotine and expectancies on outcomes of e-cigarette use. METHODS: A balanced-placebo design was utilized, crossing drug content (nicotine or no nicotine) with instructional set (told nicotine or told no nicotine). Participants (N=128) completed an experimental visit that included an ad-lib vaping session. Prior published results (Palmer & Brandon, 2018) showed cigarette craving reduction was largely driven by instructional set. For the present analysis, secondary outcome variables associated with smoking were evaluated, including enjoyment of respiratory tract sensations, aversion, attention, appetite, reward, and affect. It was hypothesized that drug would produce main effects on the objective, physiological measures, whereas the instructional set would produce effects on the subjective, psychosocial variables. RESULTS: Drug X instruction X sex ANOVAs were used to analyze results. A main effect of drug content was observed on sustained attention (p<.05), such that those receiving nicotine performed better. A drug X instruction interaction (p<.05) emerged on enjoyment of respiratory tract sensations. In the no nicotine conditions, those told no nicotine reported higher ratings than those told nicotine. Another drug X instruction interaction emerged on reward (p<.05): Among those receiving nicotine, participants told nicotine reported higher reward than those told no nicotine. Sex X drug interactions were also observed upon reward, aversion, attention, and appetite (ps<.05). CONCLUSION: These results illustrate the complex, interactive factors influencing both objective and perceived immediate and reinforcing effects of e-cigarette use.

FUNDING: Federal; Academic Institution

POS3-119

WHAT BEHAVIOUR CHANGE TECHNIQUES ARE USED IN PRACTICE TO SUPPORT PEOPLE WITH SEVERE MENTAL ILLNESS

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Significance: A common challenge in smoking cessation is that behavioural interventions are not routinely defined in terms of specific behaviour change techniques (BCT).



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BCTs are the smallest identifiable components of an intervention that in themselves have the potential to change behaviour. This paper reports on a systematic approach to identify the BCTs used in 'Quitlink' a specialised quitline intervention to support people with severe mental illness to stop smoking. **Methods:** We took two list of BCTs, Michie et al list of 93 generic ones and 53 identified from a smoking cessation intervention by West, and discussed all with a group of 3 experienced Quitline advisors as to the relevance of each. Based on this we created a list of BCTs that appeared to be used. We then validated this against the Quitline counselling manual, to ensure all were included and no specific BCTs in the manual were missing. **Results:** We identified 3 overarching activities required to support BCT implementation and 28 specific BCTs. Some missing were irrelevant to smoking cessation, others were not part of the quitline repertoire and a small number of BCTs did require modification. With some wording changes all 28 BCTs were identified as present, and no additional ones were identified. **Conclusions:** It is practical to define quitline protocols in terms of BCTs and advisors recognise them as part of practice, at least when worded appropriately. Some BCTs are not relevant to smoking, especially those which focus on non-behavioural outcomes, and some are not used by the quitline, particularly conditioning-related activities. There is room to improve the core 93 BCTs, in particular separating out core activities like assessment and review that should underpin all systematic behaviour change strategies.

FUNDING: Federal; Academic Institution

POS3-120

FEASIBILITY OF A TAILORED SMARTPHONE INTERVENTION TARGETING HIGH-RISK SITUATIONS FOR SMOKING AMONG YOUNG ADULTS

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Significance: Young adults (18-25 years old) have high smoking rates, and although they are interested in quitting, they underutilize professional cessation support. Since 92% of young adults own smartphones, these devices provide opportunities to advise "in the moment" when smokers need cessation support. This study tested the feasibility of using a novel smartphone app to deliver smoking cessation content tailored to individual smoking patterns and triggers. **Methods:** Intervention messages consisting of images and text were adapted from evidence-based text-messaging interventions and custom developed for young adults in collaboration with a social marketing agency. A total of 8 young adult smokers (M=24.1 years old; 75% male; 50% Non-Hispanic white) participated in a 14-day ecological momentary assessment (EMA) data collection, followed by a 25-day intervention phase with time- and location-triggered messages tailored to participants' unique high-risk situations. Seven participants also completed in-depth follow-up interviews, exploring perceptions of feasibility and overall effectiveness of intervention messages. **Results:** A total of 70 intervention messages were sent by the system. Overall, participants expressed unanimous agreement in the effectiveness of the app in monitoring their smoking behavior. Participants noted the ease of tracking smoking behaviors and increased awareness of their own habits due to tracking. Participants also believed the tailored intervention messages effectively curbed their desire to smoke, although some would have liked to receive messages more frequently, or to customize the content further. While participants expressed satisfaction in the consistency of location-based triggers, some expressed difficulty in responding due to situational circumstances. **Conclusion:** We showed feasibility of using smartphones to monitor smoking behavior and deliver tailored content to support smoking cessation among young adults. Future studies are needed to test intervention message efficacy for curbing smoking urges and behaviors in this high-risk population.

FUNDING: Federal

POS3-121

THE EFFECT OF FLAVOR MANIPULATION IN ESTABLISHED VS. BEGINNER WATERPIPE SMOKERS' SUBJECTIVE MEASURES, PUFF TOPOGRAPHY, AND EXPOSURE TO TOXICANTS

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Significance: Flavored tobacco plays an important role in youth's experience with new products, such as waterpipe (WP). However, the flavor effect will likely differ according to WP smokers' smoking trajectory, which can be revealed by studying the effect of flavor

manipulation in WP smokers at different stages of their smoking. This study compares the effect of WP tobacco flavor manipulation between the established and beginner WP smokers on subjective measures, puff-topography, and toxicant exposure. **Methods:** This crossover study was conducted among 138 WP smokers (N=65 established and N=73 beginners) aged 18-30 years in a clinical laboratory setting. The subjects participated in two counterbalanced 45-minute ad libitum smoking sessions (preferred flavor vs non-flavored tobacco) were preceded by 24 hours of tobacco abstinence. Outcomes included puff topography, expired carbon monoxide (eCO), and subjective measures. **Results:** There was no significant difference in mean age between established (M=22.01, SD =2.95) and beginner (M=21.68, SD=2.95) WP smokers. While a greater average of puffing time was observed among established smokers during the preferred flavored session compared with beginner smokers ($p\text{-value}=0.042$), no significant differences were observed between two groups during non-flavored session. Established WP smokers had higher eCO boost in both sessions ($p\text{-values} <0.001$) compared with beginners. While there was no significant difference in smoking time among two groups in two conditions, inhaled volume was higher among established WP smokers compared with beginners in both conditions ($p\text{-values} <0.001$). Established WP smokers reported more craving compared with beginners in only the flavored condition ($p\text{-value}<0.05$). **Conclusion:** Our findings document the different responses of WP users at different stages of their smoking trajectory with established WP smokers reporting greater puffing time and higher total inhaled volume in flavored condition. This may explain the greater boost in eCO among established WP smokers. The findings from this study highlight a possible need for regulation of flavors in WP tobacco and targeted intervention according to different stages of WP smoking among young adults in the United States.

FUNDING: Federal

POS3-122

MENSTRUAL CYCLE REGULARITY AND REPRODUCTIVE HEALTH IN CO-USERS OF CIGARETTES AND MARIJUANA

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Background Co-use of marijuana and cigarettes is prevalent, with about 90% of marijuana users having ever smoked cigarettes. The influence of co-use on menstrual cycle and reproductive health, however, is not well known. This study aims to characterize women's menstrual cycle regularity, cycle length, and pregnancy health between co-users and cigarette-only smokers. **Methods** Female participants, age 18 to 45 years, were recruited throughout the United States. Participants were excluded if they used hormonal birth control, were currently pregnant, used other illicit drugs, or self-reported an irregular menstrual cycle length (>35 days or <21 days). Participants were asked to complete a survey consisting of self-report items assessing demographics, regular cycles (yes/no), cycle length, number of pregnancies, number of miscarriages and number of full-term deliveries. Eligible cigarette-only smokers and co-users were defined consuming marijuana and cigarettes or cigarettes-only "at least a few times per week." T-tests were used to analyze continuous variables and chi-square was used for categorical variables. **Results** Overall, participants (n=287) were on average 32.9 ± 6.3 years of age, mostly white (83.6%), non-Hispanic (92.7%) with some college education (54.5%). Co-users (n=107) were on average four years younger than cigarette-only smokers (n=180) (30.4 ± 6.2 vs. 34.4 ± 5.9 , $p < 0.001$) and had a lower BMI (27.1 ± 7.2 vs. 28.9 ± 7.7 , $p=0.0498$, respectively). Two groups had different distribution of race ($p = 0.0006$). Cigarette-only smokers reported significantly more miscarriages than co-users (0.5 ± 1.0 vs. 0.2 ± 0.6 , $p = 0.0347$). **Conclusion** We identify demographic differences between these two groups. Co-users were younger and had a lower BMI. Although this study is strengthened by a large, generalizable sample, limitations are worth noting. First, these data were self-reported and cross sectional. Second, no data were collected on the timing, quantity or frequency of marijuana use in the co-user group. Future research should seek to quantify marijuana dosage, frequency, route (inhale, oral), and timing (menstrual phase) to further explore.

FUNDING: Federal; Academic Institution

POS3-123

ELECTRONIC DECISION SUPPORT FOR TREATMENT OF HOSPITALIZED SMOKERS: A QUALITATIVE ANALYSIS OF PHYSICIANS' KNOWLEDGE, ATTITUDES, AND PRACTICES

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Significance: We recently demonstrated the ability of a suite of tools embedded in an electronic medical record (EMR) to improve tobacco cessation treatment for adult smokers admitted to the hospital. A randomized controlled trial conducted by our group demonstrated the ability of an EMR-embedded tobacco use disorder treatment tool, the Electronic Support Tool and Orders for the Prevention of Smoking (E-STOPS), to increase the identification and treatment of smokers, but its uptake varied among 126 physicians randomized to the intervention arm. The purpose of this study was to identify facilitators and barriers to using E-STOPS. **Methods:** Semi-structured individual interviews from a purposive sample of 12 hospitalist attending physicians and 9 internal medicine residents who were randomized to the E-STOPS intervention were analyzed thematically. **Results:** Three themes shaped E-STOPS use: the inpatient environment, prescriber attitudes and beliefs, and information needs. Overall, participants were pleased with E-STOPS but had specific suggestions for improvements regarding the timing of the intervention, suppression logic, and additional decision support and training. A few had concerns about the clinical appropriateness of beginning treatment for tobacco dependence during a hospitalization and the proper role of the inpatient team in that treatment. **Conclusion:** Tobacco dependence treatment for hospitalized smokers and facilitated by the EMR is generally acceptable to hospitalists and resident physicians. Improvements in provider training and feedback as well as the timing and content of the electronic tools may increase their utilization by inpatient physicians.

FUNDING: Federal

POS3-124

HEALTH PROVIDERS' PERFORMANCE OF THE 5AS FOR SMOKING CESSION CARE DURING PREGNANCY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Significance Pregnancy is an opportunity for health providers (HPs) to support women to stop smoking. **Aim** To identify the pooled prevalence for HP in providing various components of smoking cessation care (SCC) to women who smoke during pregnancy. **Methods** A systematic review synthesizing original articles that reported on 1) prevalence of HPs performing the 5As ('Ask', 'Advise', 'Assess', 'Assist', 'Arrange'), prescribing nicotine replacement therapy (NRT), and other SCC, and 2) factors associated with SCC practices. MEDLINE, EMBASE, CINAHL and PsycINFO databases searched using "smoking", "pregnancy" and "HP practices". Studies included any design except interventions (self-report, audit, observed consultations, women's reports), in English, with no date restriction, up to June 2017. Health providers included could be of any profession. Data were extracted, then appraised with the Hawker tool. Meta-analyses pooled percentages for performing each of the 5As and prescribing NRT, using e.g., 'often/always' and 'always/all'. Meta-regressions were performed of 5As for 'often/always'. **Results** Of 3933 papers, 54 were included ($n = 29,225$ participants): 33 for meta-analysis. HPs included general practitioners, obstetricians, midwives and others from 10 countries. Pooled percentages of studies reporting practices 'often/always' were: 'Ask' ($n=9$) 91.6% (95%CI:88.2,95); 'Advise' ($n=7$) 90% (CI:72.5,99.3), 'Assess' ($n=3$) 79.2% (CI:76.5,81.8), 'Assist (cessation support)' ($n=5$) 59.1% (CI:56, 62.2), 'Arrange (referral)' ($n=6$) 33.3% (CI:20.4,46.2), and 'prescribing NRT' ($n=6$) 25.4% (CI:12.8,38). Heterogeneity (I^2) was 95.9%-99.1%. Meta-regressions for 'Arrange' were significant for year ($p=0.013$) and country ($p=0.037$). **Conclusions** HPs 'Ask', 'Advise' and 'Assess' most pregnant women about smoking. 'Assist', 'Arrange' and 'prescribing NRT' are reported at lower rates: strategies to improve these should be considered. Strength of this review is the inclusion of papers from 10 countries, and the detailed analysis of study measures from HP and women's viewpoints, limited by few studies in each category, and high heterogeneity.

FUNDING: Academic Institution

POS3-125

E-CIGARETTE USE AND BELIEFS AMONG ADULTS WITH OPIOID AND ALCOHOL USE DISORDERS

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Significance: Patients with substance use disorders (SUD) suffer disproportionate morbidity from smoking. We explored e-cigarette use characteristics and beliefs associated with e-cigarette use patterns among individuals requiring inpatient detoxification for opioid and/or alcohol use disorder(s). **Methods:** Adult patients (≥ 18 years), admitted to inpatient detoxification for alcohol and/or opioid use disorder(s) in a safety-net tertiary referral center in the New York City (NYC) area were surveyed in New York City in 2015. Descriptive statistics (proportions) were used to assess for demographic, clinical diagnosis, smoking, and e-cigarette use characteristics. Variables were compared using chi-square and t-test statistics. **Results:** Current use of both combustible cigarettes (77%) and e-cigarettes (14%) was prevalent. E-cigarette use did not differ by demographic variables. Among respondents that reported a primary care visit in the last year (59%), only 9% were asked by their physician about their e-cigarette use. Compared to participants with no prior e-cigarette use, ever e-cigarette users were more likely to have high levels of nicotine dependence (39.2% vs. 21.3%, $p=0.04$) and to have had a past year quit attempt (76.2% vs. 9.3%, $p<.001$). Current e-cigarette users (including exclusive and dual e-cigarette users) were more likely to report having a past year quit attempt compared to non-e-cigarette users (81.8 vs 38.7%, $p<.001$). **Conclusions:** Current e-cigarette use is prevalent and seems appealing to this population. E-cigarette use may offer an effective method for harm reduction and smoking cessation among patient in addiction treatment.

FUNDING: Unfunded

POS3-127

"YOU CAN ESCAPE THE CROWD BY GOING TO HAVE A CIGARETTE": A QUALITATIVE EXPLORATION OF SMOKING TO COPE WITH SOCIAL ANXIETY

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Significance: One third of smokers meet life time criteria for social anxiety disorder (SAD) and smokers with social anxiety are significantly less likely to quit smoking than smokers without social anxiety. Although mechanisms underlying this relationship are largely unknown, evidence suggests that coping-motivated cigarette smoking—particularly smoking to cope with symptoms of social anxiety—may play an important role. However, little is known about the specific ways in which socially anxious smokers utilize cigarette smoking to cope with symptoms of social anxiety. This qualitative research was conducted to explore socially anxious smokers' experiences with smoking to cope with social anxiety. **Methods:** We conducted in-depth qualitative interviews with socially anxious adult smokers ($n=9$; 56% women). All interviews were recorded and transcribed. An inductive approach to content analysis was used to identify themes. We will continue to recruit participants until thematic saturation is met. **Results:** On average, participants were 40 years old and smoked 11 cigarettes per day. Six central themes emerged regarding ways in which participants reported smoking to cope with social anxiety: (1) Social facilitation—smoking to meet people or facilitate conversation; (2) Escape—using smoking as an excuse to leave a social interaction; (3) Social avoidance—smoking to avoid social interaction or conversation altogether; (4) Keep busy—smoking to appear busy or have something to do in a social context; (5) Mental distraction—smoking to distract oneself from social anxiety-provoking thoughts; and (6) Occupy hands—smoking to alleviate concern of what to do with one's hands around others. **Conclusions:** Results from this formative study highlight specific functions of smoking that help socially anxious smokers cope with acute experiences of social anxiety, which may contribute to failed cessation attempts among this group of smokers. Socially anxious smokers may greatly benefit from targeted interventions that build awareness of the specific ways the individual uses smoking to cope with social anxiety and offer more adaptive methods of coping with social anxiety.

FUNDING: Federal

POS3-128

ABUSE LIABILITY OF REDUCED-NICOTINE CONTENT CIGARETTES: A BEHAVIORAL-ECONOMIC ANALYSIS

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Significance: The Tobacco Control Act provided the FDA with authority to regulate cigarette nicotine content. Reducing cigarette nicotine content has been proposed as a means for reducing cigarette consumption. However, the relative



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abuse liability of reduced- vs. full-nicotine cigarettes is under-investigated. This study addresses this gap using an operant behavioral economic demand approach. **Methods:** Cigarette-deprived, dependent smokers (n=16) completed multiple, operant experimental sessions. Demand curves were generated as participants worked for cigarette puffs across a range of fixed-ratio response requirements (Lindsley plunger pulls; FR-10 to FR-10,000 for 3 puffs), with both full- (14.8 mg/g) and reduced-nicotine (4.8, 2.2, or 1.3 mg/g across participants) cigarettes available alone and concurrently. Following completion of demand sessions, participants were given reduced-nicotine cigarettes to smoke over a three-week exposure period. Participants then returned to the laboratory to repeat the demand sessions. **Results:** Neither demand intensity (consumption at lowest price) nor demand elasticity (price-sensitivity) differed between full- and reduced-nicotine cigarettes before or after at-home exposure. Similarly, as full-nicotine response requirement increased, consumption of concurrently-available reduced-nicotine cigarettes increased at both timepoints. There was a reduction in demand intensity and increase in demand elasticity for both full- and reduced-nicotine content cigarettes following the exposure period in the single-item but not concurrent demand procedures. **Conclusions:** These preliminary data (recruitment ongoing) indicate that the abuse liability of reduced-nicotine cigarettes is comparable to full-nicotine cigarettes; however, prolonged exposure to reduced-nicotine cigarettes can reduce cigarette demand and, in-turn, cigarette consumption, at least when only one cigarette type is available. Furthermore, these data suggest that reduced-nicotine cigarettes may serve as substitutes for standard cigarettes in current smokers, and may ultimately lead to reduced levels of cigarette consumption.

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POS3-129

ASSOCIATIONS OF PSYCHOMOTOR RESTLESSNESS AND AGITATION WITH TOBACCO WITHDRAWAL SYMPTOMATOLOGY IN AFRICAN AMERICAN SMOKERS

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Significance: Psychomotor restlessness and agitation (PRA)—unintentional motor activity stemming from mental tension such as fidgeting and pacing—is a psychopathological trait present in subtypes of several disorders that are comorbid with tobacco dependence (e.g., schizophrenia, mania, and depression). Whether PRA exacerbates tobacco withdrawal when abstaining from smoking is unknown but could inform personalized tobacco dependence treatment for smokers with psychiatric problems, including populations who experience health disparities. The present laboratory study investigated trait PRA as a predictor of tobacco withdrawal after experimentally-induced abstinence in African American daily cigarette smokers. **Methods:** African American smokers (N=729; 48% female; M age= 50 years old) attended an initial baseline session that assessed severity of trait PRA. Participants subsequently attended two counterbalanced sessions (16-hr abstinence vs. non-abstinent) where they completed self-report questionnaires on urges to smoke, nicotine withdrawal symptoms, and affect states. Linear regression models assessed the association of trait levels of PRA with the magnitude of abstinence-induced changes in study outcomes (abstinent - non-abstinent difference). Models adjusted for age, gender, alcohol use, drug use, sensation seeking, depression, cigarettes per day, mentholated vs. non-mentholated cigarette preference, and nicotine dependence. **Results:** Higher trait PRA was significantly associated with greater abstinence-induced increases in a nicotine withdrawal symptoms composite score (Standardized β =.12; $p<.05$) and several negative affect states (i.e., anger, anxiety, negative affect composite score, β tas=.14-.18; $p<.05$). Trait PRA was not significantly associated with abstinence-related changes in smoking motivation (reward vs. relief from negative affect, $p>.05$), confusion ($p>.05$), and positive affect states (i.e., elation, friendliness, vigor, positive mood, $p>.05$). **Conclusions:** Greater levels of trait PRA predict severity of negative affect-related tobacco withdrawal symptoms in African American smokers. With additional validation, results like these could inform personalized treatment matched to PRA phenotype status.

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POS3-130

ORAL CANCER SCREENING PRACTICES AMONG ORAL HEALTH PROVIDERS IN THE UNITED STATES

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Background Using nationally representative data from the 2015-2016 National Health and Nutrition Examination Survey (NHANES), this study aims to explore whether patient smoking status affects dental personnel when advising or performing oral cancer screenings and encouraging smoking cessation. **Methods** Demographic data, and completed household questionnaires from NHANES 2015-2016 were analyzed. Analytical samples were outcome-dependent. The primary outcome evaluated participants ever receiving an oral cancer screening exam by dental providers among all the adults \geq 30-year-old and visited a dentist at least once in their lifetime. Secondary outcomes assessed the participants receiving counseling to promote oral cancer screening and smoking cessation among individuals \geq 16-year-old and visited a dentist at least once in the previous year. Participants were grouped into current, former and never smokers. Weighted proportions were calculated, and multivariable logistic regression was performed to report adjusted Odds Ratios (OR) of primary and secondary outcomes with 95% Confidence Intervals (95% CI). **Results** Roughly one quarter of adults (\geq 30-years-old) who had ever visited a dentist received an oral cancer screening. The high-risk group of current smokers had 0.47 (95% CI 0.3-0.74) lower odds of receiving screening exam compared to never smokers. All minority groups showed decreased odds of receiving oral cancer screenings compared to non-Hispanic whites. The odds of oral cancer screening increased with age, education level, and income. Dental providers more likely to counsel participants on importance of oral cancer screening among older and highly educated patients. However, non-Hispanic Asians were less likely to be counseled compared non-Hispanic whites. Mexican-Americans and those above 400% FPL were less likely to receive smoking cessation counseling by a dental provider. **Conclusions** Oral health providers are under screening for oral cancer among the highest risk groups. Disparities exist for current smokers, minority groups, and patients from low income and less education who had lower odds of receiving an oral cancer screening exam.

POS3-131

NICOTINE PHARMACOKINETICS AND SUBJECTIVE EFFECTS FOLLOWING USE OF A NOVEL NICOTINE CONTAINING POWDER PRODUCT

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Background. Novel nicotine delivery systems, delivering nicotine without smoke, are complementary to tobacco harm reduction strategy. We present the first data from the clinical assessment of a novel nicotine-containing product, similar in appearance to a cigarette, that generates an inhalable aerosol from nicotine powder when air is drawn through it without the help of electronics. **Methods.** This was an open-label, randomized, crossover study to evaluate the nicotine pharmacokinetic (PK) profiles of four product variants, differing in nicotine content (1 or 2 mg), nicotine-powder particle size, and presence/absence of mentholated flavor, following a fixed puffing regimen and a one-hour *ad libitum* use period. A compartmental PK analysis approach was used to perform nicotine baseline correction. Safety and product satisfaction were assessed to provide further insights on product acceptance and product use. Eighteen healthy adult smokers were randomized in this study conducted in Switzerland and registered at www.clinicaltrials.gov (NCT03369340). **Results.** The mean of maximal nicotine concentrations (C_{max}) ranged between 1.1 and 3.1 ng/mL for the different product variants during fixed regimen and were reached after 15-22.5 minutes. During each *ad libitum* session, subjects used between one and four products to reach maximal nicotine concentrations (C_{peak}) between 2.6 and 5.4 ng/mL. Lowest extent of nicotine exposure was observed for the 1 mg variant, while the presence/absence of flavor and nicotine powder particle size did not influence the PK parameters for both regimens. Product satisfaction, assessed using an adapted version of the modified cigarette evaluation questionnaire, was similar across variants, with slightly lower scores for the unflavored variant, and was also similar to previously reported scores for cigarettes. Product variants were well tolerated, as indicated by the adverse events collection, safety monitoring, and cough assessment. **Conclusion.** This novel nicotine-containing product shows potential as an alternative to cigarettes for smokers in terms of product satisfaction and simplicity of use without the involvement of electronics.

Funding: Tobacco Industry



POS3-132

COMPARISON OF ALCOHOL-INDUCED SMOKING URGE IN HEAVY DRINKING AND ALCOHOLIC YOUNG ADULTS

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Smoking and drinking are highly associated and alcohol (up to a standard 0.8 g/kg dose) has been shown to increase smoking urge in heavy social drinking smokers (HD). However, less is known about alcohol-induced smoking urge in smokers with alcohol use disorder (AUD) and at very high levels of intoxication. Thus, as part of the larger Chicago Social Drinking Project, we compared alcohol's effect on smoking urge in HD and AUD at a standard intoxicating dose and in an even higher dose for AUD drinkers. Non treatment-seeking participants were n=126 HD (10+ drinks/week) and n=44 AUD (28+ drinks/week, 21+ for females) who smoked at least once in the past month. Each participant underwent two double-blinded randomized laboratory sessions to examine acute response to a standard dose of oral alcohol (0.8 g/kg, 4-5 drink equivalent) and a placebo, with AUD participants undergoing a third laboratory session to examine response to a very high dose (1.2g/kg, 7-8 drink equivalent). Participants were smoke-free for three hours prior to and throughout testing. Smoking urge was assessed via the Brief Questionnaire of Smoking Urges (B-QSU) at pre-drink baseline and at post beverage consumption intervals aligning with the breath alcohol curve (BrAC). As expected, AUD reported heavier drinking than HD (drinks/week: 45.9 vs. 19.9; heavy drinking days/month: 64% vs. 31%, $p < .001$). Despite similar smoking behavior between the groups (smoking days: 19.4 vs. 16.4 (HD); cigarettes/day: 6.5 vs. 6.0, $p \geq .10$), AUD reported significantly higher pre-drink smoking urges than HD (30.3 vs. 22.4, $p = .01$). Both AUD and HD showed alcohol (vs. placebo) increases in smoking urge throughout the BrAC (dose: $F = 37.4$, $p < .001$). In AUD, the very high dose of alcohol also produced increases in smoking urge compared to placebo ($p = .02$), but the increases were similar to those produced by the standard dose (standard vs. very high dose: $F = 0.11$, $p = .73$). In sum, alcohol robustly increased smoking urges in both HD and AUD, with a potential threshold at a 4-5 drink equivalent dose. Results are relevant for intervention in drinkers who want to continue drinking when attempting to quit smoking.

FUNDING: Federal

POS3-133

TOBACCO QUITLINE CESSATION OUTCOMES FOR SEXUAL AND GENDER MINORITIES

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Significance: Sexual and gender minorities (SGM) have disproportionately higher rates of tobacco use, and fewer report cessation, compared to cisgender heterosexuals (CH). Telephone quitlines (QL) offer free coaching and medications, are effective for cessation in the general population, and are accessed by SGM. However, the effectiveness of QL for cessation among SGM as compared to CH has not been studied. **Methods:** Data were analyzed from adults who called the Pennsylvania QL from 2012-2014 and responded to an evaluation survey 7-months after intake (response rate = 16%). Baseline characteristics (demographics, SGM identity, tobacco use and quit history, health status) and subsequent use of QL services (# calls completed: 3+/ < 3; nicotine replacement therapy (NRT) y/n) were collected during intake. Cessation was defined by self-reported past 30-day abstinence (y/n) on the evaluation survey. Gender-stratified propensity score matching was used to control for sample-size, achieve covariate balance (including use of QL services), and estimate the average treatment effect on treated (ATET) for the effect of SGM identity on cessation. **Results:** Evaluation surveys were completed with 3909 females (3.6% SGM) and 2333 males (4.5% SGM). There were significant differences in baseline characteristics between SGM and CH for both males and females. Compared to CH, SGM females more frequently completed 3+ QL calls combined with NRT (40.3% vs 30.3%, $p = .012$), but not QL calls or NRT alone. There were no differences in use of QL services for males. Before matching, male and female SGM reported lower quit rates than CH, but differences were not statistically significant (Females: SGM=25.2%, CH=31.7%, $p=.103$; Males: SGM=31.7%, CH=34.8%, $p=.518$). After matching, the treatment effect of SGM identity on cessation was 10.3% lower for females ($p=.08$) and 1.1% higher for males ($p=.87$), but not statistically significant. **Conclusion:** Among smokers calling the QL, SGM had similar quit rates compared to their CH counterparts in this single state sample. Further investigation in multiple states and larger samples is needed to understand this potential SGM identity-based disparity.

FUNDING: Academic Institution

POS3-134

SMOKING-RELATED SYMPTOMS AND BIOMARKERS BY HORMONAL CONTRACEPTIVE USE

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Introduction: Sex hormones influence nicotine dependence, smoking behavior, smoking-related symptoms (e.g., craving) and smoking relapse. Despite the growing literature in this area, a significant gap remains - the role of hormonal contraceptives (HCs). The use of oral contraceptives, a form of cyclical HCs (C-HC), has been linked to increased activity of the cytochrome P450 2A6 and faster nicotine metabolism. This relationship has yet to be examined in long-acting HCs (L-HC), such as Depo Provera TM. We aimed to examine the role of hormonal contraceptives on smoking-related biomarkers and symptoms. **Methods:** This secondary-data analysis utilized data from a larger study that aimed to compare biomarker exposure by nicotine content in cigarettes. We restricted the sample to women who were between the ages of 18 and 45. Participants were further classified into three groups based on HC use: C-HC, L-HC, and no-HC. At baseline, participants completed the Fagerstrom Test of Nicotine Dependence (FTND), Brief Wisconsin Inventory of Smoking Dependence Motives (WISDM) and provided a urine sample that was analyzed for total nicotine equivalent (TNE) and 4-(methylnitrosamino)1-(3-pyridyl)-1-butanol (NNAL). Kruskal-Wallis Rank Test was used to make comparisons between the three groups. **Results:** Participants (C-HC: n=15; L-HC: n=30; no-HC: n=40) were, on average, 30.3 ± 6.6 years old. There were significant differences in FTND scores with no-HC (5.3 ± 1.9) having the highest score followed by L-HC (4.8 ± 2.4) and C-HC (3.5 ± 2.1 ; $p=0.03$). A similar pattern was observed in the WISDM Tolerance subscale (no-HC= 4.7 ± 1.7 vs. L-HC= 4.5 ± 1.8 vs. C-HC= 3.4 ± 1.7 ; $p=0.02$) and TNE (no-HC= 70.1 ± 32.6 vs. L-HC= 61.2 ± 27.7 vs. C-HC= 49.0 ± 33.9 ; $p=0.02$). **Discussion:** Though limited by a small sample size and these data indicate that there may be differences in smoking-related symptoms and, possibly, smoking-related biomarkers, based on hormonal contraceptive use. Additional research is needed to replicate these observations in fully-powered studies and explore the implications for smoking cessation in women who use HCs.

FUNDING: Federal

POS3-135

IF YOU BUILD IT, THEY WILL COME: A COMPARISON OF SMOKING CESSATION TREATMENT MODELS IN ONTARIO BY DEMOGRAPHICS, HEALTH STATUS AND HEALTHCARE SERVICE UTILIZATION

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Significance: From its inception in 2005, the STOP program has used 11 treatment models to reach Ontario smokers. Little was known about the sociodemographics, health status, and healthcare utilization of patients served by these models. In order to describe and compare the patients that sought treatment via each of these models, we linked STOP enrollment data to administrative healthcare service utilization data.

Methods: 132,506 STOP enrollments were linked to administrative health databases (96% linkage rate). After validity exclusions and limiting to first enrollment the sample consisted of 107,302 unique Ontario patients who initiated smoking cessation treatment between 18Oct2005 and 31Mar2016. Comparisons of patients served by each model were made. Healthcare service utilization and total healthcare cost were measured for the 2 years up to enrollment. Prevalent physical health conditions were measured by algorithm based on administrative health data, and prevalent mental health conditions were measured by self-report. Personal socio-demographic variables were measured via self-report and neighbourhood socio-demographic characteristics by linkage to indexes by patients' residential postal code.

Results: Females outnumbered males in each model except in the Addiction Agency (AA) and Hospital models. The median age was 47 and the Web model was the youngest (median 39). SES was highest in the Pharmacy, Phone and Web models, and lowest in the Community Health Centre, Nurse-Practitioner Led Clinics (NPLC) and AA models. In the two years prior to enrollment: median healthcare costs were \$2740 and highest in the AA model with a median of \$9,393. Services used varied by model. COPD and hypertension were the most common physical health conditions in



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each model, but ranged from 14% in the Web model to 31% in Family Health Teams. NPLC and AA models had the highest prevalence of anxiety and depression (>50%). The Phone model had the lowest prevalence of each of the mental health comorbidities. **Conclusions:** Given the varying patient populations served by these models, tailored programming might best serve the needs of Ontario smokers.

FUNDING: State; Other

POS3-136

MULTIAXIAL ASSESSMENT OF EATING DISORDER SYMPTOMS IN COLLEGE WOMEN SMOKERS

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Significance: Individuals with eating disorder symptoms are more likely to smoke, often due to weight control expectancies. They are also more likely to have difficulties with smoking cessation due to greater post-cessation weight gain concerns. Eating disorder symptoms are often comorbid with depression symptoms such as negative affect, as well as urgency to reduce negative affect. Therefore, negative reinforcement expectancies may also contribute to nicotine use in individuals with eating disorder symptoms and depression symptoms. The purpose of this study was to determine whether negative affect reduction expectancies mediated the relationship between MAEDS scales of eating disorder symptoms and depression and smoking status. **Methods:** Participants (N = 59) included undergraduate females who completed a battery of measures. Specific to the current study, are the Multiaxial Assessment of Eating Disorder Symptoms (MAEDS) and the Negative Reinforcement Scale of the Smoking Consequences Questionnaire (SCQ). Smoking status was assessed via self-report and expired carbon monoxide. There were 20 never-smokers and 39 ever-smokers. Correlations among study variables were examined. Mediation analyses were conducted using the Baron and Kenny model. **Results:** No significant correlations emerged between the MAEDS eating disorder symptoms scales and smoking status; however, there was a significant correlation between the MAEDS Depression Scale and smoking status. A logistic regression analysis was used to determine whether smoking expectancies for negative affect reduction mediated the relationship between the MAEDS Depression Scale and smoking status. This model was significant (*Chi Square* (2) = 9.83, *p* = .007). The negative reinforcement expectancies predicted smoking status, (*Beta* = .021, *p* = .044), and the MAEDS Depression scores were no longer significant when the effect of expectancies on smoking status were statistically controlled. **Conclusion:** Future investigations of the unique contributions of the multiaxial symptoms of eating disorders to smoking behavior is warranted and could be useful for informing tailored interventions for female smokers.

FUNDING: Academic Institution

POS3-137

THE FEASIBILITY OF A PEER DELIVERED HEALTHY LIFESTYLE INTERVENTION TO IMPROVE THE HEALTH BEHAVIOURS OF PEOPLE LIVING WITH SEVERE MENTAL ILLNESS

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Significance: Better Health Choices is an 8-session telephone-delivered healthy lifestyle intervention that was developed for people living with SMI. It encourages participants to decrease their smoking, reduce their alcohol use, improve their diet by increasing their intake of fruit and vegetables, and reduce their leisure screen time. It incorporates clear health messages, established behavioural strategies and can be tailored to the personal goals of each participant. Previous trials of Better Health Choices have demonstrated it to be feasible when delivered by experienced clinical psychologists. The primary aim of the current study was to evaluate the feasibility of Better Health Choices when it is delivered by peer workers (i.e. people with their own lived experience of mental illness). Feasibility was assessed in terms of treatment and control group retention, as well as consumer satisfaction, and fidelity to protocol. Preliminary outcomes of the program were also examined. **Methods:** The study was conducted as a randomised controlled feasibility trial. Participants were randomly assigned to either the treatment or wait list control. Participants were recruited from Neami National, an Australian community mental health organization. The seven peer workers in this study were drawn from the Neami National workforce. **Results:** Forty-three participants were recruited. The average number of sessions completed by participants in the treatment condition was 5.7 (*SD*= 2.6) (from a total of 8 sessions). Seventeen participants (77%) completed at least half

of the sessions, and nine participants (40%) completed all eight sessions. Participant satisfaction was high, with a mean treatment group CSQ-8 score of 26.9 (*SD*= 3.6), with all participants followed up rating the quality of the service they received as 'good' or 'excellent'. Fourteen of the 24 treatment group participants reported smoking within the previous week at baseline assessment, and this had reduced to seven at 12-week follow up, and five at 16-week follow up. **Conclusions:** Results were promising regarding the feasibility of peer workers delivering Better Health Choices. The recruitment strategy was successful in reaching the desired number of participants within the time-frame planned. Good retention rates and high consumer satisfaction ratings in the treatment group demonstrated that peer workers were capable of delivering the intervention to the extent that consumers found it beneficial. Good follow up rates in the control group are promising for future clinical trials.

FUNDING: Nonprofit grant funding entity

POS3-138

PILOT STUDY ON CUE-BASED TREATMENT FOR LIGHT SMOKERS

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Background: Over the last several decades, light daily smoking (smoking \leq 10 cigarettes per day) has become increasingly prevalent. Light smoking poses significant health risks, as smoking even a few cigarettes a day has been shown to increase morbidity and mortality. Results from smoking cessation trials in light smokers are mixed. Most light smokers do not experience significant nicotine withdrawal during periods of abstinence, but instead smoke almost entirely in response to smoking cues. To help light smokers quit, it may be advantageous for smoking cessation treatments to directly target cue-based smoking with treatments that reduce cue reactivity or improve skills to manage cues. **Methods:** We present data from an ongoing developmental pilot study designed to evaluate the feasibility and acceptability of a cue-based intervention to promote smoking cessation among light smokers. Participants were randomized to one of three arms: Arm 1) standard smoking cessation plus support text messages; 2) enhanced cue exposure treatment that included interactive SMS texting to extend cue exposure treatment to the real-world; Arm 3) enhanced cue exposure treatment + D-cycloserine (a partial NMDA receptor inhibitor with known effects on cue-based learning). Outcomes included feasibility (number of participants recruited) and acceptability (response to cue-based treatments). **Results:** So far, we have enrolled 12 participants; 77% were female, 72% White, with an average age of 42. Participants smoked an average of 6.3 CPD. 75% completed real time data collection, 87% sent images. Participants attended an average of 4 of 5 sessions mean usefulness was 5.7 (1-7). **Discussion:** Results from this pilot study show that an intervention addressing cue reactivity among light smokers is feasible and acceptable. Methods used to extend cue exposure treatment to real-world environments via a text-based program were perceived as useful. From this small study it appears that cue-based treatments may be promising as an approach to helping light smokers quit.

FUNDING: Unfunded; Academic Institution

POS3-139

EFFECTS OF COUNSELING ENGAGEMENT AND MEDICATION UTILIZATION ON SHORT AND LONG-TERM CESSATION AMONG HOSPITALIZED PATIENTS

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Significance: Hospital interventions must extend to at least one month post-discharge to be effective. Medications significantly improve quit rates. Few hospital studies evaluate the relative contribution of different interventions delivered as multi-component "packages". This study evaluated the effects of counseling engagement and medication utilization on among participants in a hospital-based smoking cessation trial. **Methods:** The study data is from a trial examining the effects of enrollment in quitline via fax referral versus a "warm handoff". All participants (N=984) were offered quitline and a prescription for cessation pharmacotherapy on discharge. We used logistic regression to assess the associations of post-discharge quitline and pharmacotherapy use with abstinence at 1- and 6-months, adjusting for study arm and predictors identified in the literature and in bivariate analyses of study data. Our anal-



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ysis of predictors of 6-month abstinence also controlled for abstinence at 1-month. **Results:** Following hospitalization, 28% of the sample reported using some form of pharmacotherapy and 69% completed at least one quitline call. In bivariate analyses, post-discharge pharmacotherapy use and quitline calls completed were each associated with abstinence at 1-months and 6-months. In multivariable analyses, after controlling for a range individual and treatment related factors, abstinence at 1-month was associated with both pharmacotherapy use (OR = 1.48, p < .05) and total quitline calls (OR = 1.23, p < .001). After controlling for individual, treatment factors, and abstinence at 1-month, only total number of quitline calls was associated with abstinence at 6-months (OR = 1.22, p < .001). **Conclusions:** Pharmacotherapy and quitline counseling independently facilitate short-term abstinence, while longer-term abstinence is selectively facilitated by engagement in quitline services. This pattern of findings suggests that quitline counseling may be of particular benefit for reinforcing abstinence over the long-term post-hospitalization or for promoting cessation among smokers attempting to quit at time points more distal from their hospital discharge.

FUNDING: Federal

POS3-140

EFFECTS OF SIX-WEEK USE OF VERY LOW NICOTINE CONTENT CIGARETTES IN SMOKERS WITH SERIOUS MENTAL ILLNESS

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Significance: Smokers with serious mental illness (SMI) have lower cessation rates than smokers without these disorders. The FDA has proposed a nicotine reduction policy for cigarettes, but little is known about how this may affect cigarette use in people with SMI. In this study, we compared the effects of 6-week use of very low nicotine content (VLNC) and normal-nicotine content (NNC) cigarettes on smoking rates and other measures in smokers with SMI. **Methods:** Non-treatment seeking participants underwent a 1-week usual-brand baseline, followed by randomization to Spectrum VLNC (0.4 mg nicotine/g tobacco) or NNC (15.8 mg/g) research cigarettes under double-blind conditions for 6 weeks. Participants were instructed to smoke only their assigned cigarettes during the trial. Multiple linear regression was used to examine effects of cigarette condition on total (study + non-study) CPD, carbon monoxide (CO) levels, total nicotine exposure (TNE), heart rate, blood pressure and psychiatric symptoms at Week 6, while controlling for gender, age, and baseline levels of each outcome variable. **Results:** Participants (n = 58; 78% schizophrenia) were on average 43.3 years old, 42% female, and 62% White. At baseline, participants smoked 19.2 CPD and had breath CO levels of 20.6 ppm. At Week 6, significant effects of cigarette condition on CPD and CO were observed (p's < .05). Compared to those in the NNC condition, those in the VLNC condition smoked 4.2 fewer CPD on average; breath CO levels were 5.3 ppm lower in VLNC than in NNC. Scores on a measure of neuroleptic-induced parkinsonism were also lower in VLNC than in NNC. No other significant differences were observed. TNE was minimally reduced in the VLNC condition, suggesting that substantial non-adherence with VLNC cigarettes occurred. **Conclusions:** Our findings bolster the idea that the beneficial effects of a nicotine reduction policy may also extend to people with SMI, but the policy could result in switching to alternative tobacco products. Future studies should examine the effects of combining VLNC cigarettes with adjunctive non-combusted forms of nicotine delivery in smokers with SMI. **Funding:** This study was supported by a grant from NIDA and the FDA Center for Tobacco Products (CTP) (U54DA031659). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the FDA.

FUNDING: Federal

POS3-141

THE EFFECT OF FLAVORED AND NON-FLAVORED WATERPIPE TOBACCO ON SUBJECTIVE EXPERIENCE, HARM PERCEPTION, PUFF TOPOGRAPHY AND EXHALED CARBON MONOXIDE

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Significance: Flavored waterpipe (WP) tobacco is a main attractant for new smokers, and a key component of the "WP experience". Yet, evidence of the effects of limiting

flavor on WP smoker's experiences and behavior is lacking. This study examined the impact of flavor manipulation on user's puffing behavior, subjective smoking experience, harm perception and toxicant exposure. **Method:** A total of 138 WP smokers completed two, 45-minute *ad libitum* smoking sessions (preferred flavor vs non-flavored tobacco) in a crossover design study. Exhaled carbon monoxide (eCO) was measured before and after each smoking session. Puff topography was recorded throughout the smoking session. Participants completed survey questionnaires assessing subjective smoking experiences and harm perception. **Results:** Compared with the non-flavored WP tobacco, participants reported enhanced subjective smoking measures of satisfaction, calmness, taste, puff liking and enjoyment following the preferred flavored WP tobacco session (p-values <0.05). While participant spent longer time on smoking during the flavored tobacco session (p-value <0.05), greater maximum puff volume and greater levels of eCO were observed during the non-flavored tobacco session (P-value <0.05). WP harm perception was significantly higher among participants after smoking non-flavored WP tobacco compared with their preferred flavor. (p-value <0.05). **Conclusion:** Our findings indicate that tobacco flavor has a substantial effect on WP smokers' subjective experiences, toxicant exposure, and harm perception. Accordingly, regulating the use of flavored WP tobacco represent an important step for future tobacco control policies aimed at reducing the appeal of WP smoking among youth.

FUNDING: Federal

POS3-142

PREDICTORS OF SMOKING CESSATION IN AN E-CIGARETTE QUIT ATTEMPT: DEVICE TYPE, CRAVING AND CIGARETTE DEPENDENCE

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Background: Although factors associated with smoking cessation success have been widely studied, very little is known about the factors that may promote cessation where e-cigarettes (EC) are used as aids. This study aimed to identify the possible predictors of smoking cessation in smokers attempting to quit using an EC. **Methods:** 70 EC naïve smokers (N = 70; 62.9% female) were followed up at 1, 3 and 6 months after a 2-week lab experiment (consisting of 3 separate sessions) in which they received either i) a cigalike EC model (CL) containing 18 mg/mL nicotine concentrations, ii) a tank EC device (TM) (18 mg/mL), iii) a TM (6 mg/mL). Logistic regression analyses were conducted to assess whether device type (initial allocation and device type used at follow up), nicotine concentrations, craving reduction following EC use in the lab, mean puff duration, cigarette dependence and motivation to quit could predict cessation. **Results:** Cigarette dependence, Craving reduction with EC use and Device type at follow up were significant predictors of cessation at 1, 3 and 6 months respectively. Nicotine concentrations, mean puff duration and motivation to quit at baseline were not significant predictors. **Conclusions:** In a sample of 70 e-cigarette-naïve smokers, less dependent smokers were more likely to quit at 1 month. Those who reported greater craving reduction following EC use in the lab were more likely to have quit at 3 months; the predictive utility of measures of craving reduction at first use can be fostered to inform smoking cessation programmes. The odds of quitting at 6 months were higher for those using a tank device at the time of follow-up compared to those using a cigalike, which is in line with previous studies suggesting that tank systems are associated with successful cessation.

FUNDING: Academic Institution

POS3-143

DISTRESS TOLERANCE AND USE OF NICOTINE AND TOBACCO PRODUCTS THROUGHOUT HIGH SCHOOL

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SIGNIFICANCE: Distress tolerance (DT), one's ability to endure aversive experiences, has been implicated in substance use problems and treatment outcomes. However, empirical data on DT in relation to progression across the early stages of the tobacco product use trajectory is lacking. **METHODS:** Data were from high school students (N=3,383) surveyed twice per year from 2013-2017 (8 waves). A series of negative binomial regression models assessed prospective associations of baseline DT (Distress Tolerance Scale [DTS], range 1=strongly agree to 5=strongly disagree, where higher values reflect greater ability to withstand distress) and use frequency (number of days used in past 30 days) of cigarettes, e-cigarettes, hookah, and cigars, as well as volume of cigarette



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use (number cigarettes smoked in past 30 days) across waves. Sample selection was used to test whether associations differed by baseline use status (lifetime never-user vs. user). All models were adjusted for mental health symptoms, sociodemographics, and baseline use of respective product per model. **RESULTS:** In unadjusted models, there was a general trend that higher DT was negatively associated with later nicotine/tobacco use. Among baseline hookah never-users, each unit increase of mean DTS was associated with 31% fewer days of hookah use in past 30 days collapsed across 7 follow-up waves ($IRR[95\%CI]=0.69[0.48, 0.99]$). No associations were observed for cigarettes, e-cigarettes, and cigars in fully adjusted models for baseline never users per respective product. Among baseline cigarette users, each unit increase of mean DTS was associated with 59% more days of cigarette use ($IRR[95\%CI]=1.59[1.05, 2.43]$) and 41% more cigarettes smoked ($IRR[95\%CI]=1.41[1.08, 1.82]$) in past 30 days across waves. No associations were observed between DT and e-cigarette, hookah, and cigar use in adjusted models for baseline users per respective product. **CONCLUSION:** While there was an association between DT and reduced levels of use among new-onset hookah users, there is little predictive value of DT over and above mental health symptoms. An unexpected association between higher DT and increased risk of smoking was identified, which warrants replication before interpretation.

FUNDING: Federal; State; Academic Institution

POS3-144

THE RATIO OF PROPYLENE GLYCOL AND VEGETABLE GLYCERIN WITHIN E-LIQUIDS: IMPACT ON VAPING REINFORCEMENT VALUE AND TOBACCO USE PATTERNS IN CURRENT CIGARETTE SMOKERS

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Significance: E-liquids are primarily comprised of propylene glycol (PG) and vegetable glycerin (VG). The ratio of PG:VG is considered an important sensory characteristic by manufacturers and users of e-cigarettes. The goal of this study was to understand how the PG:VG ratio of e-cigarette e-liquid impacts the reinforcement value of vaping and tobacco use patterns among current smokers who try using e-cigarettes. **Methods:** Current cigarette smokers sampled, in a double-blind fashion, three different e-liquids that varied only in PG:VG ratio (70:30, 50:50, 0:100) while holding constant other aspects of the e-liquid (i.e., nicotine dose, flavors, heating temperature) using the same e-cigarette device. Participants evaluated the sensory characteristics of each e-liquid before completing a preference assessment in which they chose across a series of trials to either remain abstinent or to sample the e-liquid of their choosing. Participants were then randomly assigned to receive one of the e-liquids to take home with them for a one-week sampling period. Results: 23 participants have completed the study so far, with recruitment still ongoing to reach a target sample size of 30; the study remains blinded. During the preference assessment, participants chose to remain abstinent on 37% of trials, and chose to use each of the e-liquids on 18 percent, 19 percent, and 26 percent of trials, suggesting an early preference for one PG:VG ratio. The study will be completed and unblinded results will be available for presentation at SRNT. Outcomes that will be assessed in relationship to PG:VG ratio include subjective ratings, percentage of choices in the preference assessment, and changes in cigarettes use during the at-home sampling period. Conclusion: These data will provide information about how PG:VG ratio impacts the preference for and use of e-liquids and possible implications for downstream influence on cigarette consumption. This information is relevant to understanding how aspects of e-cigarette design influence consumer preferences and for informing product standards for e-liquids.

FUNDING: Federal

POS3-145

THE RELATIONSHIP BETWEEN SMOKING ATTENTIONAL BIAS AND CIGARETTE CRAVING: A META-ANALYTIC INVESTIGATION

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Cigarette craving has been shown to predict drug use and relapse. Numerous investigators have theorized that cigarette craving and attentional bias to smoking-related cues are related processes. However, the literature on this topic has produced mixed results. In this meta-analysis, we sought to quantitatively characterize the relationship between smoking attentional bias and self-reported cigarette craving across >80 independent study statistics, from >30 published manuscripts. Additional stratified secondary analyses

were implemented in order to study the influences of attentional bias task type, attentional bias cue modality, craving questionnaire type, and temporality of craving questionnaire administration relative to the attentional bias task. Meta-regression, another secondary analysis type, was utilized in order to study the impact of sample gender. Two additional analyses were performed to account for the possible influence of publication bias on the primary study findings: calculation of Rosenthal's fail-safe N and a trim-and-fill analysis. Results indicated a small-to-medium and statistically significant positive relationship between smoking attentional bias and self-reported cigarette craving. Rosenthal's fail-safe N s were high enough to indicate that the primary meta-analytic result is unlikely to be attributable to a publication bias favoring statistically significant results. Overall, these results indicate that while these constructs are related, researchers should be cautious about generalizing findings regarding either one of these constructs to the other.

FUNDING: Federal; Academic Institution

POS3-146

ATTITUDES TOWARDS PRECISION TREATMENT OF SMOKING AMONG SMOKERS IN THE SOUTHERN COMMUNITY COHORT STUDY

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Significance: Precision interventions using biological data to enhance smoking treatment offer opportunity, yet are understudied among diverse high risk community smokers of low socioeconomic status. **Methods:** We surveyed current smokers in the NCI-sponsored Southern Community Cohort Study (70% response). Seven items assessed attitudes towards aspects of precision smoking treatment, from undergoing a blood test to acting on test results (e.g., "If a blood test could help my doctor choose the best medicine for me to quit smoking, I would take that blood test"). Items were dichotomized as favorable (strongly agree/agree) vs. less favorable (strongly disagree/disagree/neutral). Multivariate logistic regression tested independent associations of motivation (precontemplation [low], contemplation [medium], preparation [high]) and confidence in quitting (low, medium, high) with attitudes toward precision medicine, controlling for sociodemographic and smoking related factors. **Results:** Current smokers (n=885) were predominantly African American (84%), female (58%), older (median age 60; IQR 56-64), and had an annual household income <\$15,000 (63%). Participants smoked a median of 10 cpd (IQR 6-18) and 61% reported time-to-first cigarette within 30 minutes. There was broad distribution of motivation (28% low, 30% medium, 38% high) and confidence to quit (20% low, 27% medium, 48% high). Over 70% of respondents endorsed favorable attitudes toward precision medicine. Results were similar across items, and are presented for the single item shown. Adjusted odds of endorsing favorable attitudes were directly related to motivation (med vs low: AOR 2.5 [95% CI 1.6-3.9], $p<.001$; high vs low: AOR 1.9 [95% CI 1.3-2.9], $p=.002$; med vs high: AOR 0.8 [95% CI 0.5-1.2], $p=.20$) and confidence (med vs low: AOR 1.7 [95% CI 1.1-2.7], $p=.03$; high vs low: AOR 2.6 [95% CI 1.7-4.1], $p<.001$; med vs high: AOR 1.5 [95% CI 1.0-2.3], $p=.05$). **Conclusions:** In this high risk, diverse community sample, most smokers endorsed favorable attitudes toward precision smoking treatment. Those lacking confidence or motivation may need these barriers addressed before they are willing to adopt precision approaches.

FUNDING: Federal; Academic Institution

POS3-147

CAN A COMPUTERIZED CLINICAL DECISION SUPPORT SYSTEM IMPROVE PRACTITIONERS' DELIVERY OF AN ALCOHOL BRIEF INTERVENTION TO SMOKERS DRINKING AT RISKY LEVELS? RESULTS OF A PRAGMATIC CLUSTER RANDOMIZED TRIAL

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Significance: Combined tobacco and alcohol use present multiplicative risk for aero-digestive cancers. Reducing alcohol consumption improves smoking cessation outcomes and reduces cancer risk. Therefore, targeted programs for smokers who drink above



alcohol guidelines are needed. However, in primary care settings, alcohol and smoking are often treated separately despite concurrent treatment potentially leading to better outcomes. The objective of this study was to examine whether a computerized clinical decision support system (CDSS) influenced practitioner delivery of an alcohol brief intervention to smokers drinking at risky levels. **Methods:** 221 primary care clinics, implementing an existing smoking cessation program, were blindly allocated to receive CDSS (intervention) versus standard practice (control). Practitioners working in clinics randomized to the intervention arm received computer alerts when a patient reported consuming alcohol above guidelines, and were guided to provide the patient a brief intervention and an educational resource. Clinics randomized to the control arm had access to the same educational resources, but did not receive computer alerts. **Results:** In 16 months, 15,222 smokers were screened for alcohol use of which 38% drank above guidelines. Of those who drank above guidelines, 45% were offered an educational resource. Primary Outcome: There was no significant difference in practitioners' (with versus without CDSS) likelihood of offering educational resources to appropriate patients [OR=1.19 (0.88-1.64), p=0.261]. Secondary Outcome: A significantly greater proportion of patients in the intervention group accepted the offered educational alcohol resource [OR=1.48 (1.01-2.16), p=0.045]. Tertiary Outcome: There was no association between CDSS and participant having quit smoking and drinking within guidelines, at the 6-month follow-up. **Conclusion:** Use of a CDSS had no influence on practitioner behavior in offering an educational resource when prompted. However, the observed increase in patients accepting the offered resource in the CDSS group suggests that it may change practitioner behavior in other ways that the current study did not measure.

FUNDING: Nonprofit grant funding entity

POS3-149

A MIXED BAG OF CHALLENGES, A QUALITATIVE STUDY OF BARRIERS TO SMOKING CESSATION AFTER CERVICAL CANCER DIAGNOSIS

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Significance: Some population-based data suggest cervical cancer survivors (CCS) smoke at a rate much higher than other cancer survivors and non-cancer controls. Smoking after any cancer diagnosis carries significant risk, including increased risk of early mortality, second primary, recurrence, and poor treatment response among others. Despite the undeniable importance of smoking cessation after cancer diagnosis, few studies explore the reasons behind CCS' high rate of persistent smoking. This study helps fill that gap in the literature. **Methods:** Twenty-one recently diagnosed CCS (M, SD=3.9, 1.3 years post-diagnosis; M, SD=45.6, 8.4 years old) completed individual, semi-structured phone interviews, the topic of which explored their beliefs, feelings, and experiences related to smoking cessation after cervical cancer. Interviews were audio recorded, transcribed verbatim, and then analyzed in ATLAS.ti via thematic analysis. **Results:** Based on 30-day point prevalence, all participants were current smokers at diagnosis and 66.7% were current smokers at the time of study participation. Many barriers to smoking cessation and maintaining abstinence were evident via interview, with specific themes emerging around environmental, practical, and personal barriers. First, a majority of survivors described having a social network largely comprised of other smokers, which was viewed as both a trigger for smoking and challenge for quitting. Second, success with smoking cessation was sometimes further complicated by hardship associated with healthcare access, cost of cessation treatments, and/or limited knowledge of effective means to quit. Finally, many survivors identified barriers related to their wavering readiness to quit, enjoyment from smoking, views of smoking as a stress reliever, and a belief that "nothing works" with regard to cessation treatment. **Conclusion:** Altogether, this study illustrates the complexity of smoking cessation versus persistence after cervical cancer diagnosis. Study findings clearly highlight CCS as a population in need of navigation around available cessation treatments as well as tailored interventions to best address the barriers cited above.

FUNDING: Federal; Other

POS3-150

NICOTINE DEPENDENCY IN VAPERS AND SMOKERS

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Significance: The rapid rise in e-cigarette use has led to concern that smokers are simply transferring their nicotine addiction to vaping. Few studies have explored the

relative addictive properties (dependence liability) of smoking vs. vaping and existing studies have relied on retrospective and subjective reports. This study aimed to compare dependency to cigarettes in current exclusive cigarette smokers to dependency to e-cigarettes in current exclusive vapers using self-report and objective measures. **Methods:** Using a between-subjects design, 25 smokers and 21 vapers (24 male, mean age: 35 yrs) completed the following measures: i) a self-report Cigarette/e-cigarette Dependence Scale (CDS/eCDS); ii) a concurrent choice task (CCT) to measure the relative value of cigarettes/e-cigarettes against an alternative reinforcer (money) in the absence and presence of drug cues; and, iii) an economic demand task (cigarette/e-cigarette purchase task; CPT/eCPT) to assess value ascribed to cigarettes/e-cigarettes as indicated by break point, free access consumption, peak expenditure, peak price and maximum puffs. **Results:** Overall CDS/eCDS scores did not differ although vapers reported more puffs per day and higher stress if they didn't have their device whereas smokers reported using sooner after waking, feel like they used too much and higher levels of 'dropping everything to smoke'. On the CCT, smokers and vapers did not differ; percentage choice for cigarettes/e-cigarettes was higher than for money for both groups and cues for both cigarettes/e-cigarettes primed responding for smokers and vapers comparably. Peak expenditure, peak price and break point on the CPT/eCPT was higher for smokers than vapers. Free access consumption and maximum puffs did not differ between groups. **Conclusion:** Results from the self-report measure (CDS/eCDS) are ambiguous in relation to whether smokers and vapers differ in levels of dependency. Concurrent choice and cue-elicited drug-choice behaviour was similar across groups. The shorter time to use after waking, and the higher breakpoint amongst smokers on the CPT however, are indicative of higher levels of dependency in smokers vs. vapers.

FUNDING: Unfunded

POS3-151

USING REDCAP TO MONITOR BREATH CARBON MONOXIDE AND MEDICATION ADHERENCE THROUGH VIDEO CAPTURE: METHODS, BENEFITS, AND LIMITATIONS

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Significance: The objective verification of smoking and adherence to smoking cessation medication regimens has been historically challenging and costly to implement. Breath carbon monoxide (CO) is a biochemical measure of smoking, but has a short half-life, thus requiring at least daily samples to accurately capture sustained abstinence. Similarly, verifying medication adherence presents additional challenges and hardware and/or software may be cost-prohibitive. These methods of verification are increasingly important, however, to rigorously evaluate the efficacy of interventions, especially as remote methods become more common. To circumvent barriers such as cost and study start-up delays due to platform development, our research team has implemented a video capture system for breath CO and medication adherence using Research Electronic Data Capture (REDCap), which is a secure, web-based database management system. **Methods:** In an ongoing study of adult cigarette smokers (ages 18-65) (ClinicalTrials.gov NCT02737358), REDCap is being used to remotely monitor breath CO and medication adherence twice daily through video uploads (smart phone only) for the first week after randomization. **Results:** Of the 89 participants randomized (Mean age=41; SD=12), 71% of expected breath CO videos were completed and 74% of expected medication videos were completed. Approximately 30% of participants required a study phone to complete procedures. **Conclusions:** The use of REDCap for video capture in smoking trials has several benefits. Videos are collected concurrently with self-reports of mood, stress, craving, etc. REDCap databases can be set up immediately and without the need for specialty programming or stand-alone platform development. However, there are also limitations to these methods. Research staff must review videos to ensure fidelity. Video file size and poor cellular reception may extend upload times. REDCap access is also required, which is not currently available at all institutions. Even with these limitations, the use of REDCap for video capture and survey administration in smoking trials serves to improve the rigor with which we evaluate interventions, thus supporting the long-term goal of promoting abstinence from smoking.

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SRNT

POS3-152

HAS REFERRAL FOR FORMAL SMOKING CESSATION COUNSELING INCREASED AMONG LUNG-CANCER-SCREENING ELIGIBLE PATIENTS AFTER GUIDELINE CHANGE?

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Significance: Smoking cessation counseling has long been recommended for heavy smokers but uptake has been very low. The new recommendation and coverage of lung cancer screening with low dose computed tomography (LCS-LDCT) requiring concurrent smoking cessation has the potential to increase counseling. Our aim was to assess the orders of smoking cessation counseling among LCS-LDCT-eligible patients following the policy changes. **Methods:** We analyzed the electronic health records data from a large healthcare system in Northern California for 2010-2016. We examined changes before (2010-2013) and after (2014-2016) the guideline change in orders for smoking cessation counseling among: a) LCS-LDCT-eligible smokers returning to see the same primary care provider (PCP); and b) LCS-LDCT-eligible smokers who began seeing a PCP. We used Hierarchical Generalized Linear Modeling. **Results:** When LCS-LDCT-eligible smokers revisited a PCP in 2010-13, 5% (288/5479) received an order for smoking cessation counseling vs. 6% (560/8634) after the guideline change. Controlling for age, sex, race/ethnicity, pack years, and number of visits to the PCP, returning LCS-LDCT-eligible smokers were significantly [OR = 1.5 (1.2-1.9), P=0.0002] more likely to have smoking cessation counseling orders entered after the guideline change. Among patients who were new to their PCP, 11% (216/2057) visiting before guideline change received an order for counseling vs. 15% (206/1421) of those visiting after the guideline change. New patients were significantly more likely to receive an order after the guideline change (OR=1.5 (1.1-1.9), P=0.007), controlling for age, sex, race/ethnicity, and pack years. **Conclusion:** Smoking cessation counseling orders are substantially more likely to occur after the guideline change among both returning LCS-LDCT-eligible smokers and those who are new to a PCP. Although referrals for counseling are substantially higher for patients seeing a new PCP, the odds-ratio associated with a visit in the post-period were comparable. Our observation of higher referral rates with new PCPs may inform future research on patient and PCP factors in referrals.

FUNDING: State

POS3-153

CHRONIC ILLNESS AMONG LOW-INCOME SMOKERS: DEPRESSION, ANXIETY, AND NICOTINE DEPENDENCE AFFECT SELF-EFFICACY FOR SMOKING CESSATION

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Significance: Over half of the deaths that result from chronic illnesses (CI) are derived from a small number of modifiable health risks; tobacco use is among these modifiable health risks. Self-efficacy has been shown to be associated with health management behaviors for improved health. The relationship between self-efficacy and self-management behaviors in smokers is essential given that many smokers develop chronic illnesses. The current study examines the role of depression, anxiety, and nicotine dependence on self-efficacy for smoking cessation in a sample with high prevalence of CIs. **Methods:** We interviewed 80 low-income smokers (35% African-American and 29% Latinx) who were primarily recruited from the San Francisco Health Network (SFHN). Interviews were conducted at Zuckerberg San Francisco General Hospital to explore the health and social issues that low-income individuals face (such as depression, anxiety, other health and economic problems) that make it difficult for them to engage in smoking cessation efforts. Three multiple regression analyses were run to predict prevalence of CIs and smoking abstinence self-efficacy. **Results:** 73.4% of respondents reported having chronic illnesses (25% reported having one chronic illness, 13.3% reported having two chronic illnesses, and 35.1% reported having three or more chronic illnesses). Nicotine dependence, anxiety, and depression significantly predicted CIs in one regression model ($R^2 = .140$, $F(3, 54) = 2.93$, $p < .05$) and health management behaviors (communication with physicians, exercise behaviors, and self-rated health) significantly predicted CIs in the second model ($R^2 = .260$, $F(5, 54) = 3.79$, $p < .01$). Anxiety, depression, and nicotine dependence significantly predicted smoking abstinence self-efficacy ($R^2 = .099$, $F(3, 74) = 2.72$, $p < .05$). **Conclusion:** Mental health factors—depression, anxiety and nicotine dependence—and health-management behaviors are predictive of CIs in smokers. Depression and anxiety are significantly related to nicotine dependence, and smokers who are more dependent on nicotine tend to be less confident in their ability to abstain from smoking

in certain contexts. Reducing depression and anxiety symptoms and helping low-income smokers to abstain may be worthwhile health goals to reduce the high prevalence of CIs in this population.

FUNDING: State

POS3-154

MHEALTH CESSATION APPS: COMPARING PREFERENCES OF DEPRESSED AND NON-DEPRESSED SMOKERS CONTEMPLATING QUITTING

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Background: Our prior work indicated depressed smokers engaged less with a mHealth cessation app than non-depressed smokers. Understanding what app features and content areas depressed smokers find appealing and how these preferences may differ from non-depressed smokers can help us develop apps that are more engaging and effective for smokers with depression. **Methods:** Adult smokers (N=116) who owned a smartphone and wanted to quit smoking someday, but not within the next month, completed an online survey about their interest in using apps to decide if, when, or how to quit smoking. Participants also rated 20 app features and 10 content areas these apps might include using a 5-point scale. Half the sample (49%) screened positive for depression based on a single-item screener. Group responses were compared. **Results:** Depressed and non-depressed smokers were similar demographically. Although fewer depressed smokers were interested in quitting within 6 months (56% vs. 78%, $p = .021$), most were interested in using an app to help them decide if, when, or how to quit (95% non-depressed vs. 86% depressed, $p > .05$). Among the app features rated, depressed smokers were significantly less interested in video chatting with other smokers (mean=1.8 vs. 2.3; $p = .011$) or sharing their quitting progress on social media (mean=1.7 vs. 2.2; $p = .005$), though these features were among the lowest rated for both groups. Depressed smokers were significantly more interested in content on managing depression (mean=3.3 vs. 3.0; $p = .049$). All other ratings were similar between groups. Considering all features and content areas together, the highest ratings for depressed smokers were anxiety management content (mean=3.5), stress management content (mean=3.4), a feature to earn prizes (mean=3.4), and depression management content (mean=3.3). **Conclusions:** Depressed smokers are receptive to using mHealth apps to quit smoking, even if they are not ready to quit in the near term. While depressed and non-depressed smokers have mostly similar preferences for what these apps should include, some notable differences exist and should be considered when creating mHealth interventions for depressed smokers.

FUNDING: Federal; Academic Institution

POS3-155

IMPACT OF FLAVORS AND SWEETENERS ON WATERPIPE TOBACCO SMOKING TOPOGRAPHY, ABUSE LIABILITY, TOXICANT EXPOSURE, AND INTENTIONS FOR CONTINUED USE

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Introduction: Waterpipe tobacco (WT) smoking is proliferating in the US. One possible reason for the increase in WT smoking is the inclusion of flavors and sweeteners in the tobacco. No study has examined what effect the removal of flavors and sweeteners



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from WT would have on users' smoking patterns, abuse liability, behavioral intentions for continued use, and toxicant exposure. **Methods:** In a randomized crossover design, WP smokers ($N=89$, 59% male, $M_{age}=24.2$ years) completed four smoking sessions, each separated by a 48-hr washout period. Each session used a different WT flavoring preparation [flavored + sweetened (FS); flavored + unsweetened (FU); unflavored + sweetened (US); unflavored + unsweetened (UU)] and included a 10-puff standardized puffing bout followed by a 1-hour ad libitum WT smoking session. Study visits were completed in dyads. Participants completed post-session measures assessing WT abuse liability, behavioral intentions for continued use, exhaled carbon monoxide (eCO) and nicotine boost; waterpipe puff topography was measured continuously throughout the session. **Results:** 93% of participants reported that the first time they smoked waterpipe the tobacco was flavored. For all measures of drug liking/satisfaction, the FS tobacco was rated significantly higher than all other unflavored preparations, with the UU tobacco preferred the least (all $p<.05$). Participants' intentions for continued use were lowest for the UU preparation, with only 50%, 41%, and 19% of participants reporting that they were 'likely' to "try this product again", "pay to smoke this product at a waterpipe lounge", or "use this product regularly", respectively. Significant differences in puff topography were observed during standardized and ad libitum sessions, with the UU preparation leading to greater total inhaled volume and eCO boost, but lower nicotine boost compared to the FS preparation (all $p<.05$). **Conclusions:** The current study suggests that flavors and sweeteners from waterpipe tobacco significantly influence the product's abuse liability, users' reported willingness/interest for continued use, puff topography, and exposure to tobacco toxicants.

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POS3-156

PARTICIPATION IN A WORKPLACE SMOKING CESSATION PROGRAM INCENTIVIZED BY LOWERING THE COST OF HEALTH CARE COVERAGE

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Significance. Systematic analyses of workplace smoking cessation programs indicate that efficacy can be enhanced by using incentives. There is variation in the type of incentives used and their effect on participation and efficacy. The aim of our study was to examine whether lowering employee health plan costs (employee contributions, copays) incentivized employee smokers to participate in workplace smoking cessation. **Methods.** During 2014-2016, we conducted a prospective cohort study of 415 employee smokers of Loma Linda University Health (LLUH). The employees were offered participation in an incentivized workplace smoking cessation program (LLUH BREATHE Initiative) in which the incentive consisted of enrollment in an employer-provided health plan that had a 50% lower employee monthly contribution and copayment relative to the employer-provided health plan for non-participants. **Results.** In the LLUH BREATHE Cohort, we found a very high rate of participation (72.7% [95% CI 69% to 77%]) in workplace smoking cessation that was incentivized by a lower out-of-pocket health plan cost for the participating employee and/or spouse. Participation did, however, vary by gender and spousal effects whereby female employee households with a qualifying smoker were more than two times more likely (employee ($OR=2.89$ 95% CI [1.59, 5.24]) or spouse ($OR=2.71$ 95% CI [1.47, 5.00])) to participate in smoking cessation than the male employee household. The four month point prevalence of smoking cessation in participants was 55% [95% CI = 49% to 61%]. **Conclusions.** Our findings identify that workplace smoking cessation that uses a novel, reward-based incentive of lower "out of pocket" health plan costs produced a participation rate that was much higher than US norms.

FUNDING: Academic Institution

POS3-157

PREDICTORS OF ADHERENCE TO NICOTINE REPLACEMENT THERAPY IN RECOMMENDED USUAL CARE AND ENHANCED TREATMENT IN PRIMARY CARE SETTINGS

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Background: Non-adherence to smoking cessation pharmacotherapy is common and is strongly related to cessation failure. This project used a novel method to identify patients at risk for non-adherence. **Purpose:** To identify subgroups of adult smokers who differ in adherence to a short course of nicotine patch or a long course of combined nicotine patch and mini-lozenge therapy. **Design, setting, participants:** Adult smokers motivated to quit ($N=623$) were recruited from primary care clinics and randomized to either Recommended Usual Care (RUC; 8 weeks of nicotine patch plus state quitline counseling) or Abstinence-Optimized Treatment (AOT; 26 weeks of nicotine patch and mini-lozenges with up to 11 counseling contacts). Diverse baseline demographic and smoking history data were gathered. **Method:** Classification and Regression Tree modeling identified optimal cut-points in candidate demographic, smoking history, and individual difference predictors of adherence to differentiate subgroups of smokers based on adherence at 4 weeks and, for AOT only, 16 weeks post-target-quit-day. **Results:** Predictors of daily patch use at week 4 post-quit in RUC were: greater motivation to quit, stress-cue elicited craving, and taste-sensory dependence. In AOT, no baseline predictor was associated with patch use at week 4. At week 16 in AOT, exposure to others smoking, taste-sensory dependence, and confidence in quitting were positively related to daily patch use, whereas fear about smoking medication was negatively related with patch use. At both weeks 4 and 16, multiple smoking dependence dimensions were positively related to mean daily nicotine lozenge use. At week 4, greater exposure to smoking cues also predicted more lozenge use. **Conclusion:** Adherence to nicotine replacement therapy (NRT) is related to: cigarette dependence, exposure to smoking cues, quitting motivation and confidence, and medication fears. Smokers high in motivation, dependence, and awareness of cue exposure and reactivity use more NRT, perhaps as a way to mitigate these risks.

FUNDING: Federal

POS3-158

SMOKING AND SUICIDAL IDEATION AMONG COLLEGE STUDENTS

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Significance: There has been a potential dose-response relationship between smoking and suicide reported in the literature. That is, smokers have been more likely to have deaths from suicide, and the higher the daily smoking rate, the higher the odds ratio for completed suicides (Lucas et al., 2013). These findings are controversial, and it remains unclear whether other substance abuse and mental health issues were adequately controlled in studies, and whether such factors better account for the suicide findings than smoking alone. Further, little to nothing is known about potential mediating and moderating variables between smoking and suicidal ideation. **Methods:** In the present study, we assessed college undergraduates ($N = 607$) for smoking patterns, smoking history, smoking-related outcome expectancies, mental health diagnoses, including major depression and alcohol/drug use disorder, and suicidal ideation. **Results:** Participants were primarily female (82.4%) and Caucasian (75.1%), with a mean age of 20.1 ($SD = 1.9$) years. There were 433 nonsmokers, 30 exsmokers, 111 infrequent smokers, and 33 daily smokers. Most participants (87%) reported no suicidal ideation, 10.3% reported ideation, 2.0% reported a desire to kill themselves, and .7% reported they would, "kill myself if I had the chance." There was a significant main effect for smoking status on suicidal ideation, such that daily smokers had the highest level of suicidal ideation, followed by exsmokers, followed by infrequent smokers, followed by nonsmokers ($p = .003$). Also, as predicted, hierarchical logistic regression analysis showed a dose-response relationship between smoking and suicide, such that the higher the daily smoking rate, the more likely participants were to report suicidal desire or intent vs. ideation, while controlling for depression and alcohol/drug use disorder symptoms ($p = .027$). Smoking expectancies for negative affect reduction were not significant moderators between smoking and suicidal reporting. **Conclusions:** Results are discussed in terms of theoretical mechanisms and potential targeted interventions for this population.

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SRNT

POS3-159

A PHARMACOKINETIC AND PHARMACODYNAMIC EVALUATION OF CYTISINE FOR SMOKING CESSATION IN HEALTHY SMOKERS

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Significance: (-)-Cytisine is a natural plant-based alkaloid that inhibits nicotine's effects on central nicotinic acetylcholine receptors. It is approved for smoking cessation in Central and Eastern Europe as a 1.5 mg tablet administered in a downward titration from 6 to 1 tablet/day over 25 days. This study evaluated the pharmacokinetics, pharmacodynamic effects, and safety for higher 3.0 mg unit doses versus the 1.5 mg doses, using the 25-day titration schedule. **Methods:** An open-label study enrolled 24 healthy adults (18-65 years) who smoked 10+ cigarettes/day, had expired carbon monoxide (CO)>11 parts per million (ppm) and wanted to stop smoking (but no quit date was required). Subjects were randomized to 1.5 or 3.0 mg cytisine using the 25-day titration schedule. Pharmacokinetic parameters were derived from plasma concentrations-time profiles. Pharmacodynamic parameters included the reduction in the number of cigarettes smoked daily, monitored by expired CO levels. Smoking cessation was assessed on Day 26 (no cigarettes smoked over 24 hours confirmed by CO<10 ppm). Safety assessments occurred throughout study. **Results:** 24 subjects completed the study. Titrated reductions in daily dosing resulted in corresponding reductions in C_{max} levels. Plasma cytisine concentrations were higher at 3.0 mg versus 1.5 mg unit dosing. At baseline, mean cigarettes/day was 17.1 (\pm 4.5 SD) and mean exhaled CO was 20.6 (\pm 6.9 SD). On Day 25, cigarettes smoked daily was reduced by 92% or 95% in the 1.5 or 3.0 mg cytisine groups, respectively. By Day 26, smoking cessation occurred in 33% and 58% of subjects in the 1.5 or 3.0 mg cytisine groups, respectively. Adverse events (AE) ≥ 1 was 66.7% in each dose group: all events had mild or moderate severity. Headache was the most common event with a slightly higher number of subjects reporting moderate headaches in the 3.0 versus 1.5 mg dose group (33.3% vs 16.7%). There were no serious or unexpected serious AEs. **Conclusion:** This short 25-day cytisine treatment showed significant smoking reduction and cessation benefit with minimal safety risk at both the higher 3.0 mg and 1.5 mg unit doses.

FUNDING: Industry Source

POS3-160

IMPACT OF SWITCHING TO A HEAT NOT BURN TOBACCO PRODUCT ON CYP1A2 ACTIVITY: A REVIEW OF FOUR CLINICAL STUDIES

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Polycyclic aromatic hydrocarbons (PAH) are products of incomplete combustion of organic matter through tobacco smoking and are well-known inducers of drug-metabolizing enzymes. Exposure to PAHs in humans results in marked induction of cytochrome CYP1A2. For instance, the average clearance rates of caffeine, chlorpromazine, clozapine, haloperidol, olanzapine, and theophylline increase by 30-100% in smokers compared with nonsmokers. Switching to novel tobacco products that reduce the exposure to harmful and potentially harmful constituents, including PAHs, could reduce CYP1A2 activity compared with that of continuing smoking. This would mean that, smokers taking medications that are primarily metabolized by this enzyme will have higher systemic clearance due to increased enzyme induction. The aim of this review is to summarize the evidence from clinical studies on the effects of switching to a *heat-not-burn tobacco product (IQOS® with HEETS®)* on CYP1A2 activity and to review the corresponding potential effects on drugs primarily metabolized by CYP1A2. Four clinical studies that are part of the clinical assessment of *IQOS with HEETS* looked at CYP1A2 activity by measuring the caffeine metabolic ratio (CMR) in plasma in switchers to *IQOS with HEETS* and those who continued smoking or abstained from smoking. Results showed that after five days of exclusive *IQOS with HEETS* use, CMR levels were significantly decreased to an extent similar to that of smoking abstinence in all clinical studies, with a difference of *IQOS with HEETS* vs. cigarette smoking between 21.7% and 37%. The CMR levels remained decreased in *IQOS with HEETS* users in one study (ratio of 72.1% at Day 5 and 70.4% at Day 90) while the effect was partially diluted in the other one (ratio of 63.0% at Day 5 and 77.1% at Day 90) which may be explained by the concomitant cigarette smoking during the ambulatory period. The observed reduction in CYP1A2 activity when using *IQOS with HEETS*, comparable to that seen in smoking

abstinence, suggests that monitoring smokers using medications primarily metabolized by CYP1A2 with a narrow therapeutic margin may be recommended upon switching to *IQOS with HEETS*.

FUNDING: Tobacco Industry

POS3-161

BIOMARKER DISCOVERY FOR NICOTINE-CONTAINING PRODUCT ASSESSMENT CAN BE FACILITATED BY INTERVALS, A PLATFORM TO SHARE AND ANALYZE NONCLINICAL AND CLINICAL DATA

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The harm caused by smoking could be reduced by offering safer alternatives to cigarettes, such as e-cigarettes and heated tobacco products, to smokers who are not willing to quit. Extensive and rigorous scientific studies are conducted by industry and the global scientific community to assess the relative risk of so-called "modified risk tobacco products" compared with that of smoking cigarettes. As the scientific community is conducting such assessments in a variety of laboratory models as well as clinical studies, knowledge and large datasets on toxicity and disease mechanisms are becoming available. By fostering the consolidation of data and knowledge gained from studies assessing novel tobacco/nicotine delivery products on a community platform, new hypotheses may be generated, including the development of biomarkers of exposure or disease risk. Therefore, we have created and are developing INTERVALS (www.intervals.science), an online platform supporting independent, third-party collaboration by proactively sharing detailed protocols, tools, and data from assessment studies. Data files are accompanied by the relevant information to foster reproducible research and encourage data re-analysis. Strengthened by community and peer-review features, INTERVALS enables the necessary dialogue between industry, independent reviewers, the public health community, and regulatory agencies that can validate the harm reduction potential of these products. Employing datasets from multiple *in vivo* and clinical studies, we have derived a whole blood gene signature that can distinguish current smokers from either nonsmokers or former smokers with high specificity and sensitivity. A crowdsourcing challenge, part of sbv IMPROVER, has allowed verification of the signature and classification of samples from smokers switching to a heat-not-burn product and those who continue to smoke. All datasets and a summary of the methods used to generate this signature are published on INTERVALS. In this presentation, we will summarize the gene signature, its crowdsourced verification, and the classification obtained as well as introduce the INTERVALS platform, a new vector of innovation.

FUNDING: Tobacco Industry

POS3-162

EVALUATION OF AN ELECTRONIC HEALTH RECORD ENABLED COMPREHENSIVE CHRONIC CARE SMOKING TREATMENT SYSTEM FOR PRIMARY CARE

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Significance: Although most primary care patients are asked about tobacco use and advised to quit smoking, comprehensive smoking cessation assessment, assistance, and follow-up are still rare. Population health approaches that proactively engage patients in chronic disease management may extend the reach and effectiveness of smoking cessation treatments, thereby reducing smoking prevalence. This study aimed to evaluate the reach and effectiveness of a proactive disease management approach to promote smoking reduction and cessation among all adult patients who smoke in a Midwestern health care cooperative. **Methods:** Clinical tools were developed in the Epic Systems electronic health record (EHR) to: identify all adult smokers using a smoker registry, facilitate clinician assessment and assistance in quitting at clinic visits, and guide proactive, opt-out telephone and electronic outreach and follow-up by dedicated tobacco cessation outreach specialists (TCOS) with every adult patient who smokes at least once



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per year. TCOS were hired by the healthcare system, certified in tobacco use treatment, and trained in tobacco use outreach and follow-up. Program reach after 3-6 months of implementation in 2 clinics was computed using EHR data. **Results:** A total of 12% of 5093 adult patients seen were current smokers. Of these, 16% agreed to set a quit date after counseling by the treating clinician and were referred to a TCOS for follow-up. In addition, in TCOS outreach to patients not interested in quitting at a clinic visit 1-2 weeks earlier, 8% were reached and set a quit day. In TCOS outreach to smokers not seen in clinic in the past year, 9% of patients were reached and agreed to set a quit day. TCOS reached 70% of smokers 5-7 weeks after their target quit date, of whom 28% reported being smoke free for at least 1 month and another 47% agreed to set a new quit date. Only 3% of patients opted out of TCOS outreach. **Conclusions:** Proactive tobacco use management during primary care visits and via telephone can engage a substantial proportion of primary care patients who smoke in cessation treatment (24%), with low rates of opting-out and impressive retention in follow-up.

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POS3-163

A PILOT STUDY OF CLOSED LOOP ELECTRONIC REFERRAL TO SMOKEFREETXT IN ADULT OUTPATIENT SETTINGS

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Background: Although 70% of smokers visit primary care clinics annually, and smoking is assessed at most clinic visits, few smokers receive evidence-based tobacco dependence treatment at such visits. Interventions delivered at low cost via mobile technology have great potential to reach many smokers and provide cessation support in adult outpatient healthcare settings. **Purpose:** To evaluate the feasibility of using secure, interoperable electronic health record (EHR)-based closed-loop electronic referral ("eReferral") of adult outpatients who smoke to SmokefreeTXT, a free National Cancer Institute text message smoking cessation support program. **Methods:** SmokefreeTXT eReferral was implemented in a primary care clinic with 10 Roomers (Medical Assistants and nurses who start clinical encounters), 12 treating clinicians, and approximately 450 adult patients per month, and a specialty care (Adult Allergy) clinic with 6 Roomers, 2 treating clinicians, and approximately 200 adult patients per month, both in a Midwestern integrated healthcare system. SmokefreeTXT eReferral was implemented by treating clinicians for 4 months and then by Roomers for 4 months in each clinic. Rates of SmokefreeTXT referral and enrollment were examined by clinic and staff type to assess eReferral reach, and by patient sex, age, and insurance type to assess the representativeness of reach. **Results:** In the primary care clinic, 17% of patients smoked, 11% were eReferred to SmokefreeTXT, and 27% of those eReferred fully enrolled and set a quit date with SmokefreeTXT, and this did not vary markedly by staff type. In the specialty clinic, 7% of patients smoked, 23% of smokers were eReferred during clinician implementation, 6% of smokers were eReferred during Roomer implementation, and 21% of those eReferred fully enrolled in SmokefreeTXT. eReferral rates did not differ by sex or age. Medicaid-eligible patients were eReferred at higher rates than patients with other insurance. **Conclusions:** Findings suggest that secure, interoperable eReferral to SmokefreeTXT is feasible and may have particular reach among Medicaid-eligible smokers, but also suggests that context and implementation strategy affect eReferral reach.

FUNDING: Federal

POS3-164

CONNECTION TO A TOBACCO QUIT LINE FROM PRIMARY CARE CLINICS: EHR-BASED VS. FAX-BASED REFERRAL

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Significance: Nearly 70% of smokers make primary care visits each year yet few receive evidence-based smoking treatments. EHR functionalities have been associated with increased assessment and documentation of smoking status but not increased cessation treatment delivery or referral. Interoperable EHR platforms enabled with automated best practice prompts, guided workflows, and integrated electronic referral orders to treatment extenders such as tobacco quitlines, hold promise to

expand cessation treatment versus traditional paper-fax referrals to tobacco quitlines. **Methods:** Rate of connection of adult patients who smoke to the Wisconsin Tobacco Quit Line (WTQL) was the primary outcome. Twenty-three primary care clinics from two regional healthcare systems were randomized to either usual care (paper-based Fax to Quit [F2Q] referral) or to an entirely EHR-based referral (eReferral). Clinicians were trained to offer and process referrals to WTQL services via either F2Q paper referrals or by clicking integrated eReferral orders. Referred smokers were dichotomously coded as "connected" or not (no response, declined, wrong number.) Demographics were available for eReferred patients only. Data were extracted from each system's EHR for six months following their training along with summary enrollment data from the WTQL. **Results:** 3,020 adult patients were documented as smokers in F2Q clinics and 3,415 in eReferral clinics. In both healthcare systems, a far greater proportion of adult smokers from eReferral clinics connected with the WTQL than did those from F2Q clinics (Healthcare System A: 5.4% of smokers via eReferral versus 1.3% via F2Q, $p < 0.001$; Healthcare System B: 5.3% of smokers via eReferral versus 2.0% F2Q, $p < 0.001$). System B had a higher proportion of African American patients than System A (19.2% vs. 1%, respectively). eReferred smokers from both systems were more likely to be Medicaid recipients and less likely to have private insurance than those not referred. **Conclusion:** eReferral greatly increased connection rates of smokers to the WTQL versus the previous standard of care, fax-based referrals and this EHR adaption reached more high risk smokers.

FUNDING: Federal

POS3-165

REINFORCEMENT FOLLOWING THE FIRST CIGARETTE OF THE DAY IN PREMENOPAUSAL WOMEN SMOKERS VARIES DEPENDING ON PRE CIGARETTE AFFECT

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SIGNIFICANCE: The first cigarette of the day is considered to be particularly important and indicative of nicotine dependence, as it comes after a period of overnight tobacco abstinence. However, prior research has not investigated the impact of within-person pre-cigarette affect on reinforcement from the first cigarette of the day, and whether cigarette reinforcement depend on an individual's average pre-cigarette affect. **METHODS:**

Eighty-seven women daily smokers completed a baseline screening session followed by 35 days of Ecological Momentary Assessment (EMA). Positive and negative pre-cigarette affect was assessed prior to the first cigarette of the day and was partitioned into between subjects (BS; Level-2, grand mean centered) and within subject (WS; Level-1, person mean centered). Positive (i.e., "Was the last cigarette pleasurable?") and negative (i.e., "Did the last cigarette relieve unwanted feelings or symptoms?") cigarette reinforcement was assessed following the first cigarette of the day.

RESULTS: WS pre-cigarette positive and negative affect was associated with increased positive cigarette reinforcement. The positive association between WS pre-cigarette positive affect and positive cigarette reinforcement was amplified in those with higher BS pre-cigarette positive affect. WS pre-cigarette negative affect was associated with increased negative cigarette reinforcement; this association was amplified in those with lower BS pre-cigarette negative affect. **CONCLUSIONS:** Results of this study suggest that pre-cigarette state affect may impact reinforcement from the first cigarette of the day and the effect of state pre-cigarette affect on reinforcement may be dampened in individuals with worse average pre-cigarette affect.

FUNDING: Federal

POS3-166

SINGLE- AND CROSS-COMMODITY DELAY DISCOUNTING OF MONEY AND E-CIGARETTE LIQUID IN EXPERIENCED E-CIGARETTE USERS

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Introduction. Prior delay discounting studies have reported that when the single commodities, money or the substance of abuse, are available, dependent individuals for alcohol, cigarettes, and cocaine tend to show greater preference for the substance of



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abuse. However, this approach does not reflect the complex situation that drug users face in real life as their choices normally include different commodities (e.g. drug now vs health later). Cross-commodity delay discounting provides an exceptional opportunity to explore the dynamics of the choices. Unfortunately, this approach has not been applied to investigate delay discounting in dependent e-cigarette users. This study aimed at overcoming this gap in the literature by exploring cross-commodity delay discounting among e-cigarette users. Methods: Thirty experienced e-cigarette users completed three delay discounting tasks between hypothetical and equivalent amounts of e-cigarette liquid and money. These tasks included two single-commodity (money vs money and e-liquid vs e-liquid) and one cross-commodity condition. Results: Greater discounting was observed for the condition mL-mL ($M_{\log k} = -2.05$, $SD_{\log k} = 0.94$) than for M-M ($M_{\log k} = -2.66$, $SD_{\log k} = 0.84$) and mL-M ($M_{\log k} = -3.43$, $SD_{\log k} = 0.120$). Post-hoc comparisons showed that all delay discounting conditions were significantly different from one another. All correlations between each logk values ($\log k$ M-M, $\log k$ mL-mL, and $\log k$ mL-M) across conditions were significant and positive. Conclusions: Our results showed that e-cigarette users discount e-liquid more than money in a same-commodity task. However, when the two commodities, money and e-liquid, are compared the substance of abuse is discounted to a lesser extent. These findings have important implications for e-cigarette cessation interventions. As such, interventions for which economic rewards are available and compete with drug use (e.g. contingency management) may be especially indicated for treating e-cigarette dependence.

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POS3-167

THE INFLUENCE OF SMOKING STATUS ON EFFORT-BASED DECISIONS

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Significance: A reduced willingness to perform effort based on the magnitude and probability of reward receipt has been associated with diminished dopamine function and anhedonia, and may be relevant to chronic drug use. Here, we investigated the influence of smoking status on effort-based decisions. Methods: Current smokers ($n = 24$), exsmokers (≥ 1 year quit, $n = 17$), and nonsmokers ($n = 23$) completed the Effort Expenditure for Rewards Task in which participants make a series of choices between a low-effort option (i.e., making 30 button presses in 7 sec with the dominant-hand index finger) worth \$1, and a high-effort option (i.e., making 100 button presses in 21 sec with the nondominant-hand pinky finger) worth between \$1.24-\$4.30. In addition, the probability of receiving the reward upon successful completion of the task varies from .12, .5 and .88. Results were analyzed using a 3 (group) \times 4 (value) \times 3 (probability) repeated measures ANOVA. Results: Participants selected more high-effort options as potential reward values increased across trials ($p < .001$). There was also a trend towards selecting more high-effort options as reward probability increased across trials ($p = .083$). Smokers were less sensitive to the changes in value and probability than nonsmokers, as shown by interaction effects for group \times value ($p = .003$) and group \times probability ($p = .017$), as well as a 1-way ANOVA of beta weights (i.e., how strongly expected value predicted choice behavior) ($p < .001$). Bonferroni post hoc tests of beta weights showed nonsmokers > smokers ($p < .001$), and exsmokers were not significantly different from smokers or nonsmokers. Conclusions: There was a step-wise increase in the sensitivity of high-effort selections to the value and probability of potential rewards from smokers, to exsmokers, to nonsmokers. These results suggest that, among exsmokers, either a pre-existing sensitivity to nondrug rewards was conducive to smoking cessation, or that smoking cessation improved the sensitivity to nondrug rewards. Future studies should investigate whether effort-related decision making can be therapeutically manipulated to improve cessation success.

FUNDING: Federal; State

POS3-168

FURTHER VALIDATION OF AN E-CIGARETTE PURCHASE TASK: A WITHIN-SUBJECT COMPARISON OF TWO UNITS OF E-CIGARETTE CONSUMPTION

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Significance: Cigarette purchase tasks, which estimate reinforcing efficacy by asking participants how many cigarettes they would purchase at increasing prices, have been widely used to characterize smoker and predict treatment outcomes. However,

a validated purchase task does not yet exist for e-cigarettes. Methods: We developed and examined two versions of the E-Cigarette Purchase Task within-subject in a population of advanced generation (e.g., tank-style) e-cigarette users. One task version asked participants how many puffs of their e-cigarette they would purchase in a 24hr period, and the other version asked how many milliliters of e-liquid they would purchase either in a 24hr period and compared these versions within-subject in a sample of advanced-generation device users ($N=100$). Both dual users (who used both cigarettes and e-cigarettes) and exclusive vapers (who had either quit or never used cigarettes) were recruited. Participants attended one laboratory session during which they completed a battery of questionnaires and completed both task versions. Results: Results showed that demand indices derived from a e-liquid-based task better correlated with reported use rates and e-cigarette dependence; demand indices derived from the puffs-based task did not correlate with these measures. Conclusions: With the exception of intensity (demand when the drug is available for free), indices were inter-correlated across the puff and e-liquid task version. The lack of correlation between intensity measures across tasks is consistent with previous data which suggests that vapers struggle quantifying their use in terms of puffs, which may affect 'amplitude' or frequency measures more than 'persistence' or reinforcement sensitivity measures (such as breakpoint). Greater intensity of demand on the e-liquid task version distinguished non-smokers from current cigarette smokers, further underscoring that the e-liquid version may be capturing demand more accurately, and perhaps indicating that among those who derive greater reinforcement e-cigarettes, quitting smoking is more likely. The e-liquid version of the task shows potential for future applications across a range of protocols.

FUNDING: Federal

POS3-169

CHANGING ADOLESCENTS' BRAIN RESPONSES TO E-CIGARETTE ADVERTISEMENTS WITH MEDIA LITERACY INTERVENTION

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Traditional cigarette use among adolescents has decreased in the last decade; however, the rates of adolescents using e-cigarettes are rapidly increasing. This is likely due to widespread, poorly regulated e-cigarette advertising. Previous studies have shown that exposure to e-cigarette advertisements may lead to increased craving and associated neural activity in cognitive control and reward brain regions. One prevention and behavior change strategy is media literacy, which aims to increase individuals' critical analysis and evaluation of advertisements and has produced positive behavior changes in adolescents. This pilot study examined the impact of a media literacy intervention has on adolescents' brain activation in cognitive control regions when viewing e-cigarette advertisements. In addition, susceptibility for e-cigarettes and traditional cigarettes use was assessed. Methods: Twenty-two non-smoking adolescents ages 13-18 were enrolled in the study and 18 had usable functional magnetic resonance imaging (fMRI) data. The fMRI scan consisted of an e-cigarette advertisement reactivity task before and following a brief media literacy intervention delivered in the MRI scanner. During the task, participants viewed e-cigarette and neutral advertisements. Results: Following the intervention, brain activation increased in the dorsolateral prefrontal cortex when participants viewed e-cigarette compared to neutral advertisements ($p < .005$ voxelwise, cluster size at least 156 mm³). The results also showed that 63% of participants were susceptible to traditional cigarettes pre-intervention but none were susceptible post-intervention. Similarly, 74% were susceptible to e-cigarettes pre-intervention, compared to 37% post-intervention. Conclusion: These results suggest that brief media literacy interventions may influence neural responses to e-cigarette advertising by increasing activation in regions associated with cognitive control, as well as, reduce susceptibility. Overall, this project will inform future studies aimed at using media literacy messaging to reduce the appeal of e-cigarette and vaping products and could further future tobacco prevention and control efforts.

FUNDING: Academic Institution



POS3-170

FACILITATED EXTINCTION USING VERY LOW NICOTINE CONTENT CIGARETTES: A PRELIMINARY FEASIBILITY TRIAL

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Background: The FDA is considering a reduced nicotine standard that would render combustible cigarettes minimally or non-addictive, with consequent benefits to public health. Very low nicotine content (VLNC) cigarettes have been widely studied, but little research has evaluated procedures to enhance their treatment potential. We sought to adapt and evaluate a cessation method (Brandon et al., 2018) to facilitate extinction of cue-provoked cravings via smoking VLNC cigarettes prior to cessation. We report on a preliminary study assessing feasibility of the treatment prior to a planned randomized controlled trial (RCT). **Methods:** Treatment-seeking smokers (N=15) were randomized to one of two conditions during a 5-week pre-quit period: (1) immediate reduction to 0.4 mg of nicotine per gram of tobacco, (2) gradual reduction from 15.5 mg to 0.4 mg of nicotine per gram of tobacco. A treatment workbook was provided, along with weekly counseling, to emphasize opportunities for extinction prior to a Target Quit Day (TQD). For instance, participants were instructed to maintain their normal daily smoking amount and to exclusively smoke VLNC cigarettes in situations associated with their prior smoking. This report focuses on feasibility indices from this preliminary study. **Results:** Retention goals were met with a 73% completion rate through the treatment phase, and 91% of participants maintained their daily cigarette amount. Approximately 55% stated that they believed the nicotine in their study cigarettes gradually decreased, independent of group assignment. Participants from both groups reported decreasing smoking satisfaction, urges, and enjoyment from cigarettes (QSU-Brief, CES) over the pre-quit period. Moreover, both groups rated the treatment workbook favorably and that they would recommend VLNC cigarettes for cessation. While this study was not powered for statistical comparisons between groups, some trends were observed. Particularly, as compared to the immediate group, the gradual group reported lower craving, enjoyment, and satisfaction. **Conclusions:** These findings support the feasibility of testing this smoking-cessation method in a fully-powered RCT.

FUNDING: State

POS3-171

RESEARCH ON NICOTINE DISCRIMINATION THRESHOLD MAY SUPPORT FDA POLICY ON SETTING MAXIMUM NICOTINE CONTENT IN CIGARETTES

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An FDA advance notice of proposed rulemaking (ANPRM) may set a maximum nicotine content in cigarettes to minimize addictiveness, helping dependent smokers to quit and minimizing risks of becoming dependent among those who initiate tobacco smoking. This ANPRM states "FDA is particularly interested in comments about the merits of nicotine levels like 0.3, 0.4, and 0.5 mg nicotine/g of tobacco filler, as well as other levels of nicotine," similar to a threshold for addiction noted by a 2015 WHO Advisory Note. Among four study "types" of interest to FDA in addressing such a nicotine standard are "indirect estimates of an addiction threshold." Our recent research may indirectly support the potential for setting non-addictive nicotine levels at or below 0.5 mg/g. We recently conducted studies (published 2016 and 2017) with Spectrum research cigarettes from NIDA with different fixed amounts of nicotine contents (ranging from 0.4 to 13 mg/g), to assist FDA by indirectly estimating an addiction threshold. The threshold nicotine cigarette discriminated from the very lowest, 0.4 mg/g, cigarette was also one reliably self-administered, while lower "sub-threshold" nicotine cigarettes were not self-administered. In other words, cigarettes able to be discriminated were also reinforcing, and those *unable* to be discriminated were *not* reinforcing, as hypothesized. Based on our research, only 5% of dependent smokers could discriminate 1 mg/g from 0.4 mg/g nicotine, meaning 95% of smokers could not. Thus, because the lowest Spectrum research cigarette for comparison with this 1 mg/g contained 0.4 mg/g nicotine, not zero, a nicotine content below the threshold of virtually all smokers for discrimination and self-administration in comparison with a zero nicotine cigarette (which does not produce dependence) appears to be below 0.6 mg/g. Yet, further research explicitly assessing discrimination and self-administration of cigarettes at or below 0.6 mg/g versus zero

nicotine is necessary to confirm a nicotine content that cannot be discriminated from a true "placebo" cigarette in at least 95% of smokers, supporting FDA policy to establish a maximum nicotine content in cigarettes.

FUNDING: Federal

POS3-172

THRESHOLD FOR INCREASE IN ACUTE SUBJECTIVE RESPONSES TO LOW VS ULTRA-LOW NICOTINE CIGARETTES

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Acute perceptions from smoking are very strongly influenced by the resulting dose of nicotine intake. A proposed FDA policy to reduce the maximum nicotine content in cigarettes would be expected to correspondingly attenuate pleasurable perceptions from smoking, perhaps helping smokers quit and/or prevent teens from becoming dependent. In the current study, we used Spectrum research cigarettes (from NIDA) widely differing in nicotine content to determine the dose-dependent rise in acute perceptions compared to a cigarette virtually devoid of nicotine. In a within-subjects design, dependent adults (N=20; 10 M, 10 F) were tested on their relative subjective ratings of cigarettes with nicotine contents of 17, 11, 5, 2.3, and 1.3 mg/g, just one per session in counter-balanced order, when each was compared to an "ultra-low" cigarette with 0.4 mg/g. Each of these 5 sessions, after overnight abstinence, involved 4 trials of acute exposure to one or the other cigarettes (2 trials per cigarette administered). Each exposure trial involved 4 controlled puffs (via CReSS) under blind conditions, 20 mins between trials. Cigarette perceptions (each on 0-100 VAS) asked how much "nicotine", "flavor", and "liking" was experienced, and how "satisfying" and "strong" it was. Multivariate results showed that all perceptions were significantly related to nicotine dose, $F(20,300)=2.3$, $p<.01$, as expected. Follow-ups consistently demonstrated a mean threshold of 5 mg/g at which these perceptions for each of the higher nicotine content cigarettes was significantly greater (all $p<.05$) vs. the 0.4 mg/g ultra-low. Thus, for most smokers under these conditions, positive subjective effects from cigarettes with nicotine contents at or below 2.3 mg/g cannot be perceived differentially from the lowest comparison available (0.4 mg/g). Further research is needed to determine the content below this threshold for the vast majority (e.g. 95%) of smokers, along with other supportive research (e.g. versus a true placebo, 0 mg/g). Results could inform policy to set a maximum nicotine content that could minimize subjective pleasure from smoking, perhaps reducing risks of dependence in cigarette smokers.

FUNDING: Federal

POS3-173

TRAJECTORIES OF PATTERNS OF USE, REASONS FOR USE, AND EXPECTANCIES FOR USE AMONG ADULT EXCLUSIVE E-CIGARETTE USERS

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Significance: Young adults report elevated rates of e-cigarette use that seem to increase over time. However, there has been little exploration of how changes in use correspond with changes in reasons and expectancies for use, especially among young adults with no history of smoking. This study was designed to identify trajectories of changes in patterns of, reasons for, and expectancies for e-cigarette use among young adult, non-smoking vapers. **Method:** A sample of 137 exclusive e-cigarette users (52% male, 73% Caucasian, baseline age 19.5 ± 1.6 years) completed surveys at baseline and quarterly for a period of 12 months. **Results:** At each time point, at least 53% of participants reported past-two-week use of e-cigarettes. Prevalence of daily use increased from 13% at baseline to 18% at 12 months ($p > .47$), while rates of discontinued use increased from 13% at 3 months to 29% at 12 months ($p < .01$). Within-subjects ANOVAs showed that, at all five time points, participants rated the enjoyable nature of vaping ($p < .001$), flavors ($p < .01$), and taste sensations ($p < .02$) as primary reasons/expectancies for e-cigarette use. Mixed ANOVAs suggested that, when compared to participants who had discontinued use, participants endorsing past-two-week use of e-cigarettes reported different patterns of e-cigarette expectancies ($p = .01$) at 3 months and different reasons for using e-cigarettes ($p = .002$) at 6 months. Pairwise comparisons showed that socializing, celebrating, killing time, and stopping boredom were consistent reasons and expectancies that differentiated e-cigarette users from non-users and daily e-cigarette users from non-daily users ($p < .05$), with past-two-week use and daily use being associated with higher scores.



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Conclusions: E-cigarette use among non-smoking young adults may represent experimentation with a nicotine delivery device. Positive expectancies regarding taste and socialization represent potential mechanisms by which their e-cigarette use is initiated and maintained. Regulations that limit availability of flavors and prohibit use in social settings might curb transition from experimental to regular e-cigarette use among this population.

FUNDING: Federal

POS3-174

MEASURING ADOLESCENT E-CIGARETTE USE: ASSOCIATIONS BETWEEN COTININE LEVELS AND SELF-REPORT MEASURES OF FREQUENCY AND DEPENDENCE

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Significance: Measuring e-cigarette use is challenging due to variability between products, including differences in nicotine content and delivery. Consensus on measurement of e-cigarette frequency and dependence in adolescents is needed to understand usage patterns. This study examined correlations between cotinine levels, a marker of nicotine exposure, and frequency of e-cigarette use and dependence measures. **Methods:** Adolescents (age 13-18) who reported e-cigarette use (1+ past-month uses, 10+ lifetime uses) were recruited from the San Francisco Bay Area. Only those who reported using e-cigarettes and not smoking in the past 24 hours were included in analyses (N=146, 73.3% male, *M* age=16.58, *SD*=1.16, 60.3% non-Hispanic White). Participants gave saliva for cotinine testing and reported: 1) days of e-cigarette use in a month (0-30), 2) sessions of e-cig use on each typical day (Sunday through Saturday), 3) self-described degree of addiction (0-100%), 4) the Penn State Electronic Cigarette Dependence Index (ECDI), and 5) time to first e-cigarette (within 30 minutes of waking, 30+ minutes after waking). We calculated sessions per day by averaging sessions across days of the week, and sessions per month by multiplying days of use per month by sessions per day of use. We then examined correlations between cotinine and: days/month, sessions/day, sessions/month, degree of addiction, ECDI scores, and time to first e-cigarette. **Results:** Cotinine levels were moderately to strongly correlated with all measures of frequency and dependence. Among frequency measures, the strongest correlation was with sessions per month (*r*=.57, *p*<.001), followed by sessions per day (*r*=.54, *p*<.001), then days per month (*r*=.43, *p*<.001). Among dependence measures, the strongest correlation was with the ECDI (*r*=.44, *p*<.001), followed by time to first e-cigarette (*r*=.41, *p*<.001) and self-described degree of addiction (*r*=.41, *p*<.001). **Conclusion:** Measures of frequency and dependence were moderately to strongly correlated with cotinine in a sample of adolescent e-cigarette users. E-cigarette use sessions per month was the best measure of frequency, and the ECDI was the best measure of dependence.

FUNDING: Federal; State

POS3-176

A COMPARISON OF MULTIPLE IMPUTATION METHODS APPLIED TO A LONGITUDINAL SMOKING CESSATION CLINICAL TRIAL

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Significance: Managing missing data is an issue for any smoking cessation intervention study. Multiple imputation (MI) methods have become more common as replacements for single imputation methods (e.g., missing=smoking) and analytic methods that permit missing data under the missing at random assumption, both of which have statistical concerns. However, their application is not widespread. The aim of the present study was to apply 3 MI methods to manage missing data in an RCT first reported by Brandon et al. (2016), then compare analysis results to guide usage elsewhere. **Methods:** RCT participants were 1,874 smokers intending to quit. Treatment conditions were Usual Care (NCI booklet) and two Forever Free® interventions: Standard and Intensive. The primary outcome was self-reported 7-day point prevalence abstinence assessed every 6 months through 30 months (46% missing). The MI methods were (1) multivariate normal (NORM) using linear regression for all variables; (2) fully conditional specification (FCS, a.k.a., MICE) using logistic regression for the primary outcome; and (3) predictive mean matching (PMM) using MI methods to match each participant with a missing data point to 5 others with observed data and randomly selecting 1 to provide the imputed value. Each MI model included condition, smoking status at each assessment, demographics

(e.g., sex), and baseline smoking-related variables (e.g., FTND). Each created 20 MI data sets. **Results:** Following Brandon et al., generalized estimating equations (GEE) and paired comparisons using logistic regression at each assessment were performed for each MI method. Results were highly consistent. Differences in corresponding abstinence rates were less than 1.2%. Differences in ORs for paired comparisons were less than 0.11. Differences in ORs for overall linear dose effect using GEE were less than 0.02. **Conclusion:** The 3 MI methods produced highly similar results in terms of the primary hypotheses. Any of these MI methods for managing missing data can be effectively applied in a longitudinal smoking cessation study. All are a better than single imputation methods, as well as statistical methods that permit missing data.

FUNDING: Federal

POS3-177

WHICH COMES FIRST IN A QUIT ATTEMPT? TEMPORAL RELATIONS BETWEEN SMOKING AND NON-ADHERENCE TO NICOTINE REPLACEMENT THERAPY

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Significance: Adherent nicotine replacement (NRT) use is strongly associated with cessation success. However, it is unclear whether during quit attempts NRT non-adherence precedes lapses or whether lapses precede NRT non-adherence, or both. This research examined nicotine gum use patterns pre- and post-lapse and relapse and tested if these patterns were associated with latency to relapse. **Methods:** Primary care patients took part in a factorial experiment evaluating smoking cessation and medication adherence intervention components. All participants received nicotine gum + patch. Analyses focused on the first 6 weeks post-target quit day (TQD) when an electronic medication dispenser recorded participants' gum use. **Results:** Participants establishing 24 hours of abstinence within 13 days post-TQD were included in analyses (*N* = 416; 57.0% female; 85.1% White; 76.5% of the parent sample of 544). 261 participants (62.7%) lapsed in the first 6 weeks, on average 8 days (*SD*=9.3) after their first 24 hours of abstinence, and 119 (28.6%) relapsed (smoked on the first of 7 consecutive days of smoking) a mean of 5.3 days (*SD*=9.2) after they lapsed. A dynamic structural equation model (SEM) with lag-1 and cross-lag-1 effects between smoking and gum use across the first 6 weeks found that, on average, gum use decreased the day after smoking. Also, gum use tended to increase the day before the first lapse day, and survival analyses showed that the greater this increase in gum use, the faster the transition to relapse (*p* < .05). **Conclusions:** Smokers appear to often increase gum use the day before a lapse, with steeper acceleration in use associated with more rapid progress to relapse, and then decrease gum use following a lapse. These patterns suggest that gum use may spike in times of acute lapse risk, and, to the extent that this fails to avert lapses, decline thereafter.

FUNDING: Federal

POS3-178

INFLUENCE OF INSOMNIA SYMPTOMS ON THE LIKELIHOOD OF SMOKING CESSATION

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SIGNIFICANCE: Sleep disturbance is associated with smoking, and is also a nicotine withdrawal symptom. Adults with sleep problems are at greater risk of relapse after a smoking cessation attempt. However, little is known about how early insomnia symptoms following a cessation attempt affect longer-term cessation outcomes. **METHODS:** Participants were adults seeking tobacco cessation treatment through a research clinic. All participants were offered 6 weekly counseling sessions and 12 weeks of pharmacotherapy. Participants were encouraged to make a quit attempt one week after enrollment, and they were followed for 26 weeks after the planned quit date (QD). The Insomnia Severity Index (ISI) was administered on the QD, and at 4 and 12 weeks post-quit to assess insomnia symptoms. The primary outcome was carbon monoxide-verified smoking status at 26 weeks post-quit. **RESULTS:** Participants (*N* = 166) were predominantly female (62%) and white (59%). Participants' mean age was 50.6 years (*SD* = 12.3) and they reported an



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average of 12 years of education (SD = 2.4). Participants' average ISI scores were 11.4 (SD = 7.4), 10.4 (SD = 8.0), and 9.4 (SD = 7.8) on the QD, and at 4 and 12 weeks post-quit, with 33.6%, 26.5%, and 24.8%, respectively, reporting clinically significant insomnia (ISI \geq 15). Logistic regression analyses indicated that higher ISI at each time point predicted a greater likelihood of non-abstinence at 26 weeks post-quit (QD, OR = 1.07, p = .028; 4 weeks, OR = 1.07, p = .014; 12 weeks, OR = 1.09, p = .038). All models were adjusted for age, race, sex, years of education, pre-quit cigarettes smoked per day, and participation in other clinic research studies. CONCLUSION: Sleep disturbance during the first 12 weeks of a quit attempt was associated with non-abstinence at 26 weeks post-quit. Findings highlight the need to address sleep problems during a quit attempt in order to increase the likelihood of successful smoking cessation. FUNDING: This research was funded by Oklahoma Tobacco Settlement Endowment Trust grant 092-016-0002

FUNDING: State; Academic Institution; Nonprofit grant funding entity

POS3-179

ACCULTURATION STYLE IS ASSOCIATED WITH STRESS AND TOBACCO AND KHAT USE IN EAST AFRICAN COMMUNITIES

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Significance: Immigrants undergo a complex psychological adaptation after migrating to a different country due to having to adjust to a new culture and social norms. This process, known as acculturation, can be demanding. Evidence indicates that acculturation style is associated with stress, negative affect, and tobacco and khat use. **Methods:** In this study we recruited 405 East African adults (mean age = 46.8; SD = 20.9) to a cross-sectional study which asked demographic information, acculturation style, psychosocial stress and negative affect, and substance use. **Results:** A multivariate analysis of variance examining influences of acculturation style on stress found that individuals who reject both the culture of the host country and the culture of origin (marginalization style) had greater levels of self-reported distress and depressive symptoms relative to those who adopt both cultures (integration style). Multiple logistic regressions examining relationships between acculturation style and substance use indicated that, relative to integrated individuals, marginalized people were 5.3 times more likely to have a history of tobacco use. Also, marginalized people were 5.0 times more likely than those who were integrated to be current tobacco users. Regarding khat use, marginalization was 3.2 times more likely than integration to be associated with a history of khat use. **Conclusion:** This study demonstrated that acculturation style is associated with psychosocial stress, negative affect, and tobacco and khat use among East African immigrants. The results confirm our hypothesis that integration serves as a protective factor against stress and substance use. Research focused on characterizing integrated individuals may fill gaps pertaining to tobacco-related health disparities in East African communities.

FUNDING: Academic Institution



SRNT Notes



NOTES SRNT



SRNT Notes



POSTER SESSION 4

POS4-1

ASSESSING NATIONAL SMOKING CESSATION SERVICE IMPLEMENTATION AND DELIVERY IN KOREA

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[Significance] In South Korea, adult males' cigarette use is 40.9% (2016), and it has fallen in the last few decades. However, it is still the highest among OECD countries and estimated annual deaths are attributable to smoking is 58,000. Korean government has implemented nation-wide cessation program called "Community Based Smoking Cessation Service" at 253 community health centers, as a primary measure to reduce demand and dependence for tobacco since 2005. For the last 10 years, about 400 thousand smokers per year used this service. This study was conducted an empirical analysis using National Smoking Cessation Service data from 2014 to 2017 to assess national smoking cessation service implementation and delivery. Addressing factors associated with quitting smoking among service participants is important for improving smoking cessation service quality and efficiency. **[Methods]** In this cross-sectional study, a total number of participants aged 19 and over was about 1.4 million between 2014 and 2017. The dependent variable was verified success in smoking cessation by CO or cotinine in urine measured at 4th week, 3rd month and 6th month. The explanatory variables were nicotine replacement therapy (NRT), behavioral therapy, prescription medication, nicotine dependence, counselling pattern and frequency, smoking history and usage pattern, smoking relapse and socioeconomic characteristics. Latent class analysis and multiple logistic regression were implemented to examine the main factors associated with smoking cessation success. **[Results and Conclusion]** Higher odds of verified success of smoking cessation by each period of the service were significantly associated with counselling pattern and frequency after adjusting for sociodemographic characteristics. The result showed that the factors associated with relapse and discontinuity of cessation vary with the service delivery. Thus, national smoking cessation service reform is needed to increase success rate of quitting smoking and improvement of service quality and efficiency.

POS4-2

TEST RETEST RELIABILITY OF THE LIFESTYLE QUESTIONNAIRE. POST HOC ANALYSIS OF A SMOKING CESSATION STUDY

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Background. Health-related lifestyle behaviors are linked to many noncommunicable/chronic diseases. The 9-item Lifestyle Questionnaire is based on an adaptation of the Lifestyle Risk Scale and measures seven health-related behaviors: diet, alcohol intake, sleep deficit, physical activity, obesity, smoking, and exposure to secondhand smoke. This study aimed to characterize the test-retest reliability of the Lifestyle Questionnaire. **Methods.** The Lifestyle Questionnaire was administered at screening and baseline visits of a multicenter (42 sites), multiregional (Germany, Japan, Poland, U.K., U.S.) smoking cessation study in healthy smokers willing to quit. Agreement was assessed by Cohen's weighted kappa coefficient for scale items. Intra-class correlation (ICC) was calculated for the global score. Additional stratification analyses were undertaken by gender, age, income, education, country, body mass index, and days between assessment at Visit 1 and 2. **Results.** 1,184 subjects (50.1% male) were enrolled. The results showed high agreement between screening and baseline visits, especially for the item on smoking behavior. **Conclusions.** The Lifestyle Questionnaire is a reliable measure for clinical and epidemiological studies characterizing potential behavioral confounders. The Lifestyle Questionnaire, together with existing translations in six languages, is distributed on PROQOLID™.

FUNDING: Tobacco Industry

POS4-3

QUIT ATTEMPTS AND PERCEPTIONS ABOUT SMOKING CESSATION INTERVENTIONS AMONG DUAL-SMOKER COUPLES

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Background: Dual-smoker couples where both partners smoke are at higher risk for smoking-related morbidity and mortality due to exposures related to their own and their partner's smoking; yet they have lower quit rates than single-smoker couples. Better understanding of quit attempts and perceptions on smoking cessation interventions among dual-smoker couples is critical to develop tailored cessation interventions. This study aimed to explore in-depth quit attempts and perceptions on cessation interventions among dual-smoker couples. **Method:** This was a cross-sectional online survey study with a convenience sample of 183 smokers in a dual-smoker partnership in USA. Survey items collected data on participants' and their partner's smoking habits, quit attempts (joint and individual quit attempts), perceptions on smoking cessation interventions and demographics. **Results:** Mean age of the sample was 34 years old. Over half were females (57%) and 79% were White followed by Black/African American (14%). On average, participants smoked 16.0 cigarettes per day for 14 years. Forty-one percent (vs. 52% in the general population) tried to quit smoking individually and 23% tried jointly in the past year. Surprisingly, 75% (vs. 68% in the general population) tried to quit on their own without any professional help or nicotine replacement therapy, which may be the major reasons for the failure. Chronic stress (25%) and crisis (19%) were the top reasons for relapse. Fortunately, 63% wanted to quit smoking either within the next 30 days (27.5%) or within the next 6 months (35.5%), preferably technology-based interventions (54% and 44% in favor of websites and smartphone apps, respectively) over face-to-face or telephone interventions. Nearly half (43%) expected success in their quit attempts if their partner supported their efforts. **Conclusion:** Our findings indicate high levels of motivation to quit smoking among dual-smoker couples; however, most did not utilize professional help. Technology-based smoking cessation interventions, such as websites or smartphone apps, to address stress may help best and would decrease health disparities in dual-smoker couples.

FUNDING: Academic Institution

POS4-4

THE ASSOCIATION OF HEALTH INFORMATION LITERACY AND THE USE OF CONVENTIONAL AND ELECTRONIC CIGARETTES

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Significance: Cigarette use is associated with low levels of health information literacy (HIL; the ability to understand, appraise, and apply health information to one's life). It is unclear whether this association between cigarette use and HIL is consistent with electronic cigarettes (EC), particularly in US adults. Smokers generally believe ECs are a safer product as compared to conventional cigarettes (CC). ECs are a new product whose users generally initiate tobacco use via CCs and concurrently use ECs and CCs. Previous research has shown dual users expect greater negative health outcomes from CC use as compared to CC only users. This discrepancy may be due to differences in HIL. The goal of this study was to describe the association between HIL and current CC use specifically as well as CC/EC dual use in US adults. **Methods:** A cross-sectional sample of 90,006 adults, ages 18 and over, from the 2016 wave of the Behavioral Risk Factor Surveillance System (BRFSS) was assessed for current EC and CC use and HIL. HIL was measured by two items describing the ease of being able to understand written or verbal health information. Logistic regression models examined the association between HIL by domain and current smoking status. **Results:** Approximately 4.8% of participants were current dual users of EC and CC, while 13.4% were current CC only users. Approximately 87.9% and 82.1% of participants reported high levels of verbal and written HIL. There was no significant association between either written or verbal health information and dual use. There were significant associations between conventional cigarette use and written (OR = 0.68, 95% CI = 0.56; 0.83, p < 0.001) as well as verbal HIL (OR = 0.57, 95% CI = 0.47; 0.69 p < 0.001). However, the associations were no longer significant after adjusting for education, perceptions of current health, having access to care, age, race, and income. **Conclusion:** The reduction of risk after adjusting for covariates suggests that the covariates, rather than HIL, drive the association. These results suggest that more dissemination among current smokers of the health risks of EC use is needed.

FUNDING: Unfunded



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POS4-5

DETECTION OF FLAVORING CHEMICALS IN WATERPIPE TOBACCO PRODUCTS

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Background: Use of waterpipes (hookah) has increased dramatically in the United States over recent years. Smokers load waterpipes with shisha, flavored tobacco-molasses products that are heated using charcoal. Flavorings used in shisha attract more people to these emerging tobacco products. Many of those flavoring chemicals have been classified as respiratory irritants or potentially harmful substances. **Aim:** The aim of this study is to determine the flavoring chemicals present in unburnt and burnt shisha, as well as in first, second, and third-hand smoke. **Methods:** Eighteen shisha products from a variety of brands were tested. Products were chosen based on online hookah forum reviews and the Population Assessment of Tobacco and Health (PATH) data. A modified CORESTA 62 method was used to identify flavoring chemicals in burnt and unburnt shisha. Laboratory-controlled shisha smoking was performed using an automatic shisha smoker under the Beirut smoking protocol. Cambridge filters were used to trap particulates in smoke. Surface wipes were taken before and after each session to determine flavorings in residues deposited on surfaces in a smoking chamber. Sorbent tubes were used to trap secondhand smoke and analyzed according to a modified NIOSH 2551 method. All samples were analyzed using gas chromatography-mass spectrometry (GC-MS). **Results:** Various flavoring chemicals were detected in all analyzed samples. Unburnt shisha contained an average of 17 flavoring compounds while burnt shisha contained an average of 6 compounds. Some flavorings, such as isobutyl alcohol, were detected in unburnt shisha but not found in most samples of burnt shisha. Several derivatives of flavoring chemicals, such as mesitylene, were detected in burnt shisha but not in unburnt shisha. **Conclusions:** During sessions of shisha smoking, a significant number of flavoring chemicals are released from the products. Waterpipe smokers and bystanders may be exposed to those substances. Additionally, new compounds are created from flavoring chemicals during the heating process.

FUNDING: Federal

POS4-6

SUCCESSFUL MOBILIZATION OF AN EXISTING COUNTY WIDE ECONSULT SYSTEM CONNECTING SMOKERS TO THE CALIFORNIA SMOKERS' HELPLINE

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Significance: The LA County Department of Health Services (LA DHS) is the second largest public health system in the country and has a 16% smoking prevalence. In 2012, LA DHS launched an innovative eConsult system that allows primary care providers to communicate directly with specialty services, which reduced patient access barriers. In 2016, LA DHS included an electronic referral to the state tobacco quitline, the California Smokers' Helpline (Helpline), as an eConsult specialty service. This project uses the RE-AIM framework to examine the implementation of the Helpline eConsult order after minimal promotion. **Methods:** Data includes provider ordering reports from the eConsult database and service outcomes from Helpline reports from July 2016 through March 2018. The RE-AIM framework is used to evaluate eConsult implementation with the following definitions. **Reach:** Proportion of eConsult orders and outcomes. **Effectiveness:** proportion of eConsults resulting in counseling completion. **Adoption:** proportion of providers and clinics using eConsult for Helpline referral out of those with eConsult ordering capability. **Implementation:** description of initial rollout of the eConsult. **Maintenance:** Monthly orders of the eConsult over time. **Results:** From July 2016 to March 2018, the Helpline received 699 eConsult orders. **Reach and Effectiveness:** The Helpline successfully reached 50% of these patients, and of this group, 38% accepted Helpline services. **Adoption:** 8% of providers and 13% of clinics with eConsult ordering capabilities used the eConsult system to refer patients to the Helpline. **Implementation and Maintenance:** eReferrals to the Helpline have remained consistent over time after initial outreach to providers and workgroups. **Discussion:** Adding the Helpline as a specialist in the existing eConsult system represents a feasible method to increase access to tobacco cessation resources for LA DHS partnership clinics, by bridging different electronic health records. The eConsult showed similar reach and effectiveness outcomes as other studies of electronic referrals to tobacco quitlines despite minimal promotion.

FUNDING: Federal; State

POS4-7

A CONTENT ANALYSIS OF NEWS STORIES ABOUT THE NASEM ECIGARETTE REPORT

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Significance In January 2018, the National Academies of Sciences, Engineering, and Medicine (NASEM) released a summary report on e-cigarettes and stated, "e-cigarettes cannot simply be categorized as either beneficial or harmful," concluding that e-cigarettes may lead youth to start and adults to stop cigarette smoking. Previous research has identified news articles as an important information source for the public. This study examined the content of news stories that covered the NASEM report.

Methods We conducted a content analysis of NASEM-related news articles published within the first week of its January 23rd release in the top circulating newspapers and wire services. Given the use of wire services to disseminate news stories to journalists, we identified duplicate news articles as well as unique articles for content analysis. For each article, we recorded the title and primary source, and coded for a variety of topics. Key topics coded included prevalence of use, regulatory aspects of e-cigarettes, inclusion of health benefit or risk statements, and/or pros and cons related to use. We then weighted each unique article by the number of duplicate news stories as identified via google search.

Results We identified 50 total articles, representing eight unique news stories. The titles were split between balanced (54%), against (40%), and for e-cigarettes (6%). Most (80%) articles included information about FDA-regulation, and 50% stated the health effects are unknown. Positive aspects discussed within articles included that e-cigarettes are less risky than cigarettes (98%) and effective for smoking cessation (44%). Negative aspects included that e-cigarettes are a gateway to other tobacco products (100%), nicotine is addictive or harmful (54%), explosions, fires, or other mechanical dangers can occur (54%), and flavors appeal to youth (14%).

Conclusions Although half of the articles presented balanced information, the focus of several was predominantly on negative aspects. Future research should continue to monitor news coverage about e-cigarettes to determine what information the public is exposed to regarding e-cigarettes.

FUNDING: Federal

POS4-8

ENDS UPTAKE AMONG MĀORI AND PACIFIC SMOKERS: A QUALITATIVE ANALYSIS

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SIGNIFICANCE: Although many smokers wish to transition to ENDS, several find the process difficult and revert to smoking. In New Zealand, Māori and Pacific peoples are disproportionately burdened by smoking, and could potentially gain greatest benefit by moving to exclusive ENDS use. More detailed understanding of Māori and Pacific smokers' experiences of ENDS use and uptake could enable better support to be offered to them, and ultimately reduce health inequities. **METHODS:** We undertook in-depth interviews with 16 Māori and Pacific dual users (n=8) and exclusive ENDS users (n=8) who had diverse smoking histories. We probed participants' movement from smoking to vaping, including the information and advice they sought, the challenges they faced, and whether and how they addressed these. We also explored factors that assisted transition. We managed the data using NVivo and used a thematic analysis approach to interpret the transcripts. **RESULTS:** We identified two overarching themes that represented the challenges participants faced and the factors that supported ENDS use. Challenges had physical and social dimensions: the latter included unpleasant initial experiences with early devices, difficulty creating a satisfying experience, unavailability of information, and poor guidance from retailers. Social challenges focussed on smoking's normative status, particularly in settings involving alcohol, which created pressure to relapse. Participants had varied experiences of stigma; some felt vaping liberated them from smoking's tainted smell while others felt outsiders if they did not smoke. Supportive factors included whanau networks and the highly reinforcing effect of cost savings and immediate health benefits. **CONCLUSIONS:** Participants found the transition to ENDS use challenging and several factors impeded exclusive ENDS



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use. Possible interventions include structured community support so ENDS use rather than smoking becomes normative, and where potential ENDS users can form trusted relationships and access expert cessation advice.

FUNDING: Nonprofit grant funding entity

POS4-9

PRELIMINARY FEASIBILITY AND ACCEPTABILITY OF THE QUIT TOGETHER COUPLE FOCUSED PREGNANCY SMOKING CESSATION INTERVENTION IN ROMANIA

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Significance: Smoking rates during pregnancy are high in Romania and other developing countries. This research reports preliminary findings on the feasibility and acceptability of a smoking cessation intervention for couples during and after pregnancy in Romania. **Methods:** The Quit Together RCT enrollment started in 2017 and is ongoing. The target population is comprised of pregnant smokers and their life partners in Romania. Eligibility criteria included age>=18; pregnant; smoker; with a stable partner; willing to share partner contact info to be invited as participants as well. The initial plan was to enroll in local ObGyn clinics by a Research Assistant. This approach was inefficient, so the efforts quickly turned to national reach in Romania and self-enrollment through the Quit Together project webpage. The online advertisement included Facebook ads and Google AdWords ad campaigns, and promotion through emails and forum posts. In addition, through a partnership with the SAMAS NGO, the project was nationally advertised by perinatal educators in ObGyn clinics and other relevant locations. We report feasibility and acceptability findings based on the online self-enrollment. **Results:** 822 women accessed the Quit Together (QT) enrollment website over approximately 12 months. Non-eligibility ranged from 2% younger than 18, 21% not smoking, to 55% not willing to share partner contact information. Reasons for not sharing partner information included him working out of the country, being too busy to participate, and not wanting him to know about maternal pregnancy smoking. Sixty-nine (8.4%) women were eligible and enrolled in QT. Of them, 22 were assigned in the intervention group, 21 in the control group, and 26 (38%) were excluded from the intervention because the life partner subsequently did not agree to enroll. Couples who accepted and completed the intervention participated, on average, in 5 prenatal counselling sessions and 1 postnatal session. **Conclusion:** A couple-focused pregnancy smoking cessation intervention shows early evidence of feasibility and acceptability. Relaxing exclusion eligibility criteria may increase the intervention's reach and relevance.

FUNDING: Federal

POS4-10

TOBACCO USE, SUBSTANCE USE, AND DSM-5 SUBSTANCE USE DISORDERS AMONG U.S. ADULTS: AN EXAMINATION OF MARRIAGE VS COHABITATION AND RACE/ETHNICITY

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Background It is known that married individuals are less likely than those single/never married to use tobacco and other substances. However, it is unclear if tobacco and substance use behaviors differ between married individuals and cohabitators, and their variations by race/ethnicity. We examine the differences in tobacco and substance use and disorders among non-Hispanic Black, non-Hispanic White, and Hispanic married vs. cohabiting adults. **Methods** Data from the 2012-2013 National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III) a cross-sectional, nationally representative sample of the civilian noninstitutionalized population of adults aged 18 and older in the United States were used. Past 12-month substance use (including tobacco) and DSM-5 substance use disorders, marital status (cohabiting vs married), race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic) and other demographics were assessed. Race/ethnicity-stratified multiple logistic regression models were used to examine association between marital status and substance use and disorders (N=36,309). **Results** Across races/ethnicities, cohabitators had higher odds of any tobacco use, current cigarette smoking, binge alcohol use, cannabis use, and drug use than those who were married ($p<0.05$). Among non-Hispanic White, compared to those who were married, cohabitators had higher odds of substance use disorder diagnoses (tobacco use disorder (AOR=2.0); alcohol use disorder (AOR=2.4); cannabis use disorder (AOR=2.4); opioid

use disorder (AOR=2.2). Among non-Hispanic Blacks, cohabitators reported higher odds of tobacco use disorders (AOR=1.9), alcohol use disorders (AOR=2.1), and cannabis use disorders (AOR=2.7) than their married counterparts. Among Hispanics, compared to those who were married, cohabitators had significantly higher odds of tobacco use disorders (AOR=2.2) and alcohol use disorders (AOR=2.0). **Conclusion** Our findings indicate a need to separate married and cohabiting in future research and public surveillance. The high prevalence of psychiatric disorders among cohabitating adults warrants further investigation to identify modifiable stressors that are unique to this population.

FUNDING: Unfunded

POS4-12

USE OF MENTHOLATED CIGARETTE PRODUCTS AND ITS EFFECT ON SUCCESSFUL CESSATION, NICOTINE DEPENDENCE AND PAST QUIT ATTEMPTS AMONG CURRENT ADULT SMOKERS IN THE U.S. IN THE POPULATION ASSESSMENT OF TOBACCO HEALTH (PATH) STUDY: FINDINGS FROM WAVES 1 AND 2

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SIGNIFICANCE: Menthol flavoring can be added to cigarettes in various ways (e.g., as a crushable filter capsule, a tobacco additive, or a combination of these). The filter capsule can be crushed by the smoker anytime while smoking and allows for a greater concentration of menthol to be transferred into the smoke, potentially altering the smoking experience. This study aimed to identify correlates of consumers who smoke menthol cigarettes, delivered through varying methods, as well as determine if differences exist in nicotine dependence and past quit attempts by menthol delivery method. **METHODS:** Data from 8,292 current adult cigarette smokers in the Population Assessment of Tobacco and Health (PATH) Study, Waves 1 and 2, were analyzed. Preferred menthol delivery method was determined by the participant's usual cigarette brand. Correlates of menthol delivery method, differences in prevalence of cessation at Wave 2, and within-person changes in nicotine dependence and past quit attempts at each wave, are reported. **RESULTS:** About 61% smoked a non-mentholated brand, 34% smoked a brand with mentholated tobacco, 3% smoked a brand with a crushable menthol filter capsule, and 2% smoked a brand with both mentholated tobacco and a filter capsule. Users of capsule products were primarily 25-34 years; men tended to report smoking a brand with only a mentholated filter capsule, while more women reported smoking a brand that contained both mentholated tobacco and a filter capsule. Cessation, nicotine dependence, and past quit attempts did not vary by menthol delivery method. Capsule products were significantly more likely to be used because of their taste and pack design. **CONCLUSION:** Although cigarettes mentholated with a crushable filter capsule are used by a small subset of smokers, consumers who use these capsule products are drawn to them based on their taste and pack design. Regulation of the amount of menthol available in a cigarette, as well as the marketing of the capsule products, may be beneficial in reducing use.

FUNDING: Unfunded

POS4-14

ATTITUDES AND EXPECTANCIES CONCERNING MARIJUANA USE AMONG TOBACCO USERS FOLLOWING LEGALIZATION OF MEDICAL MARIJUANA IN FLORIDA

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Introduction: Research has demonstrated relationships between tobacco and marijuana use, including a negative influence of marijuana use on smoking cessation. To date, there is limited information on the effects of marijuana legalization on marijuana use among tobacco users. With more US states legalizing marijuana, it is important to determine if this may change attitudes about marijuana and expectancies about the outcomes of the new law. To examine this, we conducted an online survey of tobacco smokers across Florida where medical marijuana (MM) was legalized in 2016. **Methods:** Participants were Florida residents recruited via online ads (Craigslist) and an online research panel. Tobacco users completed a survey that assessed demographics, smoking behavior, marijuana use, knowledge about the MM law, change in attitude about marijuana since legalization, and expectancies for prospective positive outcomes (e.g., "it will help people manage their medical conditions") and negative outcomes (e.g., "more people will become addicted to marijuana") of the MM law. Analyses are based



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on 776 respondents, who completed the survey during June and July, 2018. Results: Participants' mean age was 42.2 ($SD 14.7$) years; 51% were female; 41% were current (within past year) marijuana users, 32% past users, and 26% never users. Marijuana usage was associated with knowledge, change in attitude, and expectancies about positive and negative outcomes (all p 's<.001). More specifically, current users had higher knowledge scores. Compared to both current and past users, never users were more likely to report a negative attitude shift, had lower expectancies for positive outcomes, and had higher expectancies of negative outcomes. Conclusion: These results suggest that attitudes and expectancies regarding marijuana since legalization were more likely to be negative among never users compared to current and past marijuana users. This could indicate that tobacco users who never used marijuana are less likely to begin using, despite legalization. Future surveys are necessary to address the impact of the law on marijuana use and smoking-related outcomes over time.

FUNDING: State

POS4-15

ACCESSING ONLINE HEALTH INFORMATION AND INTENTION TO QUIT SMOKING AMONG ADULTS IN THE UNITED STATES

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Background While national smoking rates have decreased significantly, smoking cigarettes continues to be the leading cause of preventable illnesses and death in the US, which accounts for over 480,000 deaths annually. Using electronic means to seek online health information has become common in the US. Thus, online interventions via electronic devices may provide additional options for smokers interested in quitting. **Significance** Finding inexpensive, non-stigmatizing means to offer additional options for smokers who consider cessation is critically important given the financial burden related to tobacco use. Also, it is well-known that multiple attempts are needed to successfully quit smoking. We, therefore, examined the association between internet use to obtain health information and interest in quitting smoking among current cigarette smokers. **Methods** Data from the 2017 Health Information Trends Survey (HINTS), a representative sample of US adults administered by the National Cancer Institute (NCI) was used ($n=5,021$) to explore the association between self-reported internet use to obtain health information, and interest in quitting smoking in the next 6 months among current smokers. The data were collected using a self-administered mail questionnaire. Bivariate analysis was conducted using the survey-adjusted Rao-Scott Chi-square test. **Results** Among HINTS respondents, 82.1% reported using the internet; 10.7% reported smoking cigarettes every day and 3.8% some days. Of these current smokers, 62.3% reported seriously considering quitting smoking in the next six months. Those who smoked every day were less likely to consider quitting (59.4%) compared to those smoking some days (74.5%, $p = 0.046$). Furthermore, those who had used electronic means to look for any health/medical information for themselves during the past 12 months were more likely to consider quitting (69.3%) compared to those who did not look for this type of information (47.8%, $p = 0.003$). **Conclusion** Using online health information seems to hold promise for interest in smoking cessation among current smokers, particularly for those who do not currently smoke every day as their lower smoking frequency may be an indication of having cut down and thus be a sign of stronger readiness to quit.

FUNDING: Unfunded

POS4-16

EXPERIMENTAL INVESTIGATION OF HEAT AND MASS TRANSFER PROCESSES DURING EC AEROSOLS GENERATION AND PENETRATION THROUGH THE HUMAN RESPIRATORY TRACT

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Electronic cigarettes (ECs) which are a relatively new technical devices for nicotine delivery through the respiratory system, are still poorly characterized regarding the properties and dynamics of aerosols after leaving the EC and entering the respiratory tract. The scarcity of information on particle size for ECs is due not only to their novelty, but also as a result of technical obstacles related to the measurement of highly-concentrated aerosols containing volatile particulate material. This work investigates the impact of heat and mass transfer processes on EC-aerosol properties during both their generation and penetration through the human respiratory tract. The proposed methodology takes into account the specific properties of EC-aero-

sols and allows to measure changes of EC-aerosol properties in the following conditions: 1) during contact with the humid air with the adjusted flow rate, which results in different times of interactions, temperature and humidity of the auxiliary air, 2) under simulated conditions of the respiratory tract and a variable aerosol residence time in the humid environment for different inhalation patterns. The results obtained with laser diffraction technique indicate e.g. significant differences in the volume median diameter (VMD) of droplets in EC-aerosols mixed with the air with 30 and 85 percent RH at $T = 37^\circ\text{C}$. A strong effect is observed when the relatively small stream of air (0.75 LPM) is drawn through the EC ($\text{VMD} = 0.72 \pm 0.02$ and 1.13 ± 0.07 microns respectively). Additionally, experiments done using a breathing simulator allows to detect differences in VMD of aerosols generated at various puffing topographies. For the most typical puffing pattern, VMD of the aerosol exhaled from the conditioning chamber is close to 2.5 microns whereas for the longer and deeper puffs VMD is equal almost 3.5 microns. These results suggest a significant increase in the median droplet size in comparison to the fresh aerosol released from EC ($\text{VMD} = 0.6$ microns). Obtained results are important for a better understanding of processes responsible for EC-aerosol properties and the further analysis of safety or dangers related to EC mists inhalation. This work was financially supported by National Science Centre in Poland under the project no. 2015/19/D/ST8/00822.

FUNDING: Academic Institution; Nonprofit grant funding entity

POS4-17

THE ROLE OF EMOTIONS AND PERCEIVED AD EFFECTIVENESS. EVIDENCE FROM THE TRUTH FINISHIT CAMPAIGN

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While past research has studied the role of both positive and negative emotions related to the efficacy of anti-tobacco messaging, few studies have examined which type of emotional sentiment and level of intensity are associated with perceived ad effectiveness. This study examined how the influence of emotional valence and intensity prompted by anti-tobacco advertising messages may be associated with perceived ad effectiveness among youth and young adults. Online forced-exposure surveys were conducted among a sample of 9,534 youth/young adults, ages 15-21, to assess emotional sentiment and attitudes both prior to and after viewing 37 anti-tobacco advertisements. Emotions were categorized as positive (Powerful, Inspired, Hopeful, Happy, Confident, Motivated, Concerned) or negative (Sad, Angry, Irritated, Afraid). Intensity was measured on a continuous scale of 1 through 5 with 5 reflecting the highest level of intense emotion. Perceived ad effectiveness was measured using a multi-item scale based on agreement (1=strongly disagree to 5=strongly agree) with the following statements: (1) "this ad captured my attention," (2) "this ad was informative/educational," (3) "this ad was convincing" (4) "this ad gave me good reasons not to smoke". Linear regressions were estimated to assess type of emotional sentiment and level of intensity in relation to perceived effectiveness of the message. Overall, positive emotions ($\beta=.76$) were more highly associated with perceived ad effectiveness ($\beta=.06$). Higher intensity with positive emotional sentiment and high intensity negative produced the highest scores for perceived ad effectiveness ($\beta=.30$). Eliciting a positive, high-impact emotional response from viewers can help improve perceived effectiveness, and in turn, overall ad effectiveness. Future research should examine the role of emotional responses prompted by anti-tobacco messages on tobacco-related behaviors over time.

FUNDING: Nonprofit grant funding entity

POS4-18

COMPARING DIRECT AND INDIRECT ASSESSMENTS OF PERCEIVED RISK REDUCTIONS FOR A MODIFIED-RISK TOBACCO PRODUCT

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Manufacturers seeking to make modified-risk claims for a tobacco product that presents lower health risks compared to cigarettes must assess consumers' perceptions of absolute and relative risks for that product. We cross-validated data from two methods: (a) indirect assessments based on the difference between absolute risk ratings for the modified-risk product and cigarettes; and, (b) direct assessments comparing the modified-risk product to cigarettes. We also examined indirect assessments of consumers who, on direct assessment, responded "don't know" with regard to the risk of the product relative to cigarettes. U.S. adult current, former and never tobacco users ($n=18,234$) recruited



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from online research panels were shown advertisements stating that smokers who switch completely to Camel Snus could reduce their risk of lung cancer and respiratory disease. Respondents rated the absolute risks of Camel Snus and cigarettes - separately, on a 1-7 scale - and directly compared the risks of Camel Snus versus cigarettes, for each disease. With regard to lung cancer, the mean difference in absolute ratings for Camel Snus and cigarettes was -0.4 ± 0.02 for those who indicated no difference in risk, based on direct assessment; -2.1 ± 0.02 for those who indicated a lower risk for Camel Snus; -3.4 ± 0.04 for those who indicated Camel Snus presented no risk at all; and, -1.0 ± 0.04 for those who responded "don't know." Results were similar for respiratory disease. The tight correlation between direct and indirect modes of assessing perceived reductions in risk indicates reliability and validity for both methods. That respondents who indicated "don't know" in the direct assessment provided absolute ratings intermediate between 'same as smoking' and 'less risk' indicates their perceptions were very conservative; they do not believe Camel Snus is completely safe. The findings confirm the validity of these approaches for assessing perceived risks of a modified-risk tobacco product.

FUNDING: Tobacco Industry

POS4-19

USE OF E-MAIL, MAIL, AND SOCIAL MEDIA BY E-CIG COMPANIES AND VAPE SHOPS TO REACH YOUNG ADULT NEVER E-CIGARETTE USERS

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Significance: Currently knowledge is limited regarding the extent to which e-cigarette companies and vape shops reach e-cigarette naïve young adults through direct marketing and whether such efforts are associated with e-cigarette use susceptibility. **Methods:** Data are from 916 young adult (18-25 years old) e-cigarette never users (M age = 20.7; SD = 2.02; 57% Women; multiethnic) who form a subset of a larger sample (N = 2622) that participated in the baseline survey of a cohort study. Participants were asked if an e-cigarette company or a vape shop had ever sent them information through e-mail, mail, social media, or text-messaging. Participants were also asked if anyone working at or connected with a vape shop had ever tried to network with them through Facebook, Instagram, or Twitter. Data were collected on e-cigarette use intentions. **Results:** Three percent of the participants reported being sent information through e-mail, 4% through social media, and 2% via mail. Three percent of the participants had been approached by people connected with vape shops through Facebook, 3% through Instagram, and 1% through Twitter. Experiencing direct marketing through e-mail was associated with e-cigarette use susceptibility [OR = 2.30; 95% CI: 1.01-5.24], as was through mail [OR = 2.85; CI: 1.01-8.22] and social media [OR = 1.94; 95% CI: 1.00-3.86], after adjusting for age, gender, ethnicity, family income, and cigarette smoking status. Being approached by someone connected with vape shop on Facebook was associated with susceptibility [OR = 2.24; 95% CI: 1.01-5.24] but similar associations were not significant for Instagram or Twitter. **Conclusions:** E-cigarette companies and vape shops appear to reach small but meaningful proportions of e-cigarette naïve young people via direct marketing, which is likely to increase their e-cigarette use susceptibility. Proper regulations may need to be developed to monitor such outreach practices.

FUNDING: Nonprofit grant funding entity

POS4-20

HIGH-THROUGHPUT HCN AND VOC ANALYSIS OF MAINSTREAM LITTLE CIGAR SMOKE

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Significance: The mainstream smoke of a little cigar is a complex mixture containing thousands of chemicals. A quantitative assessment of these chemicals is important due to their toxic nature and potential to cause harm. Individual methods have been previously described for the analysis of Hydrogen Cyanide (HCN) and Volatile Organic Compounds (VOCs) in mainstream cigarette smoke. In this presentation, we describe a simplified approach for the dual quantitative

determination of HCN and VOCs (Benzene, Toluene, Acrylonitrile, Isoprene, 1,3-Butadiene) in little cigar mainstream smoke generated on a smoking machine. **Methods:** Following smoking, the cyanide is chemically trapped on a Cambridge Filter Pad (CFP) and extracted with water containing internal standard. Samples are introduced via a heated headspace syringe with on-column cryo-focusing prior to GC-MS analysis. At the same time, VOCs are collected in chemically inert teflar bags containing isotopically labeled internal standard. The VOCs are then extracted with methanol and analyzed via GC-MS with a simple liquid injection. In this study we demonstrate that the chemical treatment of the CFP does not affect VOC levels and therefore a single sample can be divided for its respective analysis. Higher throughput studies, reduced sampling costs and reduced analyst exposure are achieved. **Results and Conclusions:** This approach was used for a large study of commercially available little cigars in which replicate samples of 60 brands were examined under ISO and Canadian Intense smoking conditions. This study was done to examine the HCN and VOC content of a broad variety of little cigar products available on the market and to assess the variations between and within product brands. HCN deliveries ranged from 77.4 to 1040 micrograms per little cigar. VOC deliveries ranged from 12.4 to 1370 micrograms per little cigar across the range of target analytes.

FUNDING: Federal

POS4-21

FORMULA FOR BETTER CARE: UNIVERSITY OF COLORADO CANCER CENTER TOBACCO CESSATION PROGRAM QUALITATIVE CASE STUDY

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Aim: This qualitative case study evaluates the system-wide development of a cancer center's tobacco cessation program to inform similar initiatives for tobacco treatment in specialty-care settings. **Background:** Cancer patients who continue to smoke after diagnosis face worse treatment outcomes and increased mortality. The University of Colorado Cancer Center was one of 22 NCI-designated cancer centers to receive a two-year infrastructure grant to develop and systematically implement a tobacco cessation treatment program serving all cancer patients. **Methods:** A time- and activity-bounded single-case study design guided data collection. Program planning was modeled in two phases: 1) organizational readiness based on the Organizational Quality Improvement Program Readiness framework (HRSA), and 2) development using the PRISM extension of the RE-AIM framework. Data were collected using semi-structured key informant interviews, real-time audio-recording of project meetings, staff deliberations, and project discussion at Cancer Center provider meetings. Transcribed data were organized for review by development phase and organizational sector, and coded by two independent evaluators. Initial sector summaries were distributed to corresponding key informants for review. Feedback was coded and incorporated into results by evaluators to test for consistency in interpretation. **Results:** Program leaders were able to address challenges to program development at both system and provider levels by leveraging the skills and knowledge of an interdisciplinary, strategic leadership team. Inclusion of oncology providers in the leadership team allowed planners to engage clinicians in meaningful dialogue about program design. Providers strongly endorsed the need to address tobacco cessation as part of routine care, but required a workflow that would not add to existing responsibilities. Provider barriers included "click fatigue" (avoiding additional electronic prompts/alerts requiring responses), reluctance to disrupt provider-patient rapport for care, and uncertainty about how to discuss tobacco use and cessation with patients. Information Technology team members provided critical insight into changes to medical records systems which facilitated development of new referral, tracking and charting procedures. In retrospect, including a representative from Clinical Support Services earlier in the process would likely have aided program leaders to overcome organizational barriers and speed program launch.

FUNDING: Federal; Academic Institution



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POS4-22

PERCEIVED HEALTH KNOWLEDGE AND RISKS FOR CARDIOVASCULAR DISEASE OF TOBACCO AND ELECTRONIC NICOTINE DELIVERY SYSTEMS IN AN ADULT NATIONAL SURVEY

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Background: Electronic nicotine delivery systems (ENDS) use has markedly increased, but limited data are available about their long-term health effects, including the health knowledge and perceptions of the risks for cardiovascular (CV) disease. This study characterizes the perceived health knowledge and CV risks in adult ENDS users and cigarette smokers.

Methods: The sample consisted of 2561 participants from an adult (age 18-64 years) national survey about ENDS use in 2016. We assessed differences in the health knowledge and perceived CV risks associated with ENDS use and tobacco with respect to age, gender, race/ethnicity, and status of tobacco and ENDS use.

Results: Of the participants, 51.9% were current ENDS users, 39.1% were current cigarette smokers, and 19.8% were current dual users with both ENDS and cigarettes. Older adults (45-64 years, $p < 0.01$), whites ($p < 0.05$), non-Hispanics ($p < 0.01$) and women ($p < 0.05$) appeared to be more knowledgeable about the health risks of tobacco. In contrast, younger adults (18-24 years, $p < 0.01$) and Hispanics ($p < 0.05$) were more knowledgeable about the health risks of ENDS. Similarly, perceived CV risks for tobacco were significantly higher in older adults, whites, non-Hispanics (all $p < 0.01$), but perceived CV risks for ENDS were less related to demographics, only significantly higher in women ($p < 0.01$). Current and former adult ENDS users appeared to be more knowledgeable about health risks associated with tobacco ($p < 0.05$). Former smokers perceived the highest CV risks for tobacco ($p < 0.002$), whereas current and non-smokers perceived higher risk for ENDS ($p < 0.01$). Overall, the perceived CV risks for ENDS were lower than that for tobacco.

Conclusions: Knowledge of health risks and perceived CV risks for tobacco and ENDS were significantly different by demographics, and status of tobacco and ENDS use.

The relatively lower knowledge of health risks and perceived CV risks for ENDS use highlighted little or lack of understanding regarding the health effects of ENDS, and the need for future studies, particularly about the CV risks. Further, effective communications

about these health effects may need to be tailored to different demographic groups.

FUNDING: Federal

children; they underscore the need to better understand how these products are used, handled, and stored in the presence of children. Interventions are needed to educate EVP-users on nicotine-specific harms and how to protect children from NEL exposure.

FUNDING: Federal

POS4-24

CURRENT E-CIGARETTE USE AND EXPOSURE TO PRO E-CIGARETTE ADVERTISEMENTS AMONG CALIFORNIA HIGH SCHOOL STUDENTS

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Significance: E-cigarettes are advertised in ways that attract youth to e-cigarette experimentation. Previous research has shown a positive association between youth initiation of tobacco products and pro tobacco marketing, but there is little information about the relationship between youth e-cigarette use and advertisement exposure. The aim of this study was to examine the relationship between e-cigarette use and exposure to pro e-cigarette advertisements among California high school students. **Methods:** Data are from the 2015-2016 California Student Tobacco Survey (CSTS), a school-based survey of 8th, 10th, and 12th graders. We analyzed past 30-day e-cigarette use and exposure to pro e-cigarette advertisements through social media, television, magazines, gas stations/convenience stores, and vape/tobacco stores among 10th and 12th graders. Chi-square tests were used to examine the association between e-cigarette use, demographics, and exposure to pro e-cigarette advertisements taking into account the CSTS survey design. **Results:** Among current users, approximately 61% ($SE = 1.24$) were male, 53% ($SE = 1.30$) were Hispanic, and 25% ($SE = 1.03$) were Non-Hispanic White, compared to 49% ($SE = 0.42$), 55% ($SE = 0.57$), and 16% ($SE = 0.35$) of non-users, respectively. There were statistically significant differences ($p < 0.05$) in exposure to pro e-cigarette advertisements by e-cigarette use status, with current users reporting more exposure to advertisements through social media, magazines, gas stations/convenience stores, and vape/tobacco stores than non-users. Among current users, Non-Hispanic Whites reported statistically significantly higher ($p < 0.05$) exposure to pro e-cigarette advertising in gas stations/convenience stores and vape/tobacco stores compared to other racial/ethnic groups. **Conclusion:** Pro e-cigarette advertisement exposure was higher among current e-cigarette users compared to non-users. Given the relationship between e-cigarette use and exposure to pro e-cigarette advertisements, regulation of e-cigarette marketing may be justified and could help promote reductions in youth smoking.

FUNDING: State

POS4-23

ADULTS' HARM PERCEPTIONS OF CHILDREN BEING EXPOSED TO NICOTINE E-LIQUIDS

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Significance: Acute childhood nicotine exposures result in clinical presentations ranging from mild illness to death. In the United States (U.S.), nicotine e-liquid (NEL)-related cases of childhood nicotine toxicity have risen sharply in recent years. **Methods:** U.S. adults (≥ 18 years, $n = 611$) were surveyed via Amazon MTurk in April 2018. All participants lived with a child (≤ 6 years), and either: currently used nicotine-containing electronic vapor products (EVP-user); were not EVP users, but lived with an adult current EVP user (non-user); or lived in a never-EVP using home (never-user). Risk perceptions of children's (≤ 6 years) exposure to five modes (on the lips, in the nose, in the eye, on the skin, swallowing) at two NEL doses ('1 or 2 drops', 'a teaspoon or more') were elicited. Binomial descriptive and χ^2 statistics characterized the sample; multinomial regression analyses examined relationships between respondent characteristics and perceived NEL harm to children. **Results:** In the multinomial models, the odds of non-users perceiving NEL exposure as 'moderately' or 'very dangerous' to children were not significantly different from those of never-users across the ten dose/mode dyads examined. EVP-users (vs. never-users) perceived lower risk for the majority of modes examined. For example, EVP-users had significantly lower odds of characterizing a teaspoon or more of NEL in a child's nose as 'very dangerous' ($_{\text{a}}\text{OR}: 0.4$, 95%CL: 0.1, 0.9), or 'moderately dangerous' on a child's skin ($_{\text{a}}\text{OR}: 0.5$, 95%CL: 0.3, 0.9); they had significantly lower odds of characterizing a child swallowing 2 or 3 drops of NEL as being 'very dangerous' ($_{\text{a}}\text{OR}: 0.5$, 95%CL: 0.3, 1.0). **Conclusions:** These results raise concerns about EVP users' knowledge deficits of NEL exposure-related harms to

A PILOT RANDOMIZED TRIAL COMPARING REACH AND ENGAGEMENT OF TWO TEXT MESSAGING PROGRAMS IN MEDICAID SMOKERS: TEXT&QUIT AND TEXT4COACH

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SIGNIFICANCE: Text messaging programs have been proven to help smokers quit, but programs have not been tested within health systems. We developed two distinct SMS-based programs for reaching out to smokers in health systems, one aimed at connecting them to an evidence-based text messaging program for smoking cessation (Text&Quit) and the other aimed at connecting them to quitline phone counseling (Text4Coach).

METHODS: In an ongoing pilot RCT, we recruited adult daily smokers with Medicaid insurance from the Emergency Department at an urban hospital. Participants were randomized to Text&Quit or Text4Coach and followed-up at three weeks. Outcomes included feasibility and engagement with the programs. **RESULTS:** Forty-one participants were assessed for eligibility, 6 declined, and 1 was ineligible, resulting in 34 enrolled participants. The mean age of participants was 43 years, 59% were female, 68% had completed high school or more, 94% were African-American, and 50% were unemployed. Engagement was high across programs. Most participants replied to the program at least once within the first 2 weeks (72% for Text&Quit and 81% for Text4Coach). Among Text&Quit participants, 9 set a Quit Date (50%) using the text program. Among Text4Coach participants, 13 texted that they wanted to be called by the DC Quitline (81%). A slight majority of participants reported that the programs were helpful in quitting (66%). Most participants liked the programs in their current forms but suggestions for improvement included longer duration of the program and more information on harms of smoking for Text&Quit and modifying the timing of text messages according to participants' work



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schedules for Text4Coach. Results on 24-hour quit attempts and 7-day point prevalence abstinence will be reported. **Conclusion:** We successfully recruited smokers from the Emergency Department and engaged them in two variants of an SMS-based quit smoking program. Larger RCTs are needed to compare the efficacy of these two strategies in engaging low-income smokers.

FUNDING: Academic Institution

POS4-26

IMPLEMENTING TOBACCO CONTROL INTERVENTIONS IN PERMANENT SUPPORTIVE HOUSING FOR FORMERLY HOMELESS ADULTS

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Significance: Smoke-free policies are effective population-based strategies to reduce tobacco use, yet they are uncommon in permanent supportive housing (PSH) for formerly homeless individuals who have high rates of smoking. In this study, we partnered with six supportive housing agencies in the San Francisco Bay Area to examine the implementation of smoke-free policies and cessation services in PSH. **Methods:** We administered a questionnaire and conducted in-depth, semi-structured interviews with agency directors ($n=6$), property management staff ($n=23$), and services staff ($n=24$) from 23 PSH sites in the Bay Area between January 2017 and July 2017 on the barriers to implementing tobacco control interventions in these sites. **Results:** All properties restricted smoking in indoor shared areas, but only two had policies restricting smoking in living areas. Of the 53 staff participants, 62% were female and 26% were former smokers. While there was staff consensus that smoke-free policies were important to reduce tobacco-related harm, participants disagreed on whether smoke-free policies in indoor living areas were aligned with PSH's harm reduction framework. Residents' comorbid mental illness and substance use, and the lack of appropriate tools to enforce a smoke-free policy were barriers to implementation. Using these formative findings, we present a toolkit of strategies that encompassed policy-level, organizational-level, and individually-tailored targets to increase implementation of smoke-free policies and cessation interventions in PSH. Strategies include the adoption of voluntary smoke-free homes, incorporating tobacco use screening upon entry into housing and integrating medical and social services so that prescriptions for nicotine replacement therapy and cessation counseling are available, integrating the treatment of substance use with tobacco use, and discussing substance and tobacco use in the context of financial strain. **Conclusion:** Successful implementation of indoor smoke-free policies in PSH will require concurrent cessation services to support smoking cessation efforts and to address the mental health and substance use needs of residents.

FUNDING: State

POS4-27

LONG-TERM SMOKING CESSATION RATE OF THE SMOKING CESSATION PROGRAM INITIATED BY THE KOREAN NATIONAL HEALTH INSURANCE SERVICE

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Significance Smoking is a major contributor to health inequality. Following the introduction of the smoking cessation program by National Health Insurance Service (NHIS) in 2015, we examined the impact of this program on the abstinence rate according to the income level. **Methods** In 2015, a total of 230,800 people were enrolled in the smoking cessation program of NHIS. Of these, 954 subjects (49.13 ± 10.69 years; 90.5% men) were selected using the multi-stage stratified cluster sampling method. We first evaluated the effects of the tobacco control policy and factors affecting the abstinence rate, and later examined whether these effects were associated with the income level. **Results** For the participating subjects, the continuous abstinence rate over 6 months was 30.50%. The adjusted odds ratio (OR) of continuous abstinence over 6 months was lower among the low-income (LI) versus the middle or high-income (MHI) groups (OR 0.54, 95% CI 0.35-0.84). Multiple logistic regression analyses indicated that program completion (complete vs. incomplete: OR 2.64, 95% CI 1.93-3.61), light or moderate nicotine dependence (severe vs. light or moderate: OR 0.72, 95% CI 0.52-0.98), and varenicline use (bupropion vs. varenicline: OR 0.60, 95% CI 0.39-0.91) were significantly

associated with continuous abstinence over 6 months. However, for the LI group, the type of smoking cessation medication was not associated with continuous abstinence over 6 months. **Conclusions** The factors for long-term abstinence rates varied based on the income level. Therefore, it is advisable to promote specialized smoking cessation program for reducing health inequality in the LI group.

FUNDING: Nonprofit grant funding entity

POS4-28

ASSOCIATION OF EXPERIMENTATION WITH TOBACCO AND NICOTINE-CONTAINING PRODUCTS AND CURRENT TOBACCO USE STATUS AMONG YOUTH IN THE US: FINDINGS FROM A NATIONAL ONLINE SURVEY (2017)

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Significance: An unprecedented diversity of tobacco and nicotine-containing products (TNCPs) currently exist. Non-combustible TNCPs are considered less risky compared to combustibles. Understanding the association of TNCP experimentation and subsequent pattern of TNCP use is important in informing primary prevention. **Methods:** Using a national online survey of 3,000 youth aged 13-18 (August-October 2017) in the United States, we examined the association between first TNCP tried and current (at least monthly) TNCP use status, and current TNCP use patterns: Non-TNCP users, non-combustibles, combustibles, and mixed TNCP users using multivariate regression analyses, while controlling for sociodemographics. **Results:** Of the 1,674 participants who have experimented with TNCPs, 57% were non-current users and 15% non-combustible, 9% combustible and 19% mixed TNCP users. Compared to e-cigarettes, youth who first tried other TNCPs were more likely to be current TNCP users (aORs ranged from 1.9, 95%CI=1.5, 2.4, $p<0.01$ for cigarettes to 3.2, 95%CI=2.1, 4.6, $p<0.01$ for cigars). Compared to non-users, current non-combustible users were less likely to have first tried cigarettes (aOR=0.52, 95%CI=0.37, 0.74, $p<0.01$) and more likely to have first tried e-cigarettes (aOR=1.61, 95%CI=1.2, 2.17, $p<0.01$) or smokeless/chewing tobacco (aOR=2.61, 95%CI=1.50, 4.56, $p<0.01$). Current combustible users were more likely to have first tried cigarettes (aOR=2.8, 95%CI=1.94, 4.06, $p<0.01$) or cigars (aOR=4.07, 95%CI=2.41, 6.86, $p<0.01$) and less likely to have first tried e-cigarettes (0.14, 95%CI=0.09, 0.25, $p<0.01$). Finally, current mixed users were more likely to have first tried cigarettes (aOR=1.90, 95%CI=1.44, 2.50, $p<0.01$), cigars (aOR=2.78, 95%CI=1.82, 4.23, $p<0.01$) or hookah (aOR=2.70, 95%CI=1.69, 4.31, $p<0.01$) and less likely to have tried e-cigarettes (aOR=0.22, 95%CI=0.16, 0.30, $p<0.01$). **Conclusion:** Youth who first tried e-cigarettes were least likely to be current TNCP users. The first TNCP used seems to be strongly associated with the current TNCP use profile. Understanding experiences of youth experimentation in a diverse TNCP marketplace can inform primary prevention activities.

FUNDING: Federal

POS4-29

IDENTIFYING EFFECTIVE ELEMENTS IN E-CIGARETTE HEALTH WARNINGS

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Significance: Evidence for the health harms of e-cigarettes is growing, yet little is known about which harms may be most impactful in warnings about e-cigarettes. Our study sought to identify which harms tobacco users were aware of and which most discouraged them from wanting to vape. **Methods:** Participants were a national convenience sample of 1,328 US adult e-cigarette users and 890 cigarette-only users, enrolled in August 2018 (56% female, mean age=43). Participants evaluated 40 e-cigarette harms from 7 categories: chemical exposures, device explosions, addiction, cardiovascular harm,



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respiratory harm, e-liquid toxins, and other harms, based on the latest evidence. We randomized participants to one of four panels with 10 harms in each panel. Outcomes were awareness (yes vs. no) and discouragement from wanting to vape (1=not at all to 5=very much). **Results:** Awareness of most e-cigarette harm categories was modest, with device explosions being highest (44%) and the toxic nature of e-liquid skin contact being lowest (15%). The harm categories that most discouraged participants from wanting to vape were respiratory harm (M=3.80) and exposure to chemicals (M=3.75). Cardiovascular harm (M=3.54), e-liquid toxins (M=3.46), and device explosion (M=3.44) categories were rated lower than these categories ($p<.05$). The addiction harm category was rated as least discouraging participants from wanting to vape compared to all other harm categories (M=2.83, $p<.05$). For individual harms, the highest discouragement was respiratory and chemical exposures and the lowest discouragement was addiction-related consequences of e-cigarette use. **Conclusions:** Our findings suggest that addiction is the least motivating e-cigarette harm, a notable problem given that the current FDA e-cigarette warning communicates only about addiction. E-cigarette health warnings should include other harms, especially respiratory harms and the chemical exposures that may lead to respiratory and other health consequences.

FUNDING: Federal

POS4-31

CHARACTERISTICS OF SMOKELESS TOBACCO USERS, SMOKERS AND DUAL USERS IN INDONESIA: AN ANALYSIS OF GATS 2011 DATA

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Significance: Indonesia has the third largest population of smokers in the world, however, little is known about smokeless tobacco users in Indonesia. The 2011 Global Adult Tobacco Survey (GATS) results are the latest nationally representative data available. **Methods:** The GATS included 8,176 adults ages 15 and older. These data are weighted to be nationally representative. Weighted descriptive statistics and multivariate logistic regression were run using SAS 9.4. Analyses assessed correlates of exclusive smoking, exclusive smokeless use, and dual use compared to non-tobacco product users. **Results:** Estimated national prevalence for exclusive smokeless tobacco use (STU) was 0.9%, for exclusive smoked tobacco use was 33.9% and for dual use was 0.8%. Exclusive ST users are characteristically different from smokers and dual users. Exclusive STU are more likely to be female (OR=7.6) and to be older (45-64 years) compared to younger adults (ages 25-44) (OR=4.0). Exclusive smokers are much less likely to be female (OR=0.009) and less likely to be in the older age group (OR=0.8). Dual users are also less likely to be female (OR= 0.03) and less likely to be in the youngest age group (OR=0.3). While smoking status was negatively associated with level of education, smokeless tobacco users and dual users did not show a similarly consistent trend. **Conclusion:** These results illustrate a unique pattern of STU characteristics that differ from neighboring countries. In India, STU is more common than smoking and mostly used by males; whereas in Indonesia, it is the least commonly used tobacco product, mostly used by females. There are some similarities to use patterns in Malaysia, where nearly half of all STU also smoke tobacco. More detailed data collection on specific smokeless tobacco product types, as has been included in more recent GATS surveys, could support a more detailed characterization of STU behaviors in Indonesia, including understanding how behavior differs by gender or dual versus single product use. Additionally, if these data were assessed regionally, we may find that the prevalence rates of STU would be higher in Eastern Indonesia, where anecdotally, these products are more heavily used.

POS4-32

PREVALENCE AND CHARACTERISTICS OF TWITTER POSTS ABOUT COURT-ORDERED, TOBACCO-RELATED CORRECTIVE STATEMENTS

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Significance: Three major U.S. tobacco companies were recently ordered to publish corrective statements intended to prevent and restrain further manipulation about the health effects of smoking. The court-ordered statements began appearing in newspapers and on television in late 2017. To understand the public conversation about these statements, we analyzed relevant posts on Twitter. **Methods:** We conducted a descriptive content analysis of Twitter posts using an iterative search strategy through Crimson Hexagon and randomly selected twenty percent (n=456) of original posts occurring

between November 1, 2017 and March 31, 2018 for coding and analysis. We assessed post volume over time, source/author, valence, linked content, directive language, and reference to industry (e.g. "big tobacco," "tobacco industry," "Philip Morris") and media outlet (TV or newspaper). Retweeted content was coded for source/author and frequency. **Results:** Most posts were published in November 2017, surrounding the initial release of the corrective statements. Content was generally neutral (59%) or positive (33%) in valence, included links to additional information about the statements (95%), referred to the industry (88%), and did not contain a directive (95%) or mention a specific media channel on which the statements aired (85%). The majority of original posts were created by private citizens (55%), while the majority of retweeted posts were posted by public health organizations (51%), private citizens (33%), news organizations (14%), and celebrities (3%). **Conclusion:** Conversations about the court-ordered corrective statements are taking place on Twitter and are generally neutral or positive in nature. Public health organizations may be increasing the prevalence of these conversations through social media engagement.

FUNDING: Federal

POS4-33

TOBACCO USE AMONG CAREGIVERS IN SPECIALIZED POPULATIONS WITHIN THE NICU

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Significance- Research shows an association between maternal tobacco exposure, both active and passive, and congenital heart defects in infants. Each year 1 in 100 babies are born with congenital heart defects. In Oklahoma tobacco use is higher (19.6 %) than the national average (15.5%). The purpose of this study is to assess tobacco usage rates and intervention participation for the Neonatal Intensive Care Unit's cardiac and non-cardiac admissions within The Children's Hospital at OU Medical Center. **Methods-** From January to December of 2017, 1193 newborns were admitted to the NICU. An additional 132 admissions were diagnosed with congenital heart disease and admitted to a specialized 10 bed cardiac unit within the NICU. A tobacco use survey was developed and embedded into the current NICU Safe Sleep assessment form. All parents/caregivers of NICU admitted newborns were asked to complete the survey. Survey responders positive for tobacco use were offered tobacco cessation services. Survey responses of General versus Cardiac NICU parents/caregivers were compared for both tobacco usage and acceptance of tobacco cessation assistance. **Results-Of the 1325 admissions provided tobacco usage surveys, 1002 were completed (75.6%).** **Results** showed the tobacco use rate among all NICU caregivers was 28% with no difference between the cardiac versus non-cardiac admissions. 41% of tobacco users with non-cardiac babies in the NICU agreed to accept assistance with cessation. In contrast, the caregivers in the cardiac NICU population were much less accepting of cessation assistance with only a 22% acceptance rate. **Conclusion-** While Oklahoma tobacco usage rates remain higher than the national average, within the NICU caregiver population, the rates are even higher. Additionally, caregivers of children with congenital heart defects in the NICU setting, are much less willing to enroll into a tobacco cessation program as compared to the caregivers of other NICU patients. Additional research is needed to better assess these special populations and what psychosocial barriers may impede their desire to quit tobacco.

FUNDING: Nonprofit grant funding entity; Other

POS4-34

SMOKE-FREE AIR COALITIONS IN GEORGIA AND ARMENIA: A COMMUNITY-RANDOMIZED TRIAL

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Significance: Local coalitions are an evidence-based strategy for advancing tobacco control, particularly smoke-free air policies, but have not been widely used or well-studied in low- and middle-income countries. Georgia (GE) and Armenia (AM) are strategic for examining the utility of local coalitions given their high rates of smoking and secondhand smoke exposure (SHSe). **Methods:** This study used the Community Coalition Action Theory as a framework for intervening and evaluating local coalitions to promote smoke-



free policies using a matched-pairs community randomized controlled trial in 28 GE and AM communities. Trainings and technical assistance will be provided to the coalitions to conduct situational assessments and execute action plans to promote smoke-free policy adoption/enforcement. Assessments of coalition members/activities will be conducted annually. Community member surveys will be conducted in 2018 and 2021 to assess changes related to smoking, SHSe, and attitudes toward SHSe and smoke-free policies. **Results:** At baseline (Summer 2018), we assessed non-communicable disease (NCD) activity of public health centers in the 28 communities; 50-57% had NCD programs; 46% were involved in developing/enforcing tobacco-related policies, with 43% addressing advertising, 46% youth access, and 29% smoke-free policies. Other tobacco-related activities included providing community education (39%), youth prevention programs (32%), cessation counseling/quitting (32%), and healthcare provider tobacco dependence treatment training (29%). The majority indicated at least some support for tobacco control from regional or local government officials (89%) and from community members (54%). No differences between intervention and control communities were found. However, country differences were documented. GE communities were more likely to have NCD programs addressing tobacco control, including smoke-free policies; AM communities were more likely to have NCD programs addressing other areas (e.g., cancer). **Conclusions:** This study will serve as a catalyst for future research and evidence-based practice to support tobacco control progress in this region and more broadly.

FUNDING: Federal

POS4-35

ASSESSING STUDENT COMPLIANCE WITH AND ENFORCEMENT OF A CAMPUS WIDE TOBACCO FREE POLICY

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The present study assessed perceptions of cigarette smoking prevalence and tobacco policy compliance/non-compliance, as well as attitude towards, self-reported compliance/non-compliance with and enforcement of a 100% tobacco free campus policy. To our knowledge, this study represents the first attempt to assess these variables by surveying a large sample of college student smokers and non-smokers. Compliance and enforcement focused on cigarette smoking as this form of tobacco use is more likely noticed by participants, and the time frame used in the current study was the past 30 days. Nine hundred and thirty-two college students (670 female; 130 tobacco smokers) completed a short online (808) or in person (124) survey. All participants, regardless of smoking status, over-estimated the prevalence of on-campus cigarette smoking (44 percent vs. 14 percent (actual prevalence) of all students) and policy non-compliance (51 percent vs. 36 percent of all students who smoke). There were no significant differences in perceptions of smoking prevalence or non-compliance between smokers and non-smokers (both groups 44 percent and 51 percent, for prevalence and non-compliance, respectively). Smokers reporting non-compliance (36 percent of all smokers), compared to those reporting compliance (64 percent of all smokers), reported significantly more negative attitudes (1 equals extremely negative; 5 equals extremely positive) towards the tobacco policy [Mean (SD): 2.19 (1.10) versus 3.20 (1.16), respectively], smoking more cigarettes per day [Mean (SD): 6.86 (6.26) versus 2.98 (3.66), respectively], and perceiving non-compliance as widespread [Mean proportion (SD): .66, (.34) versus .44, (.32), respectively]. These differences were statistically significant, and the associated effect sizes fall in the "medium" range, suggesting real life significance. Although the vast majority of both smokers (96 percent) and non-smokers (89 percent) reported having witnessed non-compliance, 89 percent of the sample reported not enforcing the policy, and attitude toward the policy was moderately positive [mean (SD): 3.88 (1.19)], with non-smokers reporting the most positive attitude [mean (SD): 4.05(1.10)]. Discussion centers on explanations and implications of the findings.

FUNDING: Unfunded

POS4-36

HARM PERCEPTIONS AND TOBACCO USE INITIATION AMONG YOUTH IN WAVE 1 AND 2 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY

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Youth in the US perceive cigarettes as more harmful and addictive than other tobacco products. Monitoring harm and addiction perceptions across a range of tobacco products is important when forecasting risk for experimentation. **Methods:** This study examined data from US youth (N=10,081) ages 12-17 from the Population Assessment of Tobacco and Health (PATH) Study who completed both Wave 1 (2013-2014) and Wave 2 (2014-2015) interviews. Youth were asked about cigarettes, e-cigarette, cigars (traditional cigar, cigarillo, filtered cigar), hookah, and smokeless tobacco (including snus). Three items were used to assess harm perceptions for each product at Wave 1 and Wave 2. Two items measured perceptions of absolute harm, and were asked for all products. The third item measured harm perceptions relative to cigarettes, and was asked for all products except cigarettes. Average item-scores were used to place youth into one of three categories (1 to <2 = 'Low', 2 = 'Medium', >2 to 3 = 'High'). We also categorized perceptions of the addictiveness of each product. Analyses assessed: (1) whether perceived harm and addictiveness of a product at Wave 1 predicted trying that product for the first time by Wave 2, and (2) whether first-use of a product between waves was associated with lower perceived harm and addictiveness of that product at Wave 2. **Results:** Across products, youth levels of perceived harmfulness and addictiveness significantly increased between Wave 1 and Wave 2 ($\chi^2 = 7.8-109.2$; $p's \leq 0.02$). Compared to those with "High" perceived harmfulness or addictiveness of a tobacco product at Wave 1, those with "Low" and "Medium" perceived harmfulness or addictiveness had a significantly increased odds of using that product at Wave 2. For all products, Wave 1 youth never tobacco users who tried a product (vs. did not) at Wave 2 had a significantly higher odds of being in the "Low" category of perceived harmfulness and "Low" addictiveness at Wave 2. **Conclusion:** Among US youth, there is a bidirectional relationship between harm perceptions and product use. Understanding how changes in perceptions are related to changes in tobacco use could help to inform efforts to prevent tobacco initiation in youth.

FUNDING: Federal

POS4-37

HOOKAH SMOKING BEHAVIORAL TRANSITIONS AMONG US YOUNG ADULTS: RESULTS FROM WAVES 1-2 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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Significance: Hookah smoking is popular among young adults (YAs; 18-24 years), yet longitudinal studies are limited. **Methods:** We examined changes in hookah smoking frequency among YAs in the United States between Wave 1 (2013/2014) and Wave 2 (2014/2015) of the Population Assessment of Tobacco and Health Study. Relative risk ratios were estimated to examine correlates of changes in frequency of hookah smoking using multinomial logistic regression analyses of weighted data. **Results:** Of the 1,444 YAs reporting every day/someday hookah smoking at Wave 1 who were hookah users at Wave 2, 62.5% reported no change in smoking frequency, 24.4% reported an increase (<monthly at Wave 1 to monthly/weekly/daily at Wave 2; monthly to weekly/daily; or weekly to daily), and 13.1% reported a decrease. In adjusted analyses, Black, non-Hispanic respondents were more likely to increase (vs. no change) hookah smoking across waves compared with White, non-Hispanic respondents ($RRR=1.77$, $95\%CI=1.22-2.56$, $p<0.01$), as were respondents with a household income of \$50K-\$99,999 compared with <\$25,000 ($RRR=1.49$, $95\%CI=1.01-2.20$; $p<0.05$); past 30-day marijuana users were less likely to increase hookah smoking ($RRR=0.69$, $95\%CI=0.48-0.99$), $p<0.05$. Females were less likely than males to decrease (vs. no change) hookah smoking across waves



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(RRR=0.66, 95%CI=0.40-0.91, $p<0.05$), while past 30-day other tobacco product (OTP) users (including e-cigarettes) (RRR=1.84, 95%CI=1.13-3.01, $p<0.05$) and those who own a hookah (RRR=2.56, 95%CI=1.69-3.86, $p<0.001$) were more likely to decrease hookah smoking. Sexual orientation, education, geographic region, and alcohol use were not associated with change in frequency. Conclusions: The majority of hookah smoking YAs did not change their frequency of use over a one-year period. There were differences by race, gender, income, and OTP and marijuana use among those who changed. Decreasing frequency among YAs who own a hookah may relate to a social aspect of hookah use or a novelty effect rather than an addictive property. More granular measures of quantity and frequency of hookah use can enhance our understanding of hookah smoking trajectories to inform policy and other intervention research.

FUNDING: Academic Institution

POS4-38

A LONGITUDINAL ANALYSIS OF TOBACCO USE IN YOUNGER AND OLDER U.S. VETERANS

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Introduction: We explore how cigarette and non-cigarette tobacco products are used among U.S. veterans, a population which is prone to higher rates of smoking and smoking-related disease, but for whom non-cigarette use is not well understood. We describe the prevalence of cigarette and non-cigarette product use and determine longitudinal predictors of tobacco use transitions in this vulnerable population. **Methods:** Data are from Wave 1 (2013-2014) and Wave 2 (2014-2015) of the adult cohort in the Population Assessment of Tobacco and Health. Wave 1 prevalence estimates were calculated for past 30-day use of all queried tobacco products, and compared by veteran status. Weighted multinomial logistic regression was used to determine predictors—demographic characteristics, substance use, and physical and psychological comorbidities—of tobacco use transitions (continued use, escalation, and de-escalation) among veterans ($n=1,902$). **Results:** Compared to non-veterans, use of cigarettes, ENDS, little filtered cigars, cigarillos, traditional cigars, and pipes was significantly higher among veterans. In terms of conflict served, use of any tobacco product was highest among veterans who served since September 2001 or later. Compared to continued nonusers, continued users were more likely to: be of younger age (OR=.95, 95% CI: .95-.96), have poorer physical health (OR=1.58, 95% CI: 1.22-2.06) and mental health (OR=1.48, 95% CI: 1.18-1.85), report other drug use in the past year (OR=1.79, 95% CI: 1.21-2.64), and report problematic alcohol use (OR=4.23, 95% CI: 2.38-7.52) and were less likely to be female (OR=.57, 95% CI: .35-.93). Compared to continued nonusers, escalators were more likely to report problematic alcohol use (OR=8.63, 95% CI: 3.79-19.63), and de-escalators were more likely to be of younger age (OR=.97, 95% CI: .95-.99). **Conclusion:** Cigarette and non-cigarette use are prevalent among veterans, especially in young veterans, so prevention should begin during military service. Tobacco cessation programs should be tailored for this vulnerable population, incorporating aspects related to concomitant conditions such as physical health, mental health and substance use.

FUNDING: Federal

POS4-39

EXAMINING SMOKING ABSTINENCE AMONG ADULT MENTHOL CIGARETTE SMOKERS USING WAVES 1-4 OF THE PATH SURVEY

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Background: We prospectively examined the relationship between menthol cigarette use and abstinence. **Methods:** With adult data from Waves 1-4 of the Population Assessment of Tobacco and Health Study (fielded 2013-2017), we used an extended Cox model to estimate adjusted hazard ratios (aHR) of achieving smoking abstinence for at least 7 days for menthol- ($n=2,565$) vs. non-flavored ($n=3,931$) cigarette users. Respondents entered the analytic sample at the wave they first reported current, established, exclusive cigarette use (Wave 1, 2, or 3). Menthol flavor status was time-varying. We conducted a stratified analysis to examine abstinence by racial/ethnic subgroup and a full sample analysis to examine the interactive effect of race/ethnicity by flavor status. Models were adjusted for demographics, mental health indicators, substance use, smoking frequency, dependence, and prior quit attempts. **Results:** Preliminary findings suggest there was a non-statistically significant negative relationship between being a menthol smoker and achieving abstinence (aHR=0.86, 95% CI: 0.73-1.02) in

the full sample multivariable model. In the multivariable stratified analysis, we observed a non-statistically significant negative relationship between being a menthol smoker and abstinence in each subgroup (non-Hispanic (NH) White aHR=0.90, 95% CI: 0.73-1.09; NH Black aHR=0.70, 95% CI: 0.39-1.25; other race/ethnicity aHR=0.80, 95% CI: 0.57-1.12). In the multivariable model with the interaction term, there was a non-statistically significant reduced effect of menthol use on abstinence in NH Black smokers versus NH White smokers (aHR=0.69, 95% CI: 0.40-1.21). **Conclusion:** Although our findings were not statistically significant, we observed consistent directional effects across multiple models suggesting that menthol cigarette use may be related to reduced abstinence, and that this relationship may differ by race/ethnicity. Extending this analysis with more waves of data can help us to better understand these relationships. **Impact Statement:** This study contributes to the growing evidence base on the public health impact of menthol cigarettes.

FUNDING: Federal

POS4-40

FIRST FLAVORED TOBACCO USE PREDICTS MORE FREQUENT TOBACCO USE AMONG ADULTS IN WAVES 1 AND 2 OF THE PATH STUDY, 2013 - 2015

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SIGNIFICANCE Flavored tobacco products are known to appeal to young and inexperienced users and influence tobacco product trial. However, few longitudinal studies have examined the relationship between flavored tobacco product use and continued tobacco use. This study examines the relationship between first use of a flavored tobacco product and subsequent tobacco use, including frequency of tobacco use. **METHODS** We conducted longitudinal analysis of the Population Assessment of Tobacco and Health (PATH) Study using data collected from adults ($n=26,447$) in selected households who participated in both Wave 1 (2013-2014) and Wave 2 (2014-2015). The exposure of interest was that first use of a given tobacco product was flavored assessed at Wave 1. Outcomes of interest were frequency of current product use at Wave 2: moderate (6+ of the past 30 days), frequent (20+ of the past 30 days), daily, and current regular use. Analyses used SVY procedures in Stata/SE version 15.1 to account for weighting. Multivariable modified Poisson regression models controlled for age, gender, race/ethnicity, education, income, past 30-day alcohol, marijuana, or other drug use, and three Global Appraisal of Individual Needs (GAIN) subscales. **RESULTS** In young adults aged 18-24 and adults aged 25+, first use of a menthol/mint flavored cigarette at Wave 1 was associated with a higher prevalence of moderate, frequent, daily, and current regular cigarette use at Wave 2 compared to first use of a non-flavored cigarette at Wave 1 after adjusting for covariates. First use of a flavored tobacco product including cigarettes, e-cigarettes, cigars, cigarillos, filtered cigars, hookah, smokeless tobacco, and snus pouches at Wave 1 was associated with more frequent use of those products at Wave 2 compared to first use of a non-flavored product. **DISCUSSION** First use of flavored tobacco products, including menthol cigarettes, places young adults and adults at risk of subsequent tobacco use, including more frequent product use.

FUNDING: Federal

POS4-41

CHANGES IN FLAVORED TOBACCO PRODUCT USE AMONG CURRENT YOUTH TOBACCO USERS IN THE UNITED STATES: 2014 - 2017

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Background: Flavoring has become one of the leading reason for current tobacco use among teenagers aged 12-17 years and flavored tobacco use (FTP) is prevalent among youth. This study sought to assess changes in self-reported FTP use among youth in the United States from 2014 to 2017 and further examine the risk factors associated with FTP use. **Methods:** The study included National Youth Tobacco Survey (NYTS) data from 2014 to 2017 with 78,265 middle and high school students. Students who reported use of menthol cigarettes or any flavored non-cigarette tobacco product(s) were categorized as FTP users. Changes in prevalence of FTP use as well as product-specific flavor use patterns (e.g., e-cigarettes, cigars) were calculated across years. Logistic regression was conducted to examine the trends and factors associated with the FTP use. Sampling weights and survey stratum were included in the analysis to account for the complex survey design. **Results:** Among current tobacco users (n=12,219), the prevalence of FTP use decreased significantly from 2014 (69.4% [95% CI, 66.5%-72.3%]) to 2016 (57.7% [54.6% - 60.7%]) and rebounded from 2016 to 2017 (63.6% [60.6% - 66.5%]). Product-specific flavor use exhibited different patterns with no change for menthol cigarette use, a decreasing and then increasing trend for flavored e-cigarette use, and a decreasing and then leveling-off trend in other flavored tobacco (cigar, hookah, smokeless tobacco) use. There is also heterogeneity of FTP use by age, gender, race/ethnicity, and the number of tobacco products currently use ($p<0.05$). In the multivariable analysis, the odds of FTP use among current tobacco users was higher in 2014 (AOR=1.8, 95% CI [1.5, 2.2]), 2015 (AOR=1.2, 95% CI [1.0, 1.5]), and 2017 (AOR=1.4, 95% CI [1.1, 1.7]) than it was in 2016. Females (vs. males), non-Hispanic whites (vs. non-whites), and dual/poly tobacco (vs. single) users were more likely to report FTP use. **Conclusions:** This study found a decreasing and then increasing trend of FTP use among current youth tobacco users from 2014 to 2017. Continuous surveillance of FTP use and efforts to decrease FTP use among youth are warranted.

POS4-42

PREFERENCE FOR FLAVORS AMONG U.S. ADULT TOBACCO USERS

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Background: In the United States, flavors in cigarettes are banned, except menthol; flavors in other tobacco products are unrestricted. Preferences for flavors is not well known among adult tobacco users. **Methods:** Data were drawn from the Tobacco User Adult Cohort including rural and urban adults in Ohio. Participants reporting any tobacco use on at least some days (n=897) were included in the sample; a subset of participants repeated the survey at two interviews 6 months apart (n=186) for an assessment of reliability. By design, the cohort members were grouped into user types: exclusive combustible (68%), smokeless tobacco (18%), exclusive e-cigarette [ENDS] (9%), or dual (5%) users. Self-report of desirability for 10 flavor categories (e.g., fruits, mint, tobacco) were measured on a 9-point scale and 4 sensory attributes of an ideal flavor were rated on a 5-point scale from not important to very important. Chi-squared tests examined differences between tobacco user types, and weighted Cohen's kappa was used for reliability. **Results:** Significant differences were observed between the 4 user types for all flavor categories, except savory foods which was rated consistently low. For all user types, except ENDS, the greatest proportion (>70%) rated at least some desire for tobacco flavor; among ENDS users 58% rated at least some desire for fruits and sweets/desserts categories equally. Tobacco and mint flavors were the only categories where more than one-third of exclusive combustible and smokeless users endorsed some desire. Significant differences between user types were observed for sensory attributes of flavor type, sweetness, mintiness ($p=0.04$), but not for harshness or bitterness ratings ($p>0.05$). Few endorsed flavor type as unimportant (range: 4-21%). Current flavored users of combustible/smokeless products (combined) reported consistently lower ratings for the importance of all sensory attributes when compared to current unflavored users of those products ($p<0.05$). Fair to moderate agreement was found for the desirability of flavor categories (kappa: 0.24-0.60) with slight agreement for savory foods (kappa ≤ 0.21). **Discussion:** This novel investigation into measures for adults on desirability for tobacco flavor categories had stable reliability over a 6-month interval. Adult tobacco users provide significantly different ratings for their desirability for flavors, with dual and ENDS users generally having the more positive ratings for the desirability of flavor categories compared to combustible and smokeless users.

FUNDING: Federal

POS4-43

OVERALL AND CAUSE SPECIFIC MORTALITY AMONG NONDAILY CIGARETTE SMOKERS IN U.S. ADULTS

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Significance: A growing proportion of current cigarette smokers in the United States smoke less than 10 cigarettes per day or smoke on some days but not others (non-daily). Just a few studies have assessed the health effects of lower-intensity and non-daily smoking.

Methods: We harmonized tobacco use data collected from 505,000 adults aged 18 or over in the 1993, 1996, 1999, 2001, 2002, 2003, 2004, 2006, 2007-2008, 2010, and 2010 Tobacco Use Supplements to the Current Population Surveys. Overall and cause-specific mortalities were obtained via linkage to the National Longitudinal Mortality Survey. Current and former cigarette smokers were categorized into daily and non-daily use; non-daily smokers were further categorized into lifelong non-daily or ever daily smokers. Hazard ratios (HRs) and 95% confidence intervals (CIs) relative to never smokers were estimated using Cox proportional hazards regression using age as the underlying time metric and adjusted for sex, race/ethnicity, education, survey year, and household income level.

Results: Among about 96,000 current smokers, about 18,000 (18.8%) were non-daily smokers. Overall mortality risk was higher among lifelong non-daily smokers (HR, 1.83; 95% CI, 1.65-2.02) relative to never smokers. Increased risks among non-daily smokers were observed in men and women and across racial/ethnic groups. As expected, current daily smokers had even higher risk (HR, 2.32; 95% CI, 2.25-2.38). Mortality risks were lower with longer quit duration among non-daily and daily former smokers. Lifelong non-daily smokers had increased mortality risks from smoking-related cancer (HR, 2.21; 95% CI, 1.67-2.91), cardiovascular disease (HR, 1.66; 95% CI, 1.37-2.01), and respiratory disease (HR, 3.36; 95% CI, 2.29-4.94) with an especially high risk for lung cancer (HR, 5.79; 95% CI, 3.99-8.41) compared to never smokers. Among non-daily smokers, overall mortality risk was higher with larger number of cigarettes smoked per month in a dose-response manner and observed as low as 6-10 cigarettes per month.

Conclusions: Lifelong non-daily cigarette smoking was associated with increased risk of overall mortality and a wide range of smoking-related causes of death. Our findings confirm that there is no safe level of smoking.

Disclaimer: This presentation is released to inform interested parties of research and to encourage discussion. Any views expressed on statistical, methodological, technical, or operational issues are those of the authors and do not represent the U.S. Census Bureau, NIH, and FDA position or policy.

FUNDING: Federal

POS4-44

CHARACTERIZATION OF METAL EXPOSURE FROM E-CIGARETTE USE IN MARYLAND: A STUDY OF NON-INVASIVE BIOMARKERS

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Significance: Little is known about the chemical components of e-cigarettes and their potential as an exposure pathway to metals. Nickel (Ni) and chromium (Cr) are frequent components of e-cigarette heating coils and have been found at high levels in the e-liquid and aerosol. Ni and Cr biomarker concentrations among Maryland e-cigarette users were compared to that of non-e-cigarette users/non-smokers. Associations of e-cigarette use patterns with metal biomarker concentrations were assessed. **Methods:** We recruited 148 participants, 98 e-cigarette users and 50 non-users, from December 2015 to October 2017. Data on e-cigarette use and device characteristics were collected. Urine, saliva, and exhaled breath condensate (EBC) samples as well as e-cigarette users' e-liquid and aerosol were collected. Metal concentrations were measured using ICP-MS. **Results:** E-cigarette users had higher median metal biomarker concentrations ($\mu\text{g/l}$) than non-users (all $p<0.05$): 1.01 vs. 0.39 Ni in saliva; 0.56 vs. 0.17 Ni in EBC; 0.98 vs. 0.57 Cr in urine; 0.38 vs. 0.21 Cr in EBC. Saliva Ni concentrations were positively associated with Ni concentrations in the condensed aerosol (p for trend <0.001). Both saliva Ni and Cr concentrations were associated with Ni and Cr in the e-liquid in the tank after contact with the heating coil (p for trend 0.008 and 0.001, respectively). Regarding e-cigarette use patterns, increased Ni urine and saliva concentrations were observed in



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participants who had an earlier first time to vape in the morning (≤ 15 minutes) (p for trend 0.02). Both Ni and Cr saliva concentrations were increased among users who changed their coil more frequently (≥ 3 times/month) (p for trend 0.05 for both). Participants who consumed more e-liquid per week (> 30 ml) had higher saliva Cr concentrations (p for trend 0.04). **Conclusion:** Compared to non-users, e-cigarette users had significantly higher Ni and Cr biomarker concentrations. Associations of increased use and consumption as well as positive associations of metal concentrations in aerosol and tank with corresponding metal biomarker levels indicate e-cigarette emissions and frequent use increase metal internal dose.

FUNDING: Federal; State

POS4-45

NOVEL BIOMARKERS TO CHARACTERIZE THE SPECIFIC EXPOSURE TO ALDEHYDES OR EPOXIDES FROM E-VAPOR PRODUCTS BASED ON STABLE ISOTOPE LABELED CONSTITUENTS

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E-vapor products (EVP) are an emerging category of non-combustible tobacco products that hold the promise of harm reduction for users of combustible products. Degradation products such as aldehydes have received much attention lately, however, human exposure cannot be quantified, due to absence of source-specific biomarkers of exposure to aldehydes and epoxides, respectively. We evaluated the emission of aldehydes and epoxides in EVP under typical usage conditions generated from e-liquid containing isotope-labeled nicotine (Nic), glycerol (G) and propylene glycol (PG). Smoking conventional non-filter cigarettes spiked with the same labeled compounds served as positive control. Urine samples for biomarker analysis were derived from a clinical study comprising experienced vapers (n=20) and cigarette smokers (n=5). This approach allows for the systematic evaluation of exposure to the e-liquid constituents and their potential degradation products. Several (bio)analytical methods were developed and modified for the quantification of labeled and unlabeled aldehydes in e-liquid aerosol as well as the labeled and unlabeled urinary biomarkers of those compounds (metabolites formed from glutathione adducts, e.g. mercapturic acids). The mainstream smoke of spiked cigarettes showed significant levels of labeled acrolein, crotonaldehyde, formaldehyde and acetaldehyde. The corresponding labeled metabolites for acrolein, crotonaldehyde and formaldehyde in urine were only quantifiable in the positive control group (cigarette smokers), none of them in the vapers. In contrast, the labeled glycidol metabolite DHPMA (dihydroxypropyl mercapturic acid) was found in smokers as well as vapers suggesting the generation and absorption of glycidol during vaping of e-cigarettes. In conclusion, our data proved the applicability of the stable-isotope labeling concept to unequivocally assess exposure to potential pyrolysis products derived from PG and G from EVPs and their metabolites in human urine.

FUNDING: Tobacco Industry

POS4-46

EXPERIMENTAL SIMULATION OF THE ENDS DRY-PUFF CONDITIONS. REAL-TIME MONITORING OF AEROSOL SIZE DISTRIBUTION, CARBONYLS CONCENTRATION, AND NON-INVASIVE TEMPERATURE MEASUREMENT OF THE HEATING ELEMENT DURING WET-PUFF VS DRY-PUFF CONDITIONS

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Significance: "Dry Puff" conditions may happen if an electronic nicotine delivery system (ENDS) operates under a lack of e-liquid supply to the heating element. A "dry-puff" assumed to generate high carbonyl concentrations, resulting in potential toxin exposures for vapers. However, heating temperatures pertinent to a "dry puff" are not yet defined. Accurate laboratory studies are needed to determine the ENDS operating conditions that result in a "dry puff" as well as to provide physical and chemical characterization of the ENDS emissions resulting from a "dry puff". **Methods:** An ENDS test system that allows simultaneous real-time measurements of ENDS emissions and temperature was designed to test commercially available ENDS devices or their components. A differential mobility spectrometer, proton transfer reaction/mass spectrometer, and infrared sensor were applied to simultaneously measure aerosol size distribution, aldehyde concentrations, and heating temperature respectively. ENDS heating element

and power control modules were installed into the test system and 50:50 propylene glycol:glycerol mixture was used to generate aerosols at 5.4 and 8.8 W power and at 15 and 45 mL/s puff flow rate (5 s puff duration, 1 min inter-puff interval, 8 puffs per test). Measurements were made in triplicate with a fully wetted and continuously drying heating element for each test condition. **Results:** Wet-puff temperatures were 250-300 °C. Under a restricted liquid supply (continuously drying wick), the temperature quickly elevated to 600-1000 °C, while the concentration of aerosol increased and particle size decreased. With temperature increases from ~250 to 800 °C, carbonyl concentrations increased moderately (<3 times). Comparison with an independently operated ENDS showed similar levels of carbonyls and aerosol size distribution. **Conclusions:** Extremely high temperature can be reached very quickly in ENDS even if the heating element is only partially dried. Compared to fully wetted conditions, partially dried ENDS generated higher concentration of aerosol but with smaller particle size. High temperature did not significantly increase carbonyls emissions, indicating that "dry-puff" conditions might not be required to produce high carbonyl concentrations.

FUNDING: Federal

POS4-47

IMPACT OF VAPING PATTERNS ON CARBONYLS AND CARBON MONOXIDE EMISSIONS FROM FOUR POPULAR TYPES OF ELECTRONIC CIGARETTES

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INTRODUCTION: Wide variability of e-cigarette use patterns, such as puff topography, poses challenges in e-cigarette emission testing. It is further complicated by the rapid development of new e-cigarettes. JUUL, the most popular e-cigarette among teenagers, has not been yet thoroughly tested. There is a need to understand how the e-cigarette construction and e-cigarette use patterns affect emissions. **METHODS:** Four e-cigarette devices were selected to represent the commonly used e-cigarette device types (i.e., JUUL, cig-a-like, top-coil, and bottom-coil). The selected e-cigarette devices were operated under a wide range of vaping topography parameters. Aerosols were collected using DNPH-coated and glass fiber filters for carbonyl and nicotine analysis, respectively, and analyzed using a high-performance liquid chromatography (HPLC/UV). CO was measured along with carbonyls using an on-line CO analyzer. **RESULTS:** Carbonyl and CO emissions varied widely with e-cigarette device type and vaping topography for the same e-liquids. Top-coil, cig-a-like, bottom-coil, and JUUL device emitted, respectively, 1.59-16.89, 0.01-3.91, 0.09-0.83, and 0.01-0.11 microgram/puff of formaldehyde and 9.06-36.16, 0.35-2.60, 0.72-3.78, and 0.34-0.45 microgram/puff of CO. Aldehyde and CO levels were positively correlated with puff duration under the same flow rates. The JUUL emitted significantly higher amounts of nicotine (172-511 microgram/puff) than other e-cigarette devices. Measured nicotine levels for cig-a-like (mean=104, SD=10 microgram/puff) and bottom coil (mean=106, SD=12 microgram/puff) devices were within the range of nicotine levels reported for conventional cigarette smoke (mean=134, SD=75 microgram/puff), while the top-coil device emitted a significantly lower amount of nicotine using the same e-liquid nicotine level as the bottom-coil device. **CONCLUSIONS:** The results allow comparison between e-cigarette studies using different devices and vaping topographies. The JUUL e-cigarette emitted the smallest amounts of harmful chemicals among the tested devices but its high nicotine emissions should be of concern for regulatory authorities as they exceed FDA nicotine addiction guidelines.

FUNDING: Academic Institution

POS4-48

NICOTINE LEVELS IN SILICONE WRISTBAND SAMPLERS WORN BY CHILDREN EXPOSED TO SECONDHAND SMOKE AND ELECTRONIC CIGARETTE VAPOR ARE CORRELATED WITH URINARY COTININE

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Exposure assessments of children present difficulties not found with adults. Simple silicone wristbands are passive samplers that have potential applicability in exposure studies of children. We investigated the performance of silicone wristbands as personal nicotine samplers by determining if nicotine exposure as measured by a wristband worn by a child (n = 31) for 7 days or 2 days correlated with the child's urinary cotinine levels. Cotinine, a metabolite of nicotine, is the most widely used biomarker of secondhand



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smoke exposure. The 2-day wristband was worn in addition to the 7-day wristband for the last two days of the time period. We investigated two exposure time periods in order to optimize the length of time required for future studies. Urine was obtained on day 7, near the time the wristbands were removed. Recruitment included children with household exposure to contaminants in tobacco smoke and/or electronic nicotine delivery devices, and children from nonsmoking homes. Caregivers were interviewed to obtain reported measures of the child's exposure. Wristbands were analyzed for nicotine and urine for cotinine using isotope dilution liquid chromatography/triple quadrupole mass spectrometry (LC/MS/MS). Over the study period, one 7-day wristband was lost, and two were reported as temporarily removed. Nicotine mass per wristband ranged from 10 ng to 2400 ng, median = 100 ng (2-day exposure); and 11 ng to 1900 ng, median = 148 ng (7-day exposure). Urinary cotinine ranged from non-detect ($n = 1$) to 12 ng/mL, median = 0.88 ng/mL. There was a significant correlation between 2-day wristband nicotine mass and urinary cotinine concentration ($DF = 29$, $r^2 = 0.78$, $p < 0.01$), and 7-day wristband nicotine mass and urinary cotinine concentration ($DF = 28$, $r^2 = 0.85$, $p < 0.01$). The 2-day and 7-day wristband nicotine masses were also significantly correlated ($DF = 28$, $r^2 = 0.85$, $p < 0.01$). Silicone wristbands may be a useful tool for epidemiological and intervention studies of tobacco product exposure in children.

FUNDING: State

POS4-49

SMOKELESS AND COMBUSTIBLE TOBACCO USE AND MORTALITY: ANALYSIS FROM 1987 TO 2011, THE NATIONAL HEALTH INTERVIEW SURVEY

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Significance: Few prospective studies have examined mortality outcomes associated with smokeless tobacco use in the US and information is limited regarding the risks associated with former and current exclusive smokeless tobacco users compared to combustible tobacco smoking and dual use. **Methods:** We studied 127,995 US adults aged ≥ 18 years who participated in the National Health Interview Survey 1987, 1992, 1998, 2000 and 2005 Cancer Control Supplement and were followed for mortality through December 2011. History of combustible tobacco (cigarettes, pipes or cigars) smoking and SLT (chewing tobacco or snuff) use were assessed at baseline. Cox proportional hazards models were used to estimate hazard ratios (HR) and 95% confidence intervals (CI) for all-cause, all-cancer, cardiovascular disease, and chronic lower respiratory disease mortality comparing former and current SLT users, former and current smokers and current dual users to never tobacco users. **Results:** 51% of participants were never tobacco users, 1% former SLT users, 1% current SLT users, 22% former smokers, 25% current smokers and 1% current dual users. After a median follow-up of 12 years, there were 23,405 deaths. After multivariable adjustment, risk for all-cause mortality was higher for combustible tobacco users compared to never users (HR [95% CI] were 1.29 [1.25-1.34], 1.85 [1.78-1.93] and 1.69 [1.48-1.94] for former smokers, current smokers and current dual users respectively). The risk for death for exclusive SLT users was not significantly different from never users (HR [95% CI]: 0.93 [0.76-1.14] for former SLT users and 0.95 [0.80-1.12] for current SLT users). The findings of mortality risks comparing smokers and SLT users in all-cancer, cardiovascular and chronic lower respiratory disease were similar. **Conclusions:** Compared to never tobacco users, combustible tobacco users had higher risk in all-cause, all-cancer, cardiovascular disease, and chronic lower respiratory disease mortality. SLT users did not have higher risk than never tobacco users. These results suggest that using SLT as a replacement for combustible tobacco smoking may reduce mortality for adults who currently smoke.

FUNDING: Unfunded

POS4-50

NICOTINE REPLACEMENT THERAPY PATTERNS & PREDICTORS OF USE AMONG ALCOHOL AND OTHER DRUG CLIENTS

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Significance: Nicotine replacement therapy (NRT) is an effective first-line pharmacological support for smoking cessation in the general population. Use of NRT for smoking cessation improves quit rates but these supports are often infrequently delivered during alcohol and other drug (AOD) treatment. An organisational change intervention was implemented to increase smoking cessation care in AOD services. The intervention consisted of eight core components: engagement of organisational support, identify and support a champion, promote smoke-free policy, implement a smoker identification system, provide education and resources, provide case-worked and client feedback, provision of evidence based treatment, maintenance and follow-up. This study examined the patterns and predictors of NRT use (overall, and single vs multiple forms) among AOD clients. **Methods:** The study was part of a large cluster RCT of an organisational change intervention in 32 AOD programs. Of the 896 participants who completed a baseline survey, 471 completed a 6 week follow-up survey, and 427 completed a 6 month follow-up survey. Survey items assessed use of nicotine lozenge, oral strips, inhalators, gum, and patches. Logistic regressions examined age, gender, indigenous status, education, nicotine dependence, motivation to quit, self-efficacy to quit, intervention group and AOD program type. **Results:** At six weeks, greater odds of reporting NRT use was seen in participants who had a heavier nicotine dependence (OR 1.77 95%CI 1.1, 2.8; $p=0.016$), were more motivated to quit (OR 1.19 95%CI 1.0, 1.4; $p=0.014$), and those from intervention sites (OR 3.71 95%CI 1.8, 7.5; $p<.001$). At six months, participants from intervention sites had three times greater odds of reporting NRT use (OR 3.38 95%CI 1.9, 6.1; $p<.001$). Participants from intervention sites (OR 5.18 95%CI 2.9, 9.4; $p<.001$) had five times greater odds of reporting multiple NRT use (compared to single use) at 6 weeks post discharge. No predictors were associated with multiple NRT use at 6-months. **Conclusions:** Receiving treatment from an intervention site was a clinically important and consistent predictor of NRT use in both the short and long term post discharge.

FUNDING: Federal

POS4-53

IMPACT OF SMOKING STATUS ON SURGICAL COMPLICATIONS AND FINANCIAL PERFORMANCE FOR THORACIC PATIENTS AT ROSWELL PARK COMPREHENSIVE CANCER CENTER

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SIGNIFICANCE: Smoking during cancer treatment has been linked with poor treatment outcomes, surgical complications, treatment-related side effects, and decreased survival. Smoking-related effects on cancer treatment have been associated with diminished quality of life and an increase in overall cost of care. Hospital-based cessation programs have shown high rates of successful quit attempts and positive impacts on surgical outcomes and postoperative complications. Smoking cessation programs initiated before surgical treatment have been found to be cost effective when looking at both treatment costs and patient quality of life. **METHODS:** This study sought to (1) analyze the impact of smoking status on post-surgical complications in thoracic patients undergoing surgery at Roswell Park Comprehensive Cancer Center (RPCCC) from 2013-2016 and (2) examine the financial impact to RPCCC of differences in smoking status, complication rates and payer distribution. Data analyses were conducted using SPSS 25. Smoking status was determined by patient self-report at the time of surgery. Surgical complications examined were development of pneumonia, unplanned intubations, remaining on a ventilator for more than 48 hours, unplanned returns to the operating room, average length of stay and total time in the operating room. Controlling for sex, age and BMI, impacts of smoking status were assessed using logistic regression models for binary variables and linear regression models for continuous variables. A chi-squared test was used to assess differences in proportions of smokers and non-smokers across payer groups. A flexible cost model was developed in Excel to show the potential financial impact to RPCCC of varying rates of smoking cessation and complications. **RESULTS:** The results showed low rates of complications overall, but found a significant difference in length of time in the operating room for smokers compared to non-smokers (51 minutes, at $p < 0.0001$). This study also found a significant difference in the proportion of smokers and non-smokers across payer groups ($p < .0001$). The cost model demonstrated that different payment rates across payer groups create a disproportionate cost to the hospital for surgical complications depending on a patient's insurance provider. The cost model also showed that increasing cessation rates among surgical patients can lead to six-figure savings for RPCCC. **CONCLUSIONS:** RPCCC stands to benefit both clinically and financially from improving cessation rates in surgical patients.

FUNDING: Nonprofit grant funding entity

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POS4-54**UTILIZING CENSUS, BIRTH RECORD, AND RESEARCH COHORT DATA IN ADDICTION RESEARCH: THE ROLE OF GEOGRAPHIC VARIATION, AREA-LEVEL CHARACTERISTICS, AND INDIVIDUAL FACTORS IN PREDICTING SMOKING DURING PREGNANCY**

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SIGNIFICANCE: Cigarette smoking during pregnancy (SDP) provides a strong model system for investigating risk and protective factors in substance use cessation. Existing research has largely focused on the associations of individual factors with SDP. Assessing small-area geographic variation and neighborhood characteristics (e.g. socioeconomic deprivation) remains an important research priority, as this information is crucial in developing effective public health interventions. **METHODS:** Birth record data for births 1995-2005 (Generation 3) to participants with history of regular smoking from the Missouri Adolescent Female Twin Study (Generation 2; G2) were merged to their research data (White Non-Hispanic: 806 births, 498 mothers; African-American: 102 births, 52 mothers). Using a multivariable multilevel logistic regression, we examined geographic variation in SDP and its associations with ZIP Code-level socioeconomic deprivation from 2000 Census data and individual factors including history of Major Depressive Disorder, Alcohol Dependence, Heavy Smoking Index score, Nicotine Dependence, trauma history, sociodemographic risk from birth record, and report of SDP from the twins' mothers (Generation 1; G1). **RESULTS:** We observed significant geographic variation across ZIP Codes in SDP (Variance=0.56, $P<0.003$; Median Odds Ratio=2.05) not explained by neighborhood- and individual-level variables in the model. Individual factors associated with SDP include G1 report of SDP (Odds Ratio=1.53, 95% CI: 1.06-2.21), individual-level G2 sociodemographic risk from birth record ($\beta=0.24$, $P<0.001$), and G2 Heavy Smoking Index score ($\beta=0.29$, $P<0.001$). **CONCLUSIONS:** Our results suggest that the observed geographic heterogeneity in SDP is not fully explained by individual factors and ZIP Code-level socioeconomic deprivation. Other factors, such as accessibility to tobacco retailers, may play an important role in explaining geographic variation in SDP. More broadly, this type of analysis provides proof of concept for using administrative (e.g. birth record, Census) data in conjunction with research data to more thoroughly interrogate questions in addiction and behavioral health research.

FUNDING: Federal; Academic Institution

POS4-55**A STUDY OF THE DIMENSIONALITY OF THE BRIEF WISCONSIN INVENTORY OF DEPENDENCE MOTIVES AND DEPENDENCE MOTIVE PROFILES AMONG AFRICAN AMERICAN DAILY SMOKERS**

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Significance: African American (AA) smokers consume fewer cigarettes per day (cpd) and are less likely to report nicotine withdrawal, yet quit smoking at lower rates than White smokers. Racial differences in dependence-related factors suggest that facets of dependence may be differentially salient to the maintenance of smoking across groups. An important step toward understanding dependence among AA smokers is the evaluation of the psychometric properties of measures within this population. The present study describes validation of the Brief Wisconsin Inventory of Dependence Motives (B-WISDM) and derivation of dependence motive profiles in AA daily smokers participating in the Kick It at Swope IV randomized controlled trial of varenicline. **Methods:** The factor structure of the B-WISDM was tested using confirmatory factor analysis (CFA). Dependence motive profiles were derived using factor-mixture latent profile analysis (LPA). Profile membership was regressed on clinical characteristics to validate and characterize the obtained profiles. **Results:** Participants (n=500) were female (52%), adult (52 years, SD=11) AA smokers who used 13 cpd (SD=7). The 11-factor CFA model resulted in an improper solution, requiring the elimination of the Tolerance factor. A 10-factor model had satisfactory fit. Multiple pairs of factors were highly collinear ($r > 0.80$). The LPA of the 10-factor model yielded a 3-profile model that provided the best fit. The profiles could be distinguished by factors related to compulsive smoking, or primary dependence motives (PDM), Taste, and Affiliative Attachment factor means. Light smoking (< 11 cpd) was associated with membership in profiles with lower PDM scores and higher Taste and Affiliative Attachment scores ($OR = 2.4$, $p = .02$). **Conclusions:** This study supports the psychometric adequacy of the B-WISDM for AA

daily smokers. However, the high degree of collinearity observed among multiple pairs of factors suggest the B-WISDM may benefit from reducing the number of subscales in the measure. The profile analysis has implications for understanding dependence motivation among AA smokers and the potential treatment needs of particular subgroups.

FUNDING: Federal

POS4-56**REASONS OF USING E-CIGARETTES AMONG PAST 30-DAY ADOLESCENT E-CIGARETTE USERS IN THE US: FINDINGS FROM THE 2015-2016 NATIONAL YOUTH TOBACCO SURVEY**

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Objectives We examined associations among the reasons for using e-cigarettes, the patterns of use (exclusive and dual), and use frequency, among past-30-day e-cigarette users. **Methods** Data from the 2015 (n=17,711) and 2016 (n=20,675) National Youth Tobacco Survey (NYTS) were combined and analyzed in 2018. Weighted multivariable analyses were performed to explore whether the reasons for e-cigarette use differed in dual compared to exclusive users, and in more- than less-frequent users. **Results** E-cigarette use in the past 30 days was reported by 3,470 respondents (n%), of whom 40.3% were exclusive users, 6.1% used both cigarettes and e-cigarettes, and 15.8% used e-cigarettes on at least 20 of the past 30 days. The most common reason for e-cigarette use in all three groups was the availability of various flavors, followed by use by friends or family members. Significant differences in the reasons for e-cigarette use were evident between dual and exclusive users, and frequent and less-frequent users. Those using e-cigarettes in efforts to quit tobacco products were more likely to be dual users (aOR=6.63; 3.89-11.30). Those using e-cigarettes because they cost less than tobacco products were more likely to be frequent users (aOR=4.61; 95% CI=3.28-6.45). **Conclusions** Given that e-cigarette use among youth varies in terms of use pattern and frequency, smoking cessation interventions should consider these features. A further longitudinal study is required to explore if the reasons why e-cigarettes are used affect subsequent smoking behavior and tobacco-use frequency.

POS4-57**DUAL TRAJECTORIES OF TOBACCO AND MARIJUANA USE IN A LOW INCOME, URBAN SAMPLE: PREDICTORS AND YOUNG ADULT OUTCOMES**

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Significance: Although fewer Americans are smoking, rates of smoking remain high among individuals living below the poverty level. With the increasing legalization of marijuana, it is important to understand the potential impacts of marijuana on tobacco use in low-income populations as well as the correlates of patterns of use that might help inform prevention efforts. **Methods:** Data are from a cohort of 615 youth recruited in 1st grade from low-income neighborhoods in Baltimore. Group-based trajectory modeling was conducted to estimate joint trajectories of tobacco and marijuana use from age 14 to age 26. Multinomial logistic regression models evaluated factors at age 14 that predicted membership in trajectory groups. Logistic regression models examined the influence of group membership on young adult outcomes between ages 19-26. **Results:** The sample was 56% male, 86% African-American and 50% were receiving free or reduced price meals in 8th grade. Five trajectories were identified: no use (53%), tobacco only (12%), marijuana only (9%), adolescent dual use (14%), and chronic dual use (12%). Youth with symptoms of conduct disorder ($OR=2.1$, 95%CI=1.2, 3.6), doing poorly academically ($OR=1.5$, 95%CI=1.1, 2.2), and affiliating with deviant peers ($OR=1.7$, 95%CI=1.0, 2.9) in adolescence were more likely to be on a dual chronic use trajectory than a tobacco only trajectory. Youth on a dual chronic use trajectory were more likely to become tobacco dependent compared to youth in the tobacco only group ($OR=2.9$, 95%CI=1.4, 6.0) and more likely to become drug dependent than youth in the marijuana only group ($OR=3.7$, 95%CI=1.7, 7.9). Dual chronic users were also more likely to have major depressive disorder ($OR=3.5$, 95%CI=1.4, 8.9), antisocial personality disorder ($OR=3.1$, 95%CI=1.6, 6.3) and a criminal record ($OR=4.0$, 95%CI=1.9, 8.1) compared to tobacco only users in young adulthood. **Conclusions:** Rates of dual use were more common than using either product in isolation in this low-income, urban sample. Dual chronic users had more psychosocial problems in adolescence and young adulthood than users of only



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tobacco. The likelihood of dependence on either substance was increased among dual users compared to users of either product in isolation. This highlights the importance of considering psychosocial profiles as well as marijuana use when developing interventions to prevent and reduce tobacco use in low-income populations.

FUNDING: Federal

POS4-58

LONGITUDINAL ASSOCIATIONS BETWEEN MARIJUANA AND CIGAR USE IN A SAMPLE OF YOUNG ADULTS

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Significance: The use of cigars, including little cigars and cigarillos (LCCs) and large cigars (LCs) carries significant health risks. Increasingly, young adults are using cigars alongside marijuana. Thus, we sought to assess the longitudinal associations between marijuana and cigar (LCC and LC) use. **Methods:** Data are from a cohort study of 2391 young adults originally recruited in fall 2010 from 11 colleges in the Southeast. Using discrete-time survival analysis, we examined whether ever use of marijuana at baseline predicted initiation of LCC and LC use and whether ever use of LCCs and LCs predicted initiation of marijuana use across 10 waves of data collection (2011-2017). Models adjusted for gender, race/ethnicity, mother's education, and time-varying use of other tobacco products and alcohol. **Results:** At baseline (spring 2011), 61% of the sample reported never using LCCs or LCs and 75% reported never using marijuana. The sample was 48% female, 84% White and 62% had college-educated mothers. Among those never having tried LCCs or LCs at baseline, ever use of marijuana was associated with an increased risk of LCC onset (Hazard Ratio (HR)=1.7, 95%CI=1.1,2.5) but not LC onset in fully adjusted models. Among those never having tried marijuana, ever use of LCCs (HR=1.4, 95%CI=1.1, 1.9) and ever use of LCs (HR=1.4, 95%CI=1.1, 1.8) both predicted initiation of marijuana use in fully adjusted models. **Discussion:** Our findings support the growing evidence that marijuana and LCCs are strongly associated and use of one substance predicts use of the other, even after adjustment for other substance use. In contrast to studies of adults, we also found that young adults who have tried LCs may be at increased risk for subsequent marijuana use. These findings highlight the need to consider each product as a potential gateway to use of the other product when developing interventions for young adults.

FUNDING: Federal

POS4-59

CANNABIS USE AND THE ONSET OF CIGARETTE SMOKING AMONG YOUTH: UNINTENDED CONSEQUENCES OF CANNABIS USE FOR TOBACCO CONTROL

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Significance: While cigarette use continues to decline in the United States, cannabis use is increasing. Cannabis use has been linked with increased risk of incident cigarette use among adults, and the onset of other nicotine/tobacco product use among youth. It is not known whether cannabis use is associated with onset of cigarette use among tobacco-naïve youth. **Methods:** Data were drawn from two waves of the Population Assessment of Tobacco and Health (PATH) Study, a longitudinal study of US adults ages 12-17 (Wave 1, 2013-2014, N=13,651; Wave 2, 2014-2015, n=12,172). Logistic regression models were used to calculate the odds of cigarette use at Wave 2 among Wave 1 never smokers by Wave 1 cannabis use. **Results:** Among youth who were tobacco-naïve at Wave 1, cannabis use at Wave 1 was associated with increased risk of initiation of past year cigarette smoking (AOR=5.8 (3.3, 10.5)) at Wave 2. **Conclusions:** Continued success in tobacco control—specifically toward meeting the goal of reducing the number of new adolescent cigarette smokers—may require addressing both cannabis and cigarette use in public health education of risks, intervention and outreach. Diminished perception of risk of cannabis use, coupled with the strong link between cannabis use and cigarette use—may have unintended consequences for tobacco control among youth, the most vulnerable group in terms of smoking initiation.

FUNDING: Federal

POS4-60

CONCURRENT USE OF TOBACCO AND MARIJUANA PRODUCTS AMONG ADOLESCENTS AND YOUNG ADULTS IN CALIFORNIA

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SIGNIFICANCE: Little is known about patterns of specific tobacco and marijuana (MJ) product use among adolescents and young adults. Our aims were to (1) examine the most common types of tobacco and MJ products used separately and jointly, and (2) assess the product-specific associations between past-month use of tobacco and MJ.

METHODS: Three studies of adolescents and young adults aged 15-22 in California collected data in 2016-2017 on tobacco and MJ use (Study 1, N=3008; Study 2, N=1419; Study 3, N=466). We estimated the prevalence of single-, dual-, and poly-product use for different tobacco (e-cigarette, cigarette, hookah, cigar/cigarillo) and MJ products (combustible, vaporized, edible, blunt) during the past month. Multivariable logistic regression analyses evaluated associations between tobacco products (regressors, all products included in each model) and each MJ product separately (outcomes), controlling for demographic variables.

RESULTS: The prevalence of past-month use of any tobacco product was 10.3%, 13.0%, and 18.5% across Studies 3, 1, and 2, respectively; use of any MJ product was 22.5%, 23.8%, 26.3%, respectively; and use of any tobacco product along with any MJ product was 7.3%, 9.9%, 11.3%, respectively. For tobacco, the top three patterns of use were exclusive e-cigarette, exclusive cigarette, and dual use of e-cigarettes and cigarettes. For MJ, the top three patterns were use of all four products, exclusive combustible MJ use, and dual use of combustible MJ and blunts. Among concurrent users of both tobacco and MJ, the most common MJ form was combustible use, while e-cigarettes (Studies 1 and 3) and cigarettes (Study 2) were the most common tobacco products used.

In multivariate regression models, past-month use of any specific tobacco product was positively associated with some or all MJ products. Notably, e-cigarette users in all three samples were 1.77-21.84 times more likely to use all MJ products. Likewise, using every tobacco product, except for hookah and cigar in Study 3, increased the odds of using combustible MJ from 2.43 to 13.73 times. **CONCLUSIONS:** This study is one of the first to elucidate the most common types of tobacco and MJ products used among adolescents and young adults, and to provide further evidence on the interrelationship among a broad spectrum of tobacco and MJ products. Given the increased diversity and availability of tobacco and MJ products, interventions and regulations targeting adolescents and young adults should address every tobacco and MJ product.

FUNDING: Federal; State; Academic Institution

POS4-61

DIFFERENCES IN PERCEIVED HEALTH RISK OF CIGARETTES AND IQOS BY CURRENT PRODUCT USER CATEGORIES AND INTENTION TO QUIT: A CROSS SECTIONAL STUDY IN JAPAN

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Background. Smoking cigarettes remains a leading cause of preventable deaths. Although quitting smoking is best way of reducing health risks, reduced-risk tobacco products (RRP) are being developed as alternatives for current adult smokers. Understanding the risk perceptions associated with RRP may help create appropriate communications to facilitate harm reduction. This study examined risk perceptions of IQOS, a potential RRP, and conventional cigarettes (CC) by tobacco use and behavioral intentions.

Methods. The current study pooled data from three waves of an online, cross-sectional survey conducted among a convenience sample of IQOS users (N=1,500) registered in the product's database in Japan. Descriptive analyses were completed to visualize data. A multiple linear regression examined the relationship between tobacco use and behavioral intentions with perceived health risk. **Results.** A total of 1,323 IQOS users were included in this analysis. The majority were males (81.9%) aged 30-49 (65.2%). Nearly two-thirds of participants reported using IQOS exclusively, while 20.3% reported using both IQOS and CC. Slightly more than one-third of participants reported an intention to quit all tobacco. In the final regression model examining the difference in perceived health risk between CC and IQOS (CC/IQOS), females and those aged 40-49 perceived a statistically significantly greater difference of risk; poly-users (inclusive



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of IQOS and CC) perceived a significantly lower difference. **Conclusions:** Based on these findings, to facilitate harm reduction behaviors, messages explaining risk reduction may need to be tailored on the basis of biological sex, age, and type of tobacco use.

FUNDING: Tobacco Industry

POS4-62

DOES E-CIGARETTE TV ADVERTISING INFLUENCE USE OF NICOTINE REPLACEMENT THERAPY (NRT) PRODUCTS: EVIDENCE FROM RETAIL SALES DATA

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Significance: Previous research suggests that exposure to e-cigarette advertising leads to increased awareness of and intention to use such products. Research has also shown that one of the major reasons that smokers use e-cigarettes was to help them quit smoking. There is an ongoing debate about whether the rapid growth of e-cigarette use in recent years may have dissuaded some smokers from using FDA-approved nicotine replacement therapy (NRT) products for quitting. Despite its important public health and policy implications, the evidence on the impact of e-cigarette use on NRT use is very limited. This study aims to address this important research gap by analyzing the relationship between televised e-cigarette advertising and sales of e-cigarettes and NRT products in retail stores. **Methods:** Market level quarterly e-cigarette TV ratings data and e-cigarette retail sales data for the period 2010 to 2016 were compiled from the Nielsen Company, and linked using state, county, year, and quarter identifiers. Fixed effects models that take into account market, year, and quarter fixed effects, were used to assess the contemporaneous, cumulative, and lagged relationships between e-cigarette TV advertising (TV ratings), sales of e-cigarettes, and sales of NRT products (gum and patch). **Results:** Our preliminary analyses suggest that the amount of televised e-cigarette marketing, measured by e-cigarette TV ratings, was significantly and positively associated with sales of e-cigarettes, and was significantly and negatively associated with sales of NRT products. The magnitude of the estimated coefficient was larger for the cumulative measure of e-cigarette advertising than for the contemporaneous measure of e-cigarette advertising. **Conclusion:** While televised e-cigarette advertising may have increased sales of e-cigarettes, it may also have unintendedly reduced the use of FDA-approved NRT products. Public policies that target e-cigarettes need to take into account the complex relationship between e-cigarettes and NRT products.

FUNDING: Federal

POS4-63

SHORT BREASTFEEDING PARTIALLY MEDIATES MATERNAL SMOKING INDUCED RISK OF CHILDHOOD OBESITY

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Significance: Maternal smoking during pregnancy is a well-established risk factor for childhood obesity. But it remains unclear which mechanisms cause this association. We aimed to examine the potential mediation role of breastfeeding duration. **Methods:** We analyzed 6,100 mother-child dyads at the 5-year follow-up in the U.S. Early Childhood Longitudinal Study - Birth (ECLS-B, 2001-2007). Child weight and height at age 5 years were measured by trained research staff. Using the CDC 2000 sex-specific growth charts, we defined obesity as body mass index at or above 95th percentile. From birth certificates and interviews, maternal smoking status around pregnancy was classified into 5 categories: never-smoking, stable or increased smoking during pregnancy, reduced smoking during pregnancy, quitting smoking by end of pregnancy and remaining abstinent at 9 months postpartum, and quitting smoking by end of pregnancy but relapsing at 9 months postpartum. Based on interviews at 9 and 24 months postpartum, we calculated breastfeeding duration in months. We fit multivariable logistic regression models to examine associations between maternal smoking and childhood obesity, adjusting for education, prepregnancy body mass index, and gestational weight gain. **Results:** Never-smokers had longest breastfeeding duration (mean [SD], 4.20 [5.13] months), while mothers who had stable or increased smoking during pregnancy had shortest duration (1.20 [2.93] months). At age 5 years, obesity risk was higher among children with mothers who had stable or increased smoking during pregnancy (risk of obesity, 18.2%; adjusted odds ratio, 1.49 [95% confidence interval, 1.03 to 2.17]) and those with mothers who quit smoking by end of pregnancy but relapsed at 9 months postpartum (17.4%; adjusted odds ratio, 1.45 [1.11 to 1.90]), than those with never-smoking mothers (10.9%). After including breastfeeding duration into regression model, the correspond-

ing odds ratios were substantially attenuated to 1.37 (1.04 to 1.80) and 1.34 (0.92 to 1.96), respectively. **Conclusion:** Short breastfeeding duration can partially mediate or contribute to maternal-smoking-induced risk of early childhood obesity.

FUNDING: Federal; Academic Institution

POS4-64

E-CIGARETTE USE AND SUBSEQUENT CIGARETTE SMOKING CESSATION FROM WAVES 1 AND 2 OF THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH STUDY

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Significance: Understanding the population impact of e-cigarettes requires determining their impact on cigarette smoking cessation. **Methods:** This study characterized baseline e-cigarette use and examined its relationship with cigarette smoking cessation one year later among adults in the Population Assessment of Tobacco and Health Study (n=32,248). **Results:** Weighted analyses showed that at baseline, most adults had never tried an e-cigarette (82.1%), while 12.1% had ever tried an e-cigarette but reported currently not using them at all ("former trier"), 4.3% were someday users of e-cigarettes, and 1.3% were everyday users. Recent former smokers (≤ 1 year) (aOR=4.0; 95% CI=3.3-4.9) and former smokers who quit 2-3 years ago (aOR=1.5; 95% CI=1.1-2.1) had higher odds of being a daily e-cigarette user compared to daily smokers; however, never smokers (aOR=0.01, 95% CI=0.00-0.02) and long-term former smokers (4+ years) (aOR=0.1; 95% CI=0.0-0.1) had lower odds of daily e-cigarette use compared with daily smokers. Fourteen percent of baseline smokers had quit (using "not at all") by one year later. Compared with baseline never e-cigarette users, former triers (aOR=0.7; 95% CI=0.6-0.8) and someday users (aOR=0.8; 95% CI=0.6-0.9) had lower odds of quitting, but daily users had higher odds, although the model did not reach statistical significance (aOR=1.1; 95% CI=0.8-1.5) (p=0.7). Those who reported using e-cigarettes to quit smoking at follow-up had higher odds of quitting compared with those who did not use them to quit (aOR=1.1; 95% CI=0.9-1.4) (p=0.4), but the model was not significant. **Conclusion:** A low proportion of adults used e-cigarettes daily at baseline, emphasizing the importance of examining absolute (population) risk in addition to relative risk (to cigarettes). Recent former and daily smokers used e-cigarettes more frequently at baseline. Less frequent e-cigarette users were less likely to quit smoking, but frequent users and users of e-cigarettes with the intent to quit may be more likely to quit. Monitoring the relationship between e-cigarettes and cigarettes over time is important to determine if e-cigarettes have potential as a harm reduction tool.

FUNDING: Academic Institution

POS4-65

FLAVORS AND IMPLIED REDUCED-RISK DESCRIPTORS IN CIGAR ADS AT STORES NEAR SCHOOLS

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Significance: Ads for cigarillos and small cigars have fewer restrictions than cigarette ads and are sold in hundreds of flavors, including concepts like Tropical Twist. Cigar marketing with flavor names and implicit health terms can contribute to consumer misperceptions of reduced harm. Although FDA intends to regulate cigars, the implications for cigar advertising are unclear. We collected and analyzed retail cigar advertising, focusing on flavor and other descriptors that may convey reduced risk. **Methods:** Up to 5 cigar advertisements were photographed inside and outside of stores during marketing surveillance in a random sample of licensed tobacco retailers (n=561) near California middle and high schools. Unique ads (n=203 out of 530) were coded for brand, unambiguous flavor names (e.g. alcohol, candy/dessert, coffee/tea, fruit, other beverage/food) and ambiguous flavors, such as "sweet", colors, and concepts (e.g., Island Madness). Adapting an established coding scheme for cigarette ads, we recorded the presence of (1) "mild" and "natural"; (2) implicit health descriptors that pertain to product design (e.g. filter, wood tip) or ingredients (e.g., 100% tobacco) and (3) other descriptors of taste (e.g. gentle, fresh, satisfying, sweet) or quality (e.g., fine, hand-rolled and new). Inter-coder reliability was assessed. **Results:** At least 19 cigar brands were advertised at stores near schools



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and three top-sellers were the most commonly advertised: Swisher Sweet (21.2% of ads), Black & Mild (18.2%) and Dutch Masters (18.2%). One hundred and thirty-seven (n=137) ads had at least one flavor. Cigar ads for unambiguous flavors (43.8%) were slightly more prevalent than "sweet" (33.0%) and other ambiguous flavors (36.0%). "Natural" was common in cigar ads (22.7%). Excluding Black & Mild, one other brand marketed cigars as "mild" (2.2%). Other descriptors of taste (40.9%) and product quality (41.4%) were also prevalent. **Conclusions:** Ads for flavored cigars are prevalent near schools, which suggests additional benefits to youth from federal regulation of cigars with characterizing flavors, as well as state/local sales restrictions on flavored tobacco. Prohibiting "mild" and "natural" in cigar ads would also benefit youth.

FUNDING: Federal

POS4-66

USE OF MENTHOLATED CIGARETTES AND LIKELIHOOD OF SMOKING CESSATION: A META-ANALYSIS

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Significance: Previous qualitative reviews have summarized evidence of an association between menthol cigarette use and likelihood of smoking cessation. The objective of this meta-analysis was to provide a quantitative summary of effect sizes, their variability, and factors related to the variability in effect size for the association between menthol use and likelihood of smoking cessation. **Methods:** We systematically searched Medline, PsycINFO and Embase for prospective and cross-sectional studies of the association between menthol use and smoking cessation among quit attempts. We used random-effects meta-analyses and meta-regression. **Results:** Our review identified 22 reports from $k = 19$ studies of the association between menthol use and cessation. Our overall model did not demonstrate a significant association; however, menthol users were significantly less likely to quit among: blacks/African Americans (OR = 0.88), high quality studies (OR = 0.88), prospective studies with < 6 months follow-up (OR = 0.75), and studies controlling for cigarettes per day (OR = 0.91). **Conclusions:** Among blacks/African Americans, menthol users have approximately 12% lower odds of smoking cessation compared to non-menthol users. These findings support the restriction of menthol advertising and the ban of menthol flavoring as tobacco control efforts to increase cessation among black/African American smokers.

FUNDING: Federal; Nonprofit grant funding entity

POS4-67

THE IMPACT OF NON-MENTHOL FLAVORS IN TOBACCO PRODUCTS ON PERCEPTIONS AND USE AMONG YOUTH AND ADULTS: AN UPDATED SYSTEMATIC REVIEW

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Significance: Flavors in tobacco products can influence their perceptions and use, particularly among youth and young adults. Given the exponential growth in research on this topic, we updated a previously published systematic review examining the impact of non-menthol flavored tobacco products. **Methods: Eligibility criteria.** Observational and experimental studies that assessed the effect of flavors in e-cigarettes on perceptions and use behaviors were included. **Data sources and study selection.** PubMed, Embase, PsycINFO, and CINAHL were systematically searched for studies published and indexed between April 2016 and March 2018, resulting in 2,822 unique articles. A total of 33 articles were included. This systematic review expands evidence from a previously published systematic review on flavored tobacco products that searched all articles published through March 2016. **Data extraction and synthesis** of study characteristics and main findings were conducted by three independent coders. **Results:** Our search revealed almost twice as many e-cigarette focused studies for the two-year search period (n=33) than were found in the original search (n=17). Across all age-groups, individuals preferred e-cigarettes with flavors and cited flavors as a top reason for using e-cigarettes; this was especially pronounced among youth and young adults. For youth, 2 studies found that flavored e-cigarette users had higher odds of being susceptible to or having intentions to initiate cigarette smoking compared to non-flavored e-cigarette users. Among adults, inconsistent evidence existed whether

flavors were associated with smoking quit behaviors. **Conclusions:** Together with the previous review, findings conclusively suggest that flavors are a primary reason for use of e-cigarettes. It is possible that e-cigarette flavors may be associated with smoking initiation among youth, but more research, especially longitudinal research, is needed. Longitudinal research is also needed examining the role of flavors and quit behaviors among adults. Given existing associations between flavors and youth consumption, FDA should consider banning flavors in e-cigarettes to reduce youth e-cigarette use.

FUNDING: Federal

POS4-68

TRENDS AND ASSOCIATIONS OF MENTHOL CIGARETTE SMOKING AMONG U.S. MIDDLE AND HIGH SCHOOL STUDENTS—NATIONAL YOUTH TOBACCO SURVEY, 2011-2017

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Significance: Youth cigarette smoking has decreased significantly over the last two decades; however, some studies suggest that menthol use may be slowing the decline, as the proportion of smoking menthol cigarettes has either remained stable or increased. To better understand menthol cigarette smoking, this study examined trends of menthol status among US youth.

Methods: Using data from the 2011-2017 National Youth Tobacco Survey, we examined trends in prevalence and the proportion of youth cigarette smoking by menthol, non-menthol, and unknown-menthol status using Joinpoint regression. Menthol status was determined using questions on current use of menthol cigarettes and usual brand. The number of smokers by menthol status, annual percent change (APC), and 95% confidence intervals (CIs) were calculated. The proportion of menthol smoking was examined by sex, school level, and race/ethnicity.

Results: From 2011-2017, the prevalence of youth menthol cigarette smoking decreased from 6.0% to 2.5% [APC: -14.3%, 95% CI: -16.8, -11.7], non-menthol smoking decreased from 2.8% to 1.4% [APC: -10.8%, 95% CI: -14.1, -7.7], and unknown-menthol smoking decreased from 1.7% to 1.2% [APC: -7.1%, 95% CI: -10.0, -4.1]. Across the same period, the proportion of menthol smokers decreased from 57.3% to 48.6% [APC: -2.7%, 95% CI: -3.6, -1.9], while non-menthol smokers remained stable from 26.6% to 27.1% [APC: 0.8%, 95% CI: -1.1, 2.7], and unknown-menthol status increased from 16.1% to 24.2% [APC: 6.0%, 95% CI: 3.5, 8.6]. The proportion of menthol smoking among middle school, non-Hispanic Black, Hispanic, and male youth smokers remained stable, while decreases were observed among high school, female, and non-Hispanic White smokers. **Conclusions:** While about half of all current youth smokers reported smoking menthol cigarettes, nearly a quarter had an unknown-menthol status. Overall, menthol cigarette smoking declined faster than non-menthol or unknown-menthol status; however, no change was observed among certain subpopulations. Information from this study is useful to efforts focused on reducing youth smoking, including targeting youth who may be susceptible to menthol cigarettes.

FUNDING: Unfunded; Federal

POS4-69

FORMATIVE ASSESSMENT OF FDA MESSAGING CREATED SPECIFICALLY TO EDUCATE YOUTH ON THE HARMS OF VAPING

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Background: Youth Electronic Nicotine Delivery Systems (ENDS) use is a growing public health concern. In recent years, ENDS have replaced cigarettes as the most commonly used tobacco product among youth. In contrast to cigarettes, youth are generally less informed about the dangers of ENDS. This presentation describes results of copy testing for FDA's The Real Cost (TRC) ENDS campaign, the first national health messaging youth prevention campaign created specifically to message on harms of ENDS.

Methods: 300 youth aged 13-17 were recruited via online panel. To participate, youth had to 1) be susceptible to using ENDS or 2) have ever used ENDS. Eligible youth were randomized into either an ad viewing exposure group or a non-ad viewing control group. Participants in both groups were asked questions regarding their perceived risks of ENDS and intention to use ENDS. Participants in the exposure group were asked questions to assess perceived effectiveness (PE) and main message comprehension. A six-item scale was used to determine PE and open ended responses were analyzed using



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content analysis to evaluate main message comprehension. Effect sizes on key harm perception measures between the current study and previous studies assessing TRC cigarette messaging ads were compared using z tests. The risk perception measures that were compared included perceived damage to lungs and perceived damage to body. **Results:** PE for the tested ad was 4.17. Main message comprehension was high and all risk perception and intention measures saw statistically significant movement ($p < .05$) in the desired direction or no difference. The degree of difference between control and exposure for key risk perception measures in this study was greater than the degree of difference for similar measures assessing cigarette risk perceptions from past TRC copy testing studies. **Conclusion:** This study suggests that the first advertisement created for the FDA's ENDS campaign delivers a clearly understood message that is perceived effective by the target audience. Additionally, comparison with findings from previous TRC studies indicate substantial room-to-gain for key health related knowledge and belief measures for ENDS when compared to cigarettes.

FUNDING: Federal; E-cigarette/Alternative nicotine products Industry

POS4-70

COUNTY LEVEL FACTORS AND CESSATION BEHAVIORS IN A NATIONAL LONGITUDINAL COHORT

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Significance: Little information exists about how community level factors, such as local access to healthcare and physical environment, can influence cessation behaviors. Determining the impact of these factors is important for better targeting of strategies that aim to increase cessation. **Methods:** In 2017, the Robert Wood Johnson Foundation ranked US counties by best clinical care, a measure that combines access to and quality of clinical healthcare, and best physical environment, a weighted measure of outdoor air and water quality, housing situation, and daily commute. We matched the resulting county rankings database with county of residence for participants in the longitudinal evaluation cohort (with annual refresh) of the 2012-2016 CDC *Tips From Former Smokers* (*Tips*[®]) antismoking campaigns. Using logistic regression, we determined the odds of making a quit attempt in the past 3 months among current cigarette smokers (now smoking every day or some days) and the odds of successfully quitting (not smoking in the past 6 months) among ever smokers (smoked 100 cigarettes or more in lifetime) by county rankings at each wave, adjusting for time to account for multiple waves of data, as well as state fixed effects. State level covariates were Gross Rating Points (GRP) for *Tips* ad exposure and per-pack cigarette tax; age, education, race/ethnicity, and mental health were individual-level covariates. **Results:** Current cigarette smokers living in counties with better clinical care had a significantly higher odds of attempting to quit smoking in the past 3 months (OR=1.28, 95% CI: 1.06-1.54). Ever smokers with better clinical care were more likely to successfully quit (OR=1.59, 95% CI: 1.15-2.19). Physical environment was not a significant predictor of quit attempts (OR=0.91, 95% CI: 0.77-1.06) or a successful quit (OR=1.14, 95% CI: 0.89-1.47). **Conclusion:** Better clinical healthcare was associated with higher odds of making quit attempts and successful quits among U.S. adult cigarette smokers. Opportunities exist for tobacco control programs to collaborate with the health care sector to improve access to cessation services to further increase cessation.

FUNDING: Federal

POS4-71

PSYCHOLOGICAL DISTRESS AND RESPONSES TO COMPARATIVE RISK MESSAGES ABOUT ELECTRONIC CIGARETTES AND COMBUSTED CIGARETTES WITH AND WITHOUT ADDICTION WARNING

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Objective: People with mental illness suffer disproportionate smoking-related burdens. Comparative risk messages about e-cigarettes and combusted cigarettes may encourage this population to switch to e-cigarettes to reduce their health risks. This research examines how people with vs. without serious psychological distress (SPD) responded to comparative risk messages with presence or absence of the FDA addiction warning for e-cigarettes. **Method:** In an online experiment, 768 U.S. adult smokers or recent quitters were randomized to see either three comparative risk messages alone or three

comparative risk messages with an addiction warning. Participants' psychological distress was measured with a K6 scale before message exposure. **Results:** General linear models revealed that compared to people without SPD, people with SPD reported greater perceived absolute risk of e-cigarettes ($M_{SPD} = 3.80$ vs. $M_{NoSPD} = 3.45$), higher self-efficacy of switching completely to e-cigarettes ($M_{SPD} = 5.81$ vs. $M_{NoSPD} = 4.96$), higher efficacy beliefs that switching completely to e-cigarettes can reduce their risks ($M_{SPD} = 5.94$ vs. $M_{NoSPD} = 5.18$), greater switching intentions ($M_{SPD} = 5.69$ vs. $M_{NoSPD} = 4.81$), greater intentions to seek quit help ($M_{SPD} = 2.50$ vs. $M_{NoSPD} = 2.15$) and to use nicotine replacement therapy ($M_{SPD} = 2.57$ vs. $M_{NoSPD} = 2.38$). Logistic regression models revealed those with vs. without SPD reported higher perceived comparative risk of e-cigarettes. SPD interacted with message type on switching intentions and intentions to seek quit help. Namely, for those with SPD, comparative risk messages with vs. without an addiction warning produced higher switch intentions and intentions to seek quit help. For those with SPD, comparative risk messages with vs. without an addiction warning did not differ in intentions to switch or seek quit help. **Discussion:** People with SPD reported more favorable behavioral responses to comparative risk messages compared to people without SPD. Including an addiction warning enhanced the positive behavioral impacts of comparative risk messages among people with SPD.

FUNDING: Federal

POS4-72

EXPOSURE TO TOBACCO ADVERTISEMENTS IN MAGAZINES PREDICTS CHANGES IN TOBACCO USE ACROSS A TWO YEAR PERIOD AMONG YOUNG ADULTS

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Significance. Evidence indicates that exposure to tobacco marketing impacts tobacco use. However, studies are limited primarily by self-reported and cross-sectional data, and few examine the role of tobacco advertisements (i.e., ads) in magazines on tobacco use. This study examined the impact of exposure to tobacco ads in magazines on changes in number of tobacco products used by young adults across a 2-year period. **Method.** Participants were 4,926 18-29 year old students participating in waves 2 to 6 (6 months between waves) of a 24-college study in Texas (M wave 2 age=20.46; SD=2.35; 64% female; 36.1% non-Hispanic white, 30.9% Hispanic, and 33.3% another race/ethnicity). Number of tobacco products used was assessed at each wave and coded 0=used 0 products in the past 30-days to 4=used four products (i.e., cigarettes, e-cigarettes, cigars, smokeless) in the past 30 days. Tobacco ads were drawn from 11 magazines, selected because college students reported in wave 1 that they read these magazines. All ads in issues published during the 2-month period prior to the upcoming wave were coded by project staff. A marketing exposure index was created for each student, at each wave, by multiplying number of ads in the magazines x frequency of reading those magazines. **Results.** Growth curve models indicated a negative effect for survey wave on number of tobacco products used ($t[18,302] = -10.83, p < .001$) and a positive effect of ad exposure ($t[19,387] = 5.80, p < .001$); thus, number of products used declined across the 2-year period while students with greater tobacco ad exposure reported using more products. There was also a two-way interaction between survey wave x ad exposure ($t[17,197] = 3.57, p < .001$), indicating that students reporting greater exposure to tobacco ads in magazines showed a slower decline across the 2-year period in the number of tobacco products used. Effects were significant after controlling for sociodemographics and sensation seeking and impulsivity at waves 2-5. **Conclusion.** Federal regulations restricting tobacco ads in magazines may lead to a faster decline in the number of tobacco products used by young adults.

FUNDING: Federal

POS4-73

PREDICTIVE VALIDITY OF PERCEIVED MESSAGE EFFECTIVENESS: A COMPARISON OF MESSAGE VERSUS EFFECT PERCEPTIONS

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Background: Researchers often use perceived message effectiveness (PME) scales that assess *message perceptions* (expected persuasiveness of message) or *effect perceptions* (expected behavioral impact of message) to pick promising message for



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tobacco control campaigns. We sought to examine the predictive validity of PME scales assessing these two constructs. **Methods:** Participants were a convenience sample of 703 U.S. adult smokers who had brief messages, about the chemicals in cigarette smoke or properly disposing cigarette litter, placed on their cigarette packs for three weeks. The survey assessed message perceptions (Davis PME scale) and effect perceptions (UNC PME scale). As potential outcomes, the survey assessed antecedents to behavior change from the UNC Tobacco Warnings Model (TWM), including message attention, negative affect, cognitive elaboration, and quit intentions as well as self-reported forgoing a cigarette. Analyses examined whether message perceptions and effect perceptions (i.e., in models with both perceptions as predictor variables) were associated with each outcome. **Results:** More positive message perceptions were associated with greater attention to the messages ($B = 0.82, p < .001$), but effect perceptions were not associated with attention. In contrast, stronger effect perceptions were associated with more negative affective reactions to the messages, more thinking about the health harms of cigarette smoking (cognitive elaboration), higher quit intentions (range $B = 0.74-0.87$, all $p < .01$) and, most importantly, forgoing a cigarette ($B = 0.53, p < .001$). Message perceptions were associated with none of these outcomes. **Discussion:** Message perceptions demonstrated predictive validity with an early behavioral antecedent from the TWM (attention). In contrast, effect perceptions demonstrated predictive validity with three later behavioral antecedents as well as behavior itself. Formative research on tobacco risk messages that aim to change behavior should thus prioritize assessment of effect perceptions over message perceptions.

FUNDING: Federal

POS4-74

THE IMPACT OF E-CIGARETTE HEALTH WARNINGS ON MOTIVATION TO VAPE AND SMOKE

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Significance. Substantial attention has focused on whether e-cigarette warnings may drive people away from vaping but toward smoking cigarettes. We considered an alternative hypothesis that e-cigarette warnings could discourage both vaping and smoking. **Methods.** Participants were a national convenience sample of 1,328 US adult e-cigarette users and 890 cigarette-only users, enrolled in August 2018. We randomized participants to 1 of 7 conditions, in a 3x2 factorial experiment with a control. The experimental conditions varied the concreteness of the health effect in the message (addiction, hazards of e-cigarette use, or both hazards and harms of e-cigarette use) and pictorial content (text with image or text-only). The control condition presented a text-only message about not littering. After viewing three different warnings in the assigned condition, e-cigarette users reported intentions to quit vaping (the primary outcome) and all participants reported on other secondary outcomes. **Results.** Among e-cigarette users, text-only warnings about e-cigarettes' health threats led to higher intentions to quit vaping than control (mean 2.60 vs. 2.06, $p < .001$), and pictorial e-cigarette warnings also elicited higher intentions to quit vaping than text-only warnings (mean 2.76 vs. 2.60, $p < .05$). The text-only warnings reduced interest in smoking compared to control ($p < .05$), and text-only and pictorial e-cigarette warnings had similar effects. The text-only and pictorial warnings both led to higher negative affect, anticipated social interactions, and cognitive elaboration (all $p < .05$) but not attention to the warnings. **Conclusions.** We found no support for the hypothesis that e-cigarette warnings could encourage cigarette use. Instead, we found some support for our new hypothesis that e-cigarette warnings could discourage use of both e-cigarettes and cigarettes.

FUNDING: Federal

POS4-75

NICHEADS: DOES SOCIAL MEDIA PROMOTION OF JUUL AND JUUL-COMPATIBLE PRODUCTS TRIVIALIZED NICOTINE ADDICTION?

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Objective: Through evolving social media channels, tobacco product vendors employ innovative methods of "social selling", including influencer promotion, sponsored word-of-mouth, viral user-generated content, and affiliate marketing. Social marketing of these products has coincided with the rapid growth of use among American youth. JUUL—a novel "nicotine salt"-based vaporizer has become increasingly popular since its launch in 2015, currently representing 72% of e-cigarette market. The number of youth using JUUL is alarming and raises serious concerns that the product could be an entryway to nicotine addiction and that proliferation of nicotine-related promotion could perpetuate social acceptance of nicotine use and dependence. Our objective is to explore and characterize messages on nicotine-related JUUL and JUUL-compatible product promotion on Instagram. **Methods:** Hashtag-based keyword rules were used to collect JUUL-related posts from the Instagram API in March-May 2018. Posts are classified as commercial and organic and characterized as featuring nicotine and youth appeals, using a combination of machine learning methods, keyword algorithms, and human coding. Metadata are analyzed to assess types of linked content and geographic dispersion of the posts. **Results:** Keyword filters captured 40,071 relevant posts by 6,945 unique users. Nearly all posts contained JUUL brand mentions and 59% of posts were promotional, with 58.3% of sales and promotion-related posts featuring nicotine and addiction content. The majority of URLs linked in the posts were websites selling or advertising vaping products including JUUL. A large proportion of posts featured memes and hashtags regarding addiction and effects of nicotine use (e.g., nichead, juulbuzz, morningbuzz), as well as tag lines (e.g., "more flavor, more buzz"). **Conclusions:** JUUL and JUUL-compatible product manufacturers employ novel social media marketing techniques to promote their products and nicotine use. Future research should explore the effects of nicotine appeals on new users and youth. Tobacco marketing surveillance and regulatory efforts should include JUUL and JUUL-compatible product promotion on digital media.

FUNDING: Nonprofit grant funding entity

POS4-76

ASSOCIATION OF EXPOSURE TO MESSAGES PROMOTING E-CIGARETTES WITH ATTITUDES TOWARDS E-CIGARETTES AND TOBACCO COMPANIES AMONG ADOLESCENTS

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Background Exposure to messages promoting e-cigarettes (ECs) may influence adolescents' attitudes towards ECs and in turn attitudes towards the tobacco companies. We investigated these associations in Hong Kong adolescents. Methods In a cross-sectional school survey in 2016/17, 8700 secondary school students reported any exposure to messages promoting ECs in the past 30 days, whether EC use harms health, their attitudes towards EC use, whether tobacco companies are a respectable industry and whether tobacco companies try to get youth to smoke. Logistic regression was used to investigate the associations in never cigarette and EC users adjusting for school grade, sex, exposure to secondhand smoke at home and outside home, and clustering effect. Results 7082 students (mean age 14.8 years; 54.0% boys) had never used cigarettes or ECs. Among them, 28.9% were exposed to messages promoting ECs, 68.0% considered ECs definitely harmful, 75.6% were negative towards EC, 27.0% respected tobacco companies, and 49.1% thought that tobacco companies try to get youth to smoke. Exposed students were less likely to consider ECs definitely harmful (adjusted odds ratio 0.86, 95% CI 0.77-0.96) and less likely to hold negative attitudes towards EC use (0.82, 0.73-0.93). Those who considered ECs definitely harmful were less likely to respect tobacco companies (0.71, 0.63-0.79) and more likely to believe tobacco companies try to get youth to smoke (1.25, 1.13-1.39); those who held negative attitudes towards EC use were less likely to respect tobacco companies (0.43, 0.38-0.48) and more likely to believe tobacco companies try to get youth to smoke (1.52, 1.36-1.70). Conclusions Although tobacco advertising is banned in Hong Kong, one-third of adolescents were still exposed to messages promoting ECs in the past 30 days. Such exposure was associated with positive attitudes towards ECs, which in turn were associated with positive attitudes towards tobacco companies. Portrayed as less harmful, ECs will help normalize smoking and raise respectability of the tobacco industry. These findings support a total ban of ECs in Hong Kong.

FUNDING: State; Nonprofit grant funding entity



SRNT

POS4-77

SURVEILLING THE AGENT OF ADDICTION: TRENDS IN CIGARETTE NICOTINE YIELDS IN THE UNITED STATES, 2013-2016

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Significance: In 2018, the US Food and Drug Administration (FDA) issued an advanced notice of proposed rulemaking for a tobacco product standard to lower nicotine in cigarettes to minimally addictive or non-addictive levels. Previous research shows cigarette nicotine yields in the US increased during 1997-2005 due to cigarette design modifications; however, recent patterns of nicotine yield are uncertain. This study assessed trends in cigarette nicotine yield and corresponding sales in the US during 2013-2016. **Methods:** Machine-measured nicotine yield in cigarette smoke and pack characteristics were obtained from annual reports filed by tobacco manufacturers with the US Federal Trade Commission (FTC) for 2013-2016. FTC data were merged with monthly data on US cigarette sales during 2013-2016 from Nielsen. Sales data reflect all documented sales in convenience, club, and discount stores, mass merchandisers, supermarkets, pharmacies, and military commissaries. Sales-weighted average annual nicotine yield (mg/stick) was assessed, as were sales trends by quartiles of nicotine yield: very low (0.10-0.60 mg/stick), low (0.61-0.80 mg/stick), moderate (0.81-0.95 mg/stick), and high (0.96-2.80 mg/stick). Statistically significant trends were determined using JoinPoint regression ($p<0.05$). **Results:** During 2013-2016, average annual sales-weighted nicotine yield increased 3.9%, from 0.903 mg/stick in 2013 (95% CI: 0.897, 0.909) to 0.938 mg/stick in 2016 (95% CI: 0.931, 0.945) ($p<0.05$). The majority of pack sales occurred among high (41.5%) and low (30.7%) quartiles of nicotine yield. Sales of cigarettes in the very low quartile decreased by an average of 0.4% each month during 2013-2016 ($p<0.05$), while sales levels of all other nicotine yield quartiles did not consistently increase or decrease. **Conclusions:** Average annual cigarette nicotine yield increased during 2013-2016 in the US. Sales declined for cigarettes in the lowest nicotine yield quartile, while top-selling nicotine yield quartiles fluctuated during this period. These findings can serve as a baseline for continued surveillance of nicotine yield as FDA pursues a potential nicotine product standard for cigarettes.

FUNDING: Federal

POS4-78

THE PEOPLE HAVE SPOKEN: U.S. ADULTS' ATTITUDES TOWARD LOWERING THE NICOTINE LEVELS IN CIGARETTES TO MAKE THEM LESS ADDICTIVE

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Significance: In 2018, the US Food and Drug Administration issued an advanced notice of proposed rulemaking for a tobacco product standard to lower nicotine in cigarettes to minimally addictive or non-addictive levels. Considerable reductions in nicotine in cigarettes could reduce exposure to toxicants and reduce dependence. This study assessed US adults' attitudes toward requiring cigarette makers to lower the nicotine levels in cigarettes. **Methods:** Data came from the 2018 Summer Styles, a web-based panel survey of adults in the U.S. aged ≥ 18 years ($n=4,037$) fielded during June-July. Respondents were asked: "Do you favor or oppose requiring cigarette makers to lower the nicotine levels in cigarettes so that they are less addictive?" Response options included: strongly favor, somewhat favor, somewhat oppose, and strongly oppose. Point estimates of favorability were assessed, and adjusted prevalence ratios were calculated using multivariable Poisson regression to determine correlates of favorability (strongly or somewhat). Assessed correlates were: sex, age, race/ethnicity, education, annual household income, US region, cigarette smoking status, and non-cigarette tobacco product use. **Results:** Among adults, 81.0% "strongly" or "somewhat" favored requiring cigarette makers to lower the nicotine levels in cigarettes so that they are less addictive. Favorability was 79.3% among current cigarette smokers, 84.3% among former smokers, and 81.5% among never smokers. Favorability was significantly more likely among women than men (Adjusted Prevalence Ratio (APR) =1.06), and Hispanics than non-Hispanic Whites (APR=1.07). Favorability was significantly less likely among adults aged 25-44 years (APR=0.87) and 45-64 years (APR=0.95) than those aged ≥ 65 years, and current non-cigarette tobacco product users (APR=0.89) than non-users ($p<.05$ for all). **Conclusions:** Overall, 8 in 10 adults in the US favored requiring cigarette makers

to lower the nicotine levels in cigarettes in 2018, including more than three-quarters of current cigarette smokers. These findings can help inform potential nicotine product standards for cigarettes in the US.

POS4-79

SMOKING TOPOGRAPHY CHARACTERISTICS DURING A SIX WEEK TRIAL OF VERY LOW NICOTINE CONTENT CIGARETTES IN SMOKERS WITH SERIOUS MENTAL ILLNESS

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Significance: Given the high rates of smoking among people with serious mental illness (SMI), understanding how the FDA's proposed nicotine reduction policy for cigarettes may affect this population is critically important. A six-week trial of very low nicotine content (VLNC) cigarettes in smokers with SMI was recently completed. We assessed the impact of six-week use of VLNC cigarettes on smoking topography characteristics, to determine whether VLNC use leads to compensatory smoking behavior in smokers with SMI. **Methods:** After a one-week usual brand smoking phase, smokers with schizophrenia or bipolar disorder (N=58) were randomly assigned to receive either VLNC (0.4 mg nicotine/g tobacco) or normal nicotine content (NNC; 15.8 mg/g) research cigarettes for six weeks. Using a CRESS puff topography device, participants smoked their usual brand cigarettes at baseline and the research cigarettes to which they had been assigned at post-randomization weeks 2 and 6. Carbon monoxide (CO) exposure was measured before and after smoking. We used repeated-measures ANOVAs to compare effects of cigarette condition on topography variables and changes in CO. **Results:** Both cigarette conditions reduced total puff volume and puff flow rate compared to usual brand ($p's \leq .05$). Participants smoking VLNC cigarettes had shorter inter-puff intervals (IPI) but smoked fewer puffs per cigarette ($p's < .05$). There were no significant effects on puff duration or CO boost. **Conclusions:** Although VLNC cigarette smoking was associated with reductions in IPI, the results indicate minimal compensation when considered as a whole. Findings from this trial are consistent with previous studies of the effects of VLNC cigarettes on smoking topography.

FUNDING: Federal

POS4-80

CIGARETTE SMOKING AND ITS IMPACT ON BREAST CANCER SCREENING BEHAVIOR

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Significance: Smokers are more likely to face health disparities and report lower socioeconomic status. Although a causal association between cigarette smoking and breast cancer has not been established, attention should be focused on certain vulnerable populations, such as smokers, who tend to have a lower prevalence of healthy behaviors (including screening). In this study we examined the association between cigarette smoking and breast cancer screening. **Methods:** Data for this study is collected as part of the 2015 National Health and Interview Survey (NHIS). Women who were between the ages of 50 to 74, and had no prior breast cancer history were included in this study. Only women who had a mammogram in the past 2 years were categorized as breast cancer screening compliant. The final sample included 6,406 women: 4488 compliant, and 1918 non-compliant. Characteristics of women in these groups were examined using descriptive statistics, and chi square tests ($p \leq 0.05$). Multivariate logistic regression models were created to examine the impact of smoking status on breast cancer screening behavior. All data was weighted to be nationally representative, and data analysis was conducted using SAS software v.9.4 (Cary, NC). **Results:** Overall, 71.03% of women were compliant with breast cancer screening guidelines. Significant differences emerged by smoking status ($<.001$), education ($p<.001$), race ($p \leq .02$), insurance status ($p<.001$), marital status ($p < .001$) and period of residence in the US ($p \leq .02$). Additional variables which were significant included BMI ($p<.001$), alcohol use ($p < .001$), hormone replacement therapy (HRT) ($p < .001$), age started smoking ($p<.001$) and self-reported health status ($p < .0001$). Multivariate models adjusted for demographics, BMI, alcohol use, family history of cancer, along with additional risk factors. Current



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smokers had 52% lower odds of being breast cancer screening compliant compared to never smokers (OR = 0.48, 95% CI: 0.36, 0.65). **Conclusion:** Current smokers were the least likely to engage in breast cancer screening. Our findings indicate that public education campaigns for early breast cancer detection should be promoted among this group to improve their overall health.

POS4-82

YOUTH SUSCEPTIBILITY AND TOBACCO USE INITIATION IN A LONGITUDINAL COHORT

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INTRODUCTION. Susceptibility to cigarettes has been previously studied and found to be predictive of future cigarette use among nonsmokers. There has been less research to-date on susceptibility to other products despite their common usage as an outcome measure for tobacco prevention efforts. This prospective study explores whether these measures are predictive of future use. **OBJECTIVE.** Examine the impact of susceptibility on tobacco product initiation among youth. **METHODS.** We examined initiation to each of four tobacco products among non-users of the product: cigarettes; e-cigarettes; cigars, little cigars and cigarillos; and smokeless tobacco. We used discrete-time survival analysis to look at the risk of initiating tobacco products as a function of susceptibility and basic demographics. Data are from a national longitudinal in-home and online survey of U.S. youth conducted by RTI International as part of the evaluation of *The Real Cost* public education campaign. We examined longitudinal data from four study waves. Susceptibility was measured using a three-item scale that assessed self-reported likelihood of future product use. Youth responding "definitely not" to all three items were classified as not susceptible, whereas youth responding anything other than "definitely not" to one or more measures were classified as susceptible to the product. **RESULTS.** The rates of susceptibility to the products among non-users at baseline were as follows: 28% of non-smokers susceptible to cigarettes; 17% of non-users susceptible to cigars, little cigars, and cigarillos; and 15% of non-users susceptible to smokeless. Susceptibility to e-cigarettes was first assessed at the second study wave. Of non-users, 19% were susceptible to e-cigarettes. Susceptibility measures were significant predictors of use at the next wave of the survey for all four products after controlling for age, wave, race/ethnicity, gender, and a 4-item sensation seeking scale. Youth reporting that they were susceptible to a product were between 3 and 4 times as likely to report use at the next wave across the various products. **CONCLUSIONS.** Our findings indicate that susceptibility measures are significant predictors of product initiation among non-traditional tobacco products. Identifying youth who are at risk of product use continues to be an important research question for public health researchers.

FUNDING: Federal

POS4-83

HOW DO CONVENIENCE SAMPLES FROM VAPER NETWORKS COMPARE TO A POPULATION BASED SAMPLE OF VAPERS?

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Aims: Research on low prevalence activities, such as vaping, often rely on convenience samples (CS) recruited from groups engaged in the activity. Vapers recruited from vaping networks might be thought of as early adopters of vape technology and thus foreshadow future population patterns for the wider population, or they may represent a quite distinct group of vaping enthusiasts. This study examines whether CS vapers differ from vapers in general, and thus the implications for generalizing results from CS of vapers to the broader population. **Methods:** The International Tobacco and Vaping Policy Survey recruited smokers, ex-smokers and vapers via broadly representative market research panels (MRP) in Australia, England, Canada and the USA. In Australia, we recruited an additional CS of vapers through vape forums, Facebook groups and vape shops. We compared the characteristics of the CS to vapers recruited from the MRP. **Results:** Nearly all the CS vaped daily (97%) and most of these were ex-smokers (91% vs 30% of MRP), hence we restricted the analysis to ex-smokers who vaped daily (N= 512 CS and 536 MRP). Compared to the MRP, a greater proportion of the CS were male (73% vs 50%), aged 25-39 (42% vs 18%), used box mods (84% vs 35%), owned ≥3 devices (48% vs 19%), used a device with adjustable power (90% vs 52%) [and adjusted the power setting regularly (32% vs 10%)], used low strength (1-4mg/mL) liquids (38% vs

15%), did not recently purchase tobacco-flavoured liquid (73% vs 61%), reported vaping to be much more satisfying than smoking (50% vs 22%), extremely enjoyed vaping (43% vs 22%), reported vaping improved their health a lot (84% vs 44%) and had close friends who vaped (61% vs 46%). **Conclusions:** There were important differences between the CS and MRP vaping groups with regard to demographics, experiences, and vaping patterns, which suggests that the groups are distinct. Future research will explore whether characteristics of the CS predict changes in beliefs and behaviours of MRP vapers. This study suggests that it may not be appropriate to generalize research results from CS of vapers to the broader population.

FUNDING: Federal

POS4-84

CHANGES IN DEMOGRAPHIC CHARACTERISTICS AMONG CIGARETTE USERS IN THE UNITED STATES, 2002-2015: WHO IS TODAY'S SMOKER?

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SIGNIFICANCE: The prevalence of cigarette use continues to decline in the United States (US), with an all-time overall population low of approximately 15.5% in 2016. Yet, emerging and increasing socioeconomic disparities in cigarette use suggest that today's smoker is different in many ways from that of a decade ago. The purpose of the current study was to use representative samples of the US population to examine the prevalence of demographic characteristics among current smokers (past 30 day) from 2002 to 2015 in order to quantify the demographic profile of current smokers in the US today, and to examine how demographic changes within smoking groups occurred over the past decade. **METHODS:** Data on past-month cigarette smoking were drawn from the 2002 to 2015 National Survey on Drug Use and Health (NSDUH), an annual cross-sectional survey of US persons age 12 and older. The prevalence of demographic characteristics were examined each year from 2002 to 2015 by smoking status (current smokers, former smokers, never smokers). Trends over time were assessed using logistic regression models, adjusted for demographics. **RESULTS:** Over the years 2002 to 2015, the likelihood of a current smoker being in the lowest income group, the highest income group, a member of racial/ethnic minority group, younger age group, and female gender increased significantly. Surprisingly, prevalence of higher income and higher education is on the rise among current smokers. Additionally, the prevalence of current smoking among persons aged 18-25 years and 65 years and older decreased. **CONCLUSIONS:** Today's cigarette smoker is emerging with characteristics that differ from prior decades. Understanding and identifying the demographic profiles of today's smoker is critical to the development of innovative and targeted interventions to bring the prevalence lower among groups for whom traditional tobacco control and clinical efforts have not been as effective.

FUNDING: Federal

POS4-85

ASSOCIATIONS OF DAILY E-CIGARETTE USE AMONG ADOLESCENTS: ECOLOGICAL MOMENTARY ASSESSMENT

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We examined associations between daily environmental influences and daily use of e-cigs and tobacco cigarettes among 37 adolescents (ages 14-17) living in Kentucky. Each day for 14 days, participants reported whether they were exposed to others' use of e-cigs and tobacco cigarettes, as well as whether they saw ads for e-cigs or tobacco in their neighborhood, near school, online/social media, or in other media. Adolescents also reported frequency of vaping e-cigs for nicotine and smoking tobacco cigarettes, as well as their willingness and intentions to use either substance the next day. Controlling for demographics, results of multilevel mixed effects linear regression models showed that daily perceived exposure to e-cig marketing ($b=0.68$, $p=0.04$) and seeing peers using e-cigs on a given day ($b=1.86$, $p=0.001$) were positively associated with greater daily frequency of e-cig use. Daily perceived exposure to e-cig marketing was marginally associated with daily willingness to use e-cigs ($b=0.05$, $p=0.05$). Seeing adults ($OR=4.11$, $p=0.02$) and peers ($OR=6.10$, $p=0.00$) smoking tobacco on a given day were



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positively associated with greater intention to use e-cigs the next day. Daily greater willingness ($b=2.24$, $p=0.00$) and intention ($b=3.76$, $p=0.00$) to use e-cigs the next day were positively associated with daily frequency of e-cig use. Greater daily frequency of e-cig use was not associated with greater daily frequency of tobacco cigarette use or with intention to smoke tobacco the next day. However, greater daily frequency of e-cig use was positively associated with greater willingness to use tobacco cigarettes the next day ($b=0.01$, $p=0.01$). Our study is one of the first to use EMA to examine within-persons associations of e-cig and tobacco cigarette use among adolescents. Results suggest that daily exposure to peer e-cig use, exposure to e-cig marketing, and greater intentions and willingness to use e-cigs the next day may influence greater daily frequency of e-cig use. Interestingly, daily e-cig use was not associated with daily tobacco use or intentions to use to use tobacco the next day, but it was associated with willingness to use tobacco the next day.

FUNDING: Federal; State

POS4-86

EVALUATION OF NICOTINE DEPENDENCE ITEMS FOR SUBGROUPS OF YOUNG ADULT CIGARILLO AND MULTIPLE PRODUCT USERS

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Significance: Nicotine dependence (ND) is important for understanding tobacco use behavior and cessation, but measures of ND have been developed and validated for cigarette smokers. This study evaluates the psychometric properties of new and adapted items to measure ND among cigarillo users and evaluate item performance for subgroups by age, gender, race and multiple tobacco use. **Methods:** Items were drawn from two sources. First, items from the PROMIS Nicotine Dependence Item Bank were adapted to be product neutral. Second, new items were developed based on findings from a qualitative study of 60 young adult and adolescent cigarillo smokers that examined patterns of cigarillo smoking and experiences of smoking and addiction. A total of 42 ND items (5-point response format) were included in a web-based survey. Eligible participants included 14 to 28 year olds who smoked a minimum of 2 cigarillos per week. Analyses included factor analysis, item response theory analysis, analysis of differential item functioning (DIF), score precision, and marginal reliability. ANOVA was used to test the association of ND score with quintiles of amount of tobacco use. **Results:** Among the 1089 participants, the median number of cigarillos smoked per week was 20; 63% of participants also smoked cigarettes. Five items had significant DIF with respondent race (W vs B vs H). Other DIF was not significant. All original and 8 of 10 new items met the IRT fit criteria and are highly reliable 0.95. Score precision is good for a range of 2 standard deviations. The ND score was positively associated with quintile of cigarillo and cigarette use, $p<.001$. **Conclusions:** This adapted bank of ND items is psychometrically sound and includes items that are product neutral, making it suitable for assessing ND among cigarillo and multiple tobacco product users.

FUNDING: Federal

POS4-87

PATTERNS AND TRAJECTORIES OF SNUS USE IN THE UNITED STATES

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Snus is a low-nitrosamine oral smokeless tobacco product associated with much lower health risk than smoking. It is widely used in Sweden, less so in the United States. We document the patterns and trajectories of snus use in the U.S., using retrospective tobacco-use histories collected from 99,660 adults (18+, of legal age to purchase tobacco) surveyed in 2009-2017. Participants in the Total Tobacco Migration survey, sampled from online research panels, provided a complete tobacco use history by reporting their age at onset and offset (cessation) of each tobacco product ever used regularly. 1,080 ever-users of snus were identified. Snus was rarely the first tobacco product used: only 3.6% of snus users initiated with snus. In contrast to 30% of cigarette initiation prior to age 18, only 11% of snus initiation occurred before age 18. Among those initiating with snus, 10% subsequently smoked, setting an upper limit on potential 'gateway' effects. 75% of snus users had engaged in dual use (use of snus and cigarette smoking in the same period). Transitions into dual use were typically (68%) from smoking; only 3%

were from snus use. Among dual use periods for which a transition was reported, 40% were to exclusive snus use, and another 24% were to abstinence, suggesting that dual use can be a transitional state between smoking and behaviors associated with less risk. Transitions from dual use to snus use were especially likely among those who understood that snus is less risky than smoking. 32% of periods of snus use (without smoking) represented transitions from smoking, typically (78%) from dual use, reinforcing the notion that dual use is a transitional state. Transitions from snus use to smoking were rarely observed (0.7% of periods transitioned to exclusive smoking; 4% to dual use). The data suggest that initiation with snus, especially by youth, is uncommon, and dual use of snus with cigarettes is often a transitional state.

FUNDING: Tobacco Industry

POS4-88

ASSESSING THE VALIDITY OF TOBACCO PRODUCT ADVERTISING AS A PROXY FOR AVAILABILITY AT THE POINT-OF-SALE

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Significance: Studies on tobacco marketing at the point-of-sale frequently examine associations between an individual's exposure to in-store advertising and tobacco use behaviors. However, the research evidence base to date is largely cigarette-centric and may not generalize to the increasingly diverse tobacco market. Moreover, the extent to which the presence of specific tobacco advertisements in a store reflects product availability is unclear. Using store audit data from a sample of tobacco retailers in New York City (NYC), we assessed the validity of advertising as a proxy measure for the availability of various tobacco products.

Methods: Ten percent of licensed tobacco retailers in NYC were randomly selected for in-person audits in 2017 ($n=796$). We collected data on the presence of exterior and interior advertising, as well as product availability for cigarettes, cigars, smokeless tobacco and electronic nicotine delivery systems (ENDS). Positive predictive values (PPV, ie, the probability a store carries a product given they advertise it) and sensitivity scores (ie, the probability a store advertises a product given they carry it) were compared across each product and the neighborhood demographics of the store locations.

Results: PPV was particularly high for cigarettes and cigars; 99% of stores that advertised cigarettes and 95.8% that advertised cigars also carried the products. Advertising was a less accurate measure of availability for smokeless tobacco (PPV: 85.9%) and ENDS (PPV: 79.8%). Indeed, one in five stores (20.2%) that displayed an ENDS advertisement did not carry the product. Of note, PPV for all products was lowest in neighborhoods in the bottom quartile for median household income. Sensitivity scores (ie, the likelihood of advertising an available product) ranged from 25.8% (cigars) to 53.3% (cigarettes).

Conclusion: Particularly for non-cigarette tobacco products, in-store advertising is an imprecise measure of product availability. In order to more accurately investigate the mechanisms through which advertising influences use behaviors, both phenomena should be assessed independently in future studies on tobacco at the point-of-sale.

FUNDING: Federal

POS4-89

ASSOCIATIONS BETWEEN SMOKING AND PRESCRIPTION OPIOID MISUSE IN YOUTH AND YOUNG ADULTS

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Significance: Prior research has demonstrated associations between cigarette smoking and opioid use among adults. Daily and intermittent smokers are over three times as likely as never smokers to report past-year misuse of prescription opioids. The objective of the present study was to inform youth substance use policies and interventions by describing the relationship between smoking and prescription opioid misuse in a national sample of youth and young adults. **Methods:** Data were collected in spring 2018 as part of the Truth Longitudinal Cohort, a national sample of youth and young adults (ages 15-34, $N=14,370$). Respondents self-reported demographic and sensation seeking characteristics, ever and past-30 day cigarette smoking, ever and past 6-month prescription opioid medical and nonmedical use, ever marijuana use and risky drinking behavior. Logistic regression modeling was used to determine the association between smoking and opioid misuse while accounting for other risk factors. **Results:** Ever ciga-



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rette users reported higher prevalence of ever having been prescribed opioids (69.8%) and having misused prescription opioids (33.0%) relative to never cigarette users (53.6% and 11.8%, respectively) and these relationships held across all ages in the sample. Regression models revealed that, relative to never smokers, ever cigarette smokers had higher odds of reporting ever prescription opioid misuse (OR=1.81, $p<0.01$) even after accounting for other significant personality and behavioral risk factors (all $p<0.01$), including past medical opioid use (OR=3.60), higher sensation seeking (OR=1.37), marijuana use (OR=2.00), risky drinking (OR=1.33) and demographic covariates. Further, in a second model restricted to participants who reported ever smoking (N=7475), ever prescription opioid misuse was a significant predictor of past 30-day cigarette smoking (OR=1.85, $p<0.01$) after accounting for the same control factors. **Conclusions:** There is a clear association between smoking and opioid use and misuse among adolescents and young adults, a relationship that exists even when controlling for risky behaviors and sensation seeking.

FUNDING: Nonprofit grant funding entity

POS4-90

A CONTENT ANALYSIS OF STOREFRONT TOBACCO ADVERTISING IN NEW YORK CITY

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Significance: In response to federal restrictions on product marketing in traditional media channels, tobacco companies spend billions of dollars advertising their products at the point-of-sale. While promotional strategies of cigarette companies are well-documented in the literature, questions remain about the ways in which popular alternative tobacco products are marketed in stores. This study describes the characteristics of storefront tobacco advertisements in New York City (NYC) retailers. **Methods:** In 2017, field data collectors photographed exterior tobacco ads from a random sample of licensed tobacco retailers in NYC (n=796 stores). We coded each ad for the presence of various features (eg, price display, warning labels, menthol/flavors) and other characteristics (eg, brand, size, location). Chi-square tests examined differences by product type. **Results:** Among retailers with storefront tobacco advertising (40.8% of the sample), a total of 976 ads were photographed and included in the analysis. The majority of ads were for cigarettes (40%), followed by electronic nicotine delivery systems (ENDS, 27.9%), cigars (26.9%), and smokeless tobacco (5.2%). Although cigarette and smokeless ads more commonly displayed a warning label (90.3% and 100%, respectively) compared to cigars (51%) and ENDS (4.8%), they were also more likely to advertise prices and promote flavored products (including menthol). Indeed, 61% of both cigarette and smokeless ads were for flavored products versus 25.8% of cigar ads and 30.3% of ENDS ads ($p<0.0001$). Cigar and ENDS ads, however, were significantly more likely to be placed on the door of entry (49.4% and 46.7%, respectively) compared to cigarette (34%) and smokeless (29.4%) ads. Of note, nearly a quarter of all tobacco ads (23.4%) were for the brand Newport. **Conclusion:** Cigarette ads still dominate at the point-of-sale, but ads for alternative tobacco products such as cigars and ENDS are also highly visible and often lack warning labels. Continued surveillance of product-specific marketing strategies at the point-of-sale is critical to examine pathways through which store advertising may impact diverse tobacco use behaviors.

FUNDING: Federal

POS4-91

BIRTH COHORT CHANGES IN EDUCATIONAL INEQUALITIES IN SMOKING IN THE CONTEXT OF A SYSTEMATIC TOBACCO CONTROL PROGRAM: THE CASE OF BRAZIL

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Significance: Since 1989, Brazil implemented a robust national tobacco control program (NTCP) alongside contemporaneous macroeconomic changes (rising national incomes starting 1990s, reducing income inequality in 2000s). This study assessed whether younger generations exposed to these contextual conditions at critical developmental ages (adolescence and young adulthood) differed from older generations in terms of population smoking levels and educational inequalities in smoking. **Methods:** Data on adults 25-79 years were from four nationally representative cross-sectional surveys (1989, 2003, 2008, and 2013). Pseudo-birth cohort panels were created based on approximately 10-year intervals for older cohorts (1924-'33, 1934-'43, 1944-'55, 1954-

'64) and younger cohorts (1965-'78, 1978-'88). Smoking prevalence and educational inequalities in smoking (Relative Index of Inequality, RII) at each survey wave were compared in older vs. younger cohorts, stratified by gender. **Results:** Until the 1954-'64 cohort, smoking levels at comparable ages were generally lower in successively younger male cohorts but were stable in successive female cohorts. However, prevalence was markedly lower in the younger cohorts for both genders, compared to older cohorts at comparable ages. In terms of educational inequalities in smoking, inequalities in older cohorts at comparable ages were generally similar. For e.g., the RII at ages 46-59 years in those born 1934-'43, 1944-'55, 1954-'64 was 1.91, 2.87, and 2.68 respectively in males and 3.44, and 1.60 respectively in females. In contrast, inequalities strengthened in younger vs. older cohorts. For e.g. at ages 25-43 years, the RII in those born 1988-'78 (male: 3.53, 95% CI: 2.46-5.02, female: 3.99, 95% CI: 2.61-6.09) and 1965-'78 (males: 3.56, 95% CI: 2.86-4.43, females: 3.40, 94% CI: 1.96-5.90) were significantly larger than in the preceding cohort born 1954-'64 (males: 1.98, 95% CI: 1.70-2.30, females: 1.61, 95% CI: 1.27-2.04). **Conclusion:** Despite rising national incomes, cohorts that grew up and entered young adulthood under the NTCP had lower smoking levels, but stronger educational inequalities in smoking. This indicates that while smoking initiation was lower in cohorts exposed to a robust tobacco control program at critical developmental ages, it was disproportionately concentrated in lower SES groups. Future studies must assess the equity-impact of specific tobacco policies within the context of broader macro factors to ensure that progress in reducing tobacco use is achieved fairly.

FUNDING: Unfunded

POS4-92

BIRTH COHORT CHANGES IN EDUCATIONAL INEQUALITIES IN TOBACCO USE TYPES IN INDIA: THE CASE OF A DIVERSE TOBACCO MARKET

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Significance: Little is known about the evolution of educational inequalities in tobacco use across birth cohorts in historically diverse tobacco markets such as India, where smokeless tobacco is used widely alongside smoked products. **Methods:** Data were from the Global Adult Tobacco Survey 2017, a nationally representative cross-sectional survey. Retrospective histories of specific tobacco use types (exclusive smoking, exclusive smokeless, dual use) were created based on age of initiation and cessation for five successive 10-year birth cohorts (1948-'57, 1958-'67, 1968-'77, 1978-'87, 1988-'97). Prevalence and educational (low: less than primary vs. high: primary or higher) inequalities of tobacco use types were estimated for birth cohorts stratified by education level for each cohort. Inequalities were estimated as odds ratio of high vs. low educated via generalized estimating equations, at ages 11-34 years. Analyses were restricted to males as female tobacco use was low and precluded type specific evaluations. **Results:** Peak exclusive smoking prevalence declined substantially across successive cohorts in both lower (30%, 34%, 27%, 20%, 9%) and higher (22%, 18%, 14%, 9%, 4%) educated. Consequently, the educational inequalities remained stable across cohorts (OR, 1948-'57 vs. 1978-'87: 1.27 vs. 1.94). Conversely, smokeless use increased across successive cohorts for both lower (28%, 28%, 32%, 35%) and higher (20%, 24%, 23%, 25%) educated males until the 1978-'87 cohort. In the youngest cohort (1988-'97), use declined substantially in higher educated males (16%) but remained stable in lower educated males (35%). Consequently, educational inequalities remained stable until the 1978-'87 cohort (OR: 1.23, 95% CI: 0.95-1.61), but widened significantly in the youngest cohort (OR: 2.86, 95% CI: 2.01-3.93). Patterns for dual use were similar to smoking, i.e. use declined and inequalities were largely stable across successive cohorts. **Conclusion:** Smoking reductions across successive cohorts extended to both lower and higher educated males. Conversely, prevalence and inequalities in smokeless use increased. This indicates that cohort changes in tobacco use (both population levels and educational inequalities) vary by specific product types. Our results from India indicate that other nations with diverse existing and emerging tobacco markets must consider the evolution of specific tobacco use types to ensure an accurate characterization of the tobacco epidemic in such contexts.

FUNDING: Unfunded

POS4-94

ELECTRONIC CIGARETTE USE AMONG MIDDLE AND HIGH SCHOOL STUDENTS IN NEW YORK CITY

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Significance: Despite declines in traditional cigarette smoking nationwide, electronic cigarette, or e-cigarette, use has increased among middle and high school students. E-cigarettes are the most commonly used tobacco product among youth in the US. In 2014, New York City (NYC) prohibited sales of all tobacco products and e-cigarettes to anyone under age 21. **Methods:** We used New York State Youth Tobacco Survey data, a school-based self-administered survey of middle and high school students, to compare past 30 day e-cigarette use between 2014 and 2016. Bivariate and multivariable logistic regression analyses assessed correlates of e-cigarette use; beliefs regarding harmfulness and addictiveness; and susceptibility. **Results:** In NYC, e-cigarette use increased between 2014 and 2016 among middle (4.8% vs 9.0%, $p=0.018$) and high school (7.9% vs 19.0%, $p<0.001$) students. Adjusted models found both middle (Adjusted Odds ratio (AOR) 3.00, 95% Confidence Intervals (CI): 1.56 to 5.76) and high school (AOR 3.90, 95% CI: 2.81 to 5.41) students in 2016 were more likely to be e-cigarette users than in 2014. The likelihood of NYC middle and high school students believing e-cigarettes are less harmful than traditional cigarettes were lower in 2016 compared with 2014 (Middle school: 39% (AOR 0.61, 95% CI: 0.45 to 0.82); High school: 22% (AOR 0.78, 95% CI: 0.62 to 1.00)). NYC high school students had higher odds of believing e-cigarettes are less addictive than traditional cigarettes in 2016 (AOR 1.21, 95% CI: 1.01 to 1.45) compared with 2014. The odds of willingness to try e-cigarettes any time in the next year among those who have never tried a e-cigarette were three times higher (AOR 3.15, 95% CI: 1.54 to 6.43) among NYC middle school students and more than twice as high (AOR 2.51, 95% CI: 1.75 to 3.58) among NYC high school students in 2016 compared with 2014. **Conclusion:** E-cigarettes are gaining popularity despite policy implementation to minimize use and a decreasing belief that they are less harmful than traditional cigarettes. Programs and policies that denormalize e-cigarettes and make them difficult to obtain are needed to decrease prevalence of youth e-cigarette use.

FUNDING: Unfunded

POS4-95

CESSATION BEHAVIOR AND QUIT SELF EFFICACY OF MULTI UNIT HOUSING CLIENTS

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SIGNIFICANCE: Prior research demonstrates that multi-unit housing (MUH) residents have disproportionately higher rates of tobacco use, as well as increased rates of tobacco-related illnesses. Additionally, with the expansion of policies requiring MUH buildings to become 100% smoke free, the need for cessation classes designed specifically for MUH residents is becoming increasingly important. There is a need for research focused on barriers to cessation and other health disparities for individuals living in MUH. **METHODS:** We analyzed intake and 6 month follow-up data from 1,285 clients enrolled in tobacco cessation classes through providers contracted by the Health Promotion Council, primary contractor of Southeastern Pennsylvania Tobacco Control Project. We compared quit self-efficacy and treatment outcomes of participants in MUH cessation programs to participants utilizing other program types, including worksite, chronic disease/wellness, and behavioral health cessation programs. Chi-square analyses were utilized to assess differences in demographic characteristics and smoking behaviors between MUH and non-MUH program participants at intake and six months after treatment. **RESULTS:** MUH participants were more likely to have lower quit efficacy at intake relative to those in other programs, indicating that they disagreed or strongly disagreed that they would "quit for good" by the end of treatment ($p<.001$). Moreover, participants in MUH programs were less likely to report smoking cessation (24.4%) compared to participants in other program types ($p<.001$). MUH participants were more likely to be Hispanic/Latino(a) ($p<.001$) and were less likely to have health insurance or above a high school education compared to participants in other treatment programs ($p = .001$). **CONCLUSION:** Our initial findings suggest that clients in MUH cessation programs differ from individuals in other program types, displaying significantly lower quit efficacy at the beginning of treatment and subsequently poorer quit outcomes for MUH clients. These findings have potential implications for treatment design and delivery that is more specific to MUH clientele.

FUNDING: State; Nonprofit grant funding entity

POS4-96

EVALUATING THE REACH OF THE SMOKING TREATMENT OPTIMISATION IN PHARMACIES INTERVENTION USING SIMULATED SMOKER FEEDBACK

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SIGNIFICANCE Community pharmacies offering NHS smoking cessation services are experiencing low smoker uptake. The Smoking Treatment Optimisation in Pharmacies (STOP) programme aims to address this by developing and testing impact of a behaviour change training intervention for pharmacy staff, implemented in 30 out of 60 pharmacies across England and Wales. Intervention effectiveness is being tested within a cluster randomised controlled trial. **Aim:** To assess the reach of the STOP intervention and effects on smoker engagement by pharmacy staff.

METHOD We sent actors posing as smokers to interact with pharmacy staff. Actors recorded presence or absence of elements of the intervention using a fidelity checklist and made contemporaneous notes on staff behaviour. We carried out thematic analysis of field notes from pharmacies with the highest and lowest proportion of STOP trained staff members to assess effects of intervention reach on smoker engagement. Reach was defined as the proportion of the total number of staff at a pharmacy that was consented and/or trained by STOP.

RESULTS Pharmacies with a higher proportion of STOP trained staff members had higher fidelity scores. Actors found that counter staff in pharmacies with low intervention reach had low levels of confidence, as seen in the actor's Likert scale reporting and comments, in approaching them about smoking. This resulted in missed opportunities for smoker recruitment.

CONCLUSION The reach of the STOP intervention was related to smoker engagement behaviour of pharmacy staff which we assessed using simulated smokers. Assessing the effects of intervention reach can provide detailed insight into how and why an intervention is effective, limited or ineffective.

FUNDING: Nonprofit grant funding entity

POS4-97

WHICH TOBACCO PRODUCTS DO ADOLESCENTS USE FIRST? A CHANGING AND CHALLENGING LANDSCAPE IN A SEA OF MULTIPLE TOBACCO PRODUCTS USED

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Significance. Understanding which tobacco products adolescents use first can lead to insights for tobacco prevention interventions and policies. However, few studies have examined the first tobacco product adolescents have tried and how first product tried is associated with patterns of current and multiple tobacco product use. **Methods.** We used data from high school students who reported ever using a tobacco product from the 2017 North Carolina Youth Tobacco Survey ($n=1,053$). SAS logistic regression survey procedures were used to account for the complex survey design and sampling weights. **Results.** Cigarettes (34.4%) and e-cigarettes (33.8%) were the most frequently reported first products tried, followed by cigars (15.6%), smokeless tobacco (10.7%), waterpipe (4.2%), and other tobacco products (i.e., pipe tobacco or some other tobacco product) (1.4%). Additionally, compared to adolescents who reported not using a tobacco product within the past 30 days, adolescents who reported past 30 days use of two or more tobacco products had higher odds of reporting cigars (aOR: 2.59, 95% CI: 1.54, 4.35), smokeless tobacco (aOR: 2.58, 95% CI: 1.37, 4.84), or other tobacco products (i.e., pipe tobacco or some other tobacco product) (aOR: 3.68, 95% CI: 1.05, 12.87) as their first tobacco product tried, but lower odds of reporting e-cigarettes as their first tobacco product tried (aOR: 0.44, 95% CI: 0.25, 0.77). However, 24% of adolescents who reported trying e-cigarettes as their first tobacco product reported using two or more tobacco products in the past 30 days. **Conclusions.** Most adolescents reported either cigarettes or e-cigarettes as the first tobacco product they tried and the majority of adolescents who tried any tobacco product reported using a tobacco product in the past 30 days.

FUNDING: Federal

**POS4-98****ELECTRONIC CIGARETTE USE AND CHRONIC RESPIRATORY DISORDER IN ADULTS FROM HAWAII AND CALIFORNIA**

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Significance: The use of electronic nicotine delivery systems (e-cigarettes) has increased in recent years, yet there is little evidence between the association of e-cigarette use and health outcomes. This study investigated the association of e-cigarette use with a diagnosed respiratory disorder among adults in Hawaii and California. **Methods:** Data from adults participating in the 2016 Behavioral Risk Factor Surveillance Survey (BRFSS) in both Hawaii (unweighted N=8,087; weighted N=1,132,153) and California (unweighted N=11,393; weighted N= 30,439,756) were analyzed. Survey measures included e-cigarette use, cigarette smoking, and being diagnosed by a health professional with asthma or chronic obstructive pulmonary disease (COPD). Multivariable analyses tested associations of e-cigarette use with the respiratory variables controlling for cigarette smoking, demographics, and physical and psychosocial covariates. **Results:** In Hawaii, statistically significant associations of e-cigarette use with asthma (AOR = 1.33, CI 1.03 - 1.77, $p < .05$) and COPD (AOR = 1.44, CI 1.08 - 1.92, $p < .05$) were found, occurring primarily among non-cigarette smokers. Results from California data were similar; a statistically significant association of e-cigarette use was found with asthma (AOR = 2.03, CI 1.48 - 2.79, $p < .05$) and COPD (AOR = 1.98, CI .99 - 3.97, $p < .05$) among non-cigarette smokers. **Conclusion:** Findings from two large, representative samples of adults showed a statistically significant independent association of e-cigarette use with asthma and COPD. Study data were inconsistent with the possibility that persons with an existing respiratory disorder were using e-cigarettes for smoking cessation and support laboratory research on physiological mechanisms linking e-cigarettes with respiratory system irritation. These findings occurring among non-cigarette smokers suggest the possibility that e-cigarette use may be adding to respiratory disorders in this population.

FUNDING: Federal; State

POS4-99**ELECTRONIC CIGARETTE USE AND MYOCARDIAL INFARCTION AMONG ADULTS IN THE UNITED STATES POPULATION ASSESSMENT OF TOBACCO AND HEALTH**

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Background: Electronic cigarettes are battery operated nicotine delivery devices, popular for smoking cessation tools and as an alternative product to combustible cigarettes. This study aim is to determine the association between electronic cigarette use and myocardial infarction. **Methods:** Adults age 18 and older at Wave 1 (n = 32,320; 2013-2014) and Wave 2 (n=26,447; 2014-2015) of the Population Assessment of Tobacco and Health (PATH) study in the United States of America were used. Multivariable logistic regression was performed to determine the associations between e-cigarette use and myocardial infarction, adjusting for cigarette smoking, demographic and clinical variables. **Results:** Every day (adjusted odds ratio 2.29, 95% CI: 1.25, 4.22) and some day (1.91, 95% CI: 1.08, 3.38) e-cigarette use were independently associated with increased odds of having had a myocardial infarction with a significant dose-response ($P < 0.0005$), controlling for conventional cigarette smoking and demographic and clinical risk factors in a cross-sectional analysis of Wave 1. Odds of having had a myocardial infarction among current dual user is 6.64 compared with a never smoker who never used e-cigarettes. Having had a myocardial infarction at Wave 1 did not predict e-cigarette use at Wave 2 ($p>0.62$), suggesting that reverse causality cannot explain the cross-sectional association between e-cigarette use and myocardial infarction observed at Wave 1. **Conclusions:** Some day and every day e-cigarette use are associated with increased risk of having had a myocardial infarction, in addition to the effect of any combustible cigarette smoking. Dual use is riskier than using either product alone.

FUNDING: Federal; Academic Institution

POS4-100**DIFFERENCES AMONG E-CIGARETTE DUAL USERS BY FLAVOR**

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Significance: Flavors may be important in understanding ENDS use. Little is known, though, about how user characteristics differ by flavor choice. This study examined how ENDS flavor preference varied by demographics, tobacco history, motives and expectancies for ENDS. **Methods:** Data come from the baseline wave of a longitudinal observational study of adult dual cigarette and ENDS users (N = 381). Participants were 39% female, aged 18-69, and 41% White, 30% Black, 12% Hispanic, and 12% Asian. At baseline, participants completed questionnaires and 7 days of ecological momentary assessment of all tobacco use. Flavor preferences were grouped into four categories: tobacco (12%), menthol (32%), sweet (45%), and other (11%). **Results:** Flavor preference differed by participant age and race: users of sweet flavored ENDS ($M = 29.6$) were significantly younger, $p < .001$, than those who used tobacco ($M = 38.9$) or menthol ($M = 39.6$). Blacks were significantly more likely than other racial/ethnic groups to use menthol and less likely to use sweet flavors, $p < .001$. Tobacco patterns and dependence also varied by flavor choice. Dual users who preferred sweet flavors smoked cigarettes fewer days per month, $F(3,377) = 3.73$, $p = .01$, and at a lower rate, $F(3,377) = 4.55$, $p = .004$, than users of tobacco and menthol flavors; and used e-cigarettes more days/month, $p = .04$. Users who preferred sweet flavors also were significantly less nicotine dependent than others, $F(3,377) = 5.01$, $p = .002$. Individuals who preferred sweet flavors were more likely to use rechargeable ENDS devices with refillable cartridges than either disposables or rechargeable devices with prefilled cartridges, $p < .001$. Dual users who preferred sweet flavors also differed significantly from others in motives and expectancies, more strongly endorsing boredom reduction expectancies, $F(3,377) = 5.48$, $p < .001$, and motives related to taste and sensory experience, $F(3,377) = 7.66$, $p < .001$. **Conclusions:** Dual users who preferred sweet flavors ENDS emerged as a distinct subset differing in all domains: demographics, tobacco history, motives, and expectancies. Findings have implications for interventions and regulations. **Funding:** Research reported in this publication was supported by the NCI and FDA Center for Tobacco Products (CTP) grant R01CA184681. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the Food and Drug Administration.

FUNDING: Federal

POS4-101**GEOSPATIAL ANALYSIS OF POISON EXPOSURE CALLS AMONG CHILDREN DUE TO TOBACCO PRODUCTS AND STATE SPECIFIC PREVALENCE OF TOBACCO PRODUCT USE**

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Given regional differences in tobacco product use rates across the United States, rates of children's accidental tobacco exposure are likely to vary, yet analysis of the geographic variation in children's poisoning from tobacco products is limited. We analyzed data from the National Poison Data System (NPDS) from 2010 to 2016 to describe the geographical distribution of poisoning exposure calls among children <5 years of age due to cigarettes, e-cigarettes, snuff, cigars, and chewing tobacco as reported to poison control centers across the United States, normalized using U.S. Census population counts for children <5 years old. For e-cigarettes, given that use rates have changed dramatically since 2012, we also compared the normalized rates of exposure calls to state-specific use rates to examine whether e-cigarette use prevalence would correlate strongly with increases in state-specific exposure calls among the 50 states and DC. We found that Oklahoma, Oregon, and Wyoming had the highest rates of child-poisoning for most of the tobacco products. In 2014-15, there was a strong correlation between state-specific use rates and rates of exposure calls for e-cigarettes (n=51; Pearson $r = 0.77$; $p<0.001$); however, this correlation decreased by 27% (n=51; Pearson $r = 0.50$; $p<0.001$) in 2016. This 27% reduction in correlation may be explained by the introduction of legislation requiring child-resistant packaging for e-liquids containing nicotine or by growing consumer awareness of the poisoning risks related to nicotine. Given that NPDS is a passive surveillance system relying on voluntary reporting, caution should be exercised when interpreting the data.

FUNDING: Unfunded; Federal



SRNT

POS4-102

ASSOCIATION BETWEEN ELECTRONIC CIGARETTE ADVERTISING AND ELECTRONIC CIGARETTE USE AMONG US ADULTS

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Significance: E-cigarette sales in the U.S. reached an estimated \$4.5 billion in 2017, up from \$2.5 billion in 2014 and \$537,000 in 2010. Concurrently, advertising expenditures increased from \$5.6 million in 2010 to \$125 million by 2014, with most of the ad spending devoted to magazines (59%) and TV (27%). This study assessed the relationship between e-cigarette advertising and e-cigarette use among U.S. adults. **Methods:** Data on e-cigarette use came from the 2012-2013 and 2013-2014 waves of the National Adult Tobacco Survey, a nationally representative, phone-based (landline and cell) survey of U.S. adults aged ≥ 18 years. We matched these data with the Kantar Media database and the National Consumer Study to project the number of e-cigarette ads to which respondents were exposed in the past 6 months. The association between ever and current (everyday, someday, or rarely) e-cigarette use and e-cigarette advertising was assessed using logistic regression, controlling for age, sex, race/ethnicity, education, and state and year fixed effects. **Results:** Among all adults, current e-cigarette use was 4.2% in 2012, 5.7% in 2013, and 7.4% in 2014. Exposure to an e-cigarette ad on television in the past 6 months increased the probability of ever using e-cigarettes by 0.07 percentage points, an increase of 0.53% relative to the mean prevalence ($P < 0.05$); the effect was greater among adults ages 18-24 (0.18 percentage points; 0.50% relative to the mean prevalence) and ≥ 65 years (0.13 percentage points; 2.7% relative change). We found no association between exposure to ads on television and current e-cigarette use. Additionally, there was no association between ads in magazines and ever e-cigarette use. However, exposure to one e-cigarette ad in magazines increased the probability of current e-cigarette use among adults aged 25-44 years by 0.10 percentage point; 1.4% relative change ($P < 0.05$). **Conclusions:** Exposure to e-cigarette ads on television was associated with increased ever e-cigarettes use; exposure to e-cigarette ads in magazines was associated with increased current e-cigarette use among adults aged 25-44 years.

FUNDING: Federal

POS4-103

SMOKING BEHAVIOR AMONG TRANSGENDER INDIVIDUALS IN HOUSTON TEXAS

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Introduction: Tobacco consumption is higher for sexual and gender minority (SGM) groups than the general population. However, there is little evidence regarding smoking patterns in the transgender community. We assessed the prevalence of smoking and potential determinants of cancer risk in transgender individuals. **Methods:** Data were collected using a cross-sectional survey distributed annually among attendees of the 2015 Houston Pride Festival and at a clinic providing specialty care for transgender patients in Houston, Texas. Analysis conducted in 2018 divided the sample into trans men; those assigned female at birth (AFAB) and trans women; those assigned male at birth (AMAB) transgender individuals. Relevant variables were compared between these groups using χ^2 and t -tests when appropriate. Logistic regression model examined associations between socio-demographic determinants, as well as behavioral factors, and current cigarette smoking. **Results:** Participants comprised 72 trans women (54.5%) and 60 trans men (45.5%) individuals. Trans women and trans men individuals significantly differed with regard to age, race/ethnicity, employment status, health care coverage, and living status. Trans men individuals were more likely to be current cigarette smokers ($p < 0.013$). Transgender individuals were more likely to self-report current smoking if they were trans men (odds ratio 3.76; 95% confidence interval 1.17-12.06; $p < 0.026$) or were insured (odds ratio 4.49; 95% confidence interval 1.53-13.18; $p < 0.006$). Over half of the sample believed that the tobacco industry has been a friend to SGM groups. **Conclusions:** Transgender men are more likely to be current cigarette smokers than

transgender women. Cigarette smoking among transgender men may be a way to portray a masculine image. Our findings can inform smoking cessation programs for transgender individuals.

FUNDING: Academic Institution

POS4-104

THE EFFECT OF ELECTRONIC CIGARETTE USE ON COMBUSTIBLE CIGARETTE USE AND TREATMENT UTILIZATION

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Adults who use electronic cigarettes (ECIG) report that cessation of combustible cigarettes (CCIG) is a reason for use of ECIGs. However, evidence to support efficacy of ECIGs for cessation of CCIG has been limited. Moreover, it is not clear whether ECIG users utilize existing evidence-based smoking cessation treatments/resources. Weighted analyses examined the effect of lifetime ever ECIG use on: 1) persistent CCIG use (every day or some days; PERSIST), 2) a serious attempt to quit CCIG use in the past year (TRYQUIT) and 3) utilization of evidence-based smoking cessation treatments/resources (USEDTX) in a US adult sample (N=996) who completed surveys administrated through GfK's KnowledgePanel. In lifetime CCIG users, the rate of PERSIST was 32%, use of ECIG was 27%, and lifetime USEDXT rate was 38%. Among persistent smokers, 40% reported TRYQUIT. Weighted logistic regression analyses examining the effect of ECIG use on PERSIST, TRYQUIT, and USEDXT, controlling for nicotine dependence (heaviness of smoking index), age, gender, education and history of depression found that, relative to non-ECIG users, dual ECIG and CCIG users had significantly greater odds of PERSIST (Odds Ratio, OR= 5.4 (95% Confidence Interval(CI): 3.1-9.6) and USEDXT (OR=5.3 (95%CI:3.0-9.4); only depression history was significantly associated with the odds of TRYQUIT in persistent smokers (OR= 4.2 (95%CI:1.3-13.6). Results indicate that use of ECIGs is not associated with smoking cessation, but instead with PERSIST. Additionally, ECIG users are more likely to report USEDXT, and those with a history of depression are also more likely to report TRYQUIT. The results of this analysis do not provide support for the hypothesis that ECIG use is associated with smoking cessation. While the relationship between ECIG use, PERSIST and USEDXT may in part be explained by unexamined variables, ECIG use could be a marker for difficulty quitting. Identifying reasons for PERSIST will be critical to understanding these associations, e.g., improving smoking cessation treatments and/or their delivery, particularly for those with a history of mental illness, may lead to overall increases in smoking cessation.

FUNDING: Federal; State; Academic Institution

POS4-106

PATTERNS OF TOBACCO AND ALCOHOL ABUSE AMONG ADULTS IN LAO PDR: FINDINGS FROM THE NATIONAL ADULT TOBACCO SURVEY OF LAO PDR

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Significance. Globally, tobacco and alcohol abuse are the most highly prevalent addictive behaviors in the world, and also rank in the top ten most addictive substances. In the Western Pacific Region, there is emerging data that cigarette smoking and alcohol use is a "polydrug" behavior among young men and their initiation is occurring at about the same age. Such trends raise the possibility of targeting both risk factors in prevention programs at the community and individual level. We considered the association between alcohol and tobacco in the first nationally representative tobacco survey of Lao People's Democratic Republic. **Methods.** The National Adult Tobacco Survey of Lao PDR (NATSL) was the first nationally representative prevalence survey of adult tobacco use in Lao PDR, and was completed in 2013 by the Lao Statistics Bureau, Ministry of Health (CIEH Office), and Loma Linda University under funding from Fogarty International Center of the US NIH. NATSL investigators conducted a stratified, multi-stage cluster sampling that selected 9,706 subjects from 2,822 households located in all 17 provinces, and used the 2010 census as the sampling frame. The tobacco items were adapted from the Global Adult Tobacco Survey format and administered to all adults ages 15 years and older.



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Results. Alcohol was measured in number of drinks over a 7 day interval as beer, wine, liquor, and palm liquor that, for some rural subjects was made at home. Alcohol abuse (> 14 drinks per week) was evident in 8.9% (95% CI 8.4% to 9.5%) of adults, and primarily due to beer consumption at this level (6.1% 95% CI 5.6% to 6.5%). We found alcohol abuse (> 14 drinks per week) was strongly associated with current daily cigarette smoking (OR = 2.26 95% CI 1.89 to 2.713) among all adults, and a significant 4% increase in odds of being a smoker per drink consumed each week (OR= 1.04 95% CI 1.03 to 1.05). Conclusion. Smoking and alcohol use are strongly associated in a national sample of adults in Lao PDR, and the finding raises the possibility of targeting both risk factors in culturally tailored interventions. (Funding from Grant 2R01TW005964-06 Fogarty/NIH (PI: Singh))

FUNDING: Federal

POS4-107

TOBACCO DEPENDENCE AND QUITTING ATTEMPT IN MEXICAN CURRENT SMOKERS BY PATTERN OF CONSUMPTION. RESULTS OF A NATIONAL SURVEY

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Background: Although Mexican smokers are informed about harms of smoking, 20.1% of adults continue to smoke and most of them are occasional smokers. Exploring various aspects of dependence and their association with quitting indicators is necessary to inform cessation strategies. Our aim is to study the association of dependence and quitting attempt in Mexican current smokers by pattern of consumption. **Methods:** A secondary analysis of the National Survey of Drugs, Alcohol and Tobacco use in Mexico (ENCODAT 2016) was performed. The short Test to Assess the Psychologic Dependence on Smoking and the Fageström Test of Nicotine Dependence were used. Smokers were asked if they have done any attempt of quitting within 12 months before the interview. Logistic regression models were executed stratifying by pattern of consumption (daily and occasional) adjusting by physical, psychological and social factors. **Results:** Occasional smokers with mild and moderate psychological dependence and Daily smokers with mild psychological dependence presented higher odds of having at least one quitting attempt whiting last year in comparison with those with severe or very severe psychological dependence (OR: 1.67; CI95% 1.15-2.41; p=0.007, OR: 1.79; CI95% 1.21-2.67; p=0.004 and OR: 1.55; CI95% 1.03-2.33; p=0.034 respectively), age group of 25-44 years old, median and high socioeconomic status also showed higher odds of quitting attempt than the reference categories in occasional smokers while not being employed was associated with higher odds of quitting attempt in daily smokers. 98.8% of occasional and 82.3% of daily smokers reported mild physical addiction according to Fageström test. **Conclusions:** Lower levels of psychological dependence are related to quitting attempt both in occasional and daily smokers. Physical dependence measured by Fageström test is not a proper approach for Mexican population, especially when occasional smokers are being studied and it should be considered both in future research and clinical diagnosis.

FUNDING: Federal; State

POS4-108

PACIFIC YOUNG ADULTS' RELATIONSHIP WITH SMOKING: A TALANOA-INFORMED INVESTIGATION

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SIGNIFICANCE: Despite large reductions in smoking among younger New Zealand adolescents of all ethnicities, Māori and Pacific young adults aged between 18 and 25 have the highest smoking prevalence of any population group. Because we know little about Pacific young adults' smoking practices, we explored smoking uptake, settings, and perspectives on cessation, among this under-researched population group. **METHODS:** We conducted 23 in-depth interviews with New Zealand-based Pacific young adults using a Talanoa-informed approach. Participants identified with at least one South Pacific ethnicity and had smoked for at least six months prior to participating in the research project. Interviews were conducted from November 2017 to January 2018; the transcripts were analysed using a thematic analysis approach. **RESULTS:** Smoking initiation typically occurred in social settings, alongside friends or siblings, and often fuelled by alcohol. Participants reported rapid transitions from initiation to regular

smoking and nicotine dependence. Smoking created connections that facilitated social interactions, though was also a source of shame and a behaviour they hid from their parents. Participants regretted the loss of control addiction caused, yet used smoking to control stress arising from financial, work, and family pressures. Although most wished to quit in the longer term, few envisaged quitting in the short term as they privileged the pleasure and relief smoking brought over the risks it posed. **CONCLUSIONS:** Pacific young adults have a complex and ambiguous relationship with smoking, which both enhances and challenges their social standing. Interventions that decrease social supply of tobacco and provide alternative tools for stress management could reduce smoking uptake among this group.

FUNDING: Academic Institution; Nonprofit grant funding entity

POS4-109

PERCEPTIONS OF NATURAL AMERICAN SPIRIT CIGARETTES AMONG A COMMUNITY SAMPLE OF AMERICAN INDIANS IN MINNESOTA

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Significance: Considerable research has demonstrated that Santa Fe Natural Tobacco Company's product, Natural American Spirit (NAS) cigarettes imply a reduced harm to consumers through various aspects of their marketing practices. However, much less is known about the brand's use of American Indian imagery. NAS brand marketing relies on American Indian imagery and culture, and the company's original conception was inspired by the traditional tobacco practices of many Native communities. It is pertinent to consider the unique risks of brands like NAS within American Indian populations. This study examines perceptions of NAS cigarettes among American Indians.

Methods: Surveys were conducted with American Indian adults in Minnesota (n=89, age 19-80). Participants were recruited through modified snowball sampling and at community events. Items assessed familiarity with NAS cigarettes, perceptions of harm, opinions of the brand logo, and the use of NAS in place of traditional tobacco for cultural purposes.

Results: One quarter of participants were current cigarette smokers, though the majority have smoked at least 100 cigarettes in their lifetime (77%). Most participants were familiar with NAS cigarettes (91%) and have smoked them (36%), but felt that they were inappropriate to substitute for traditional tobacco use (80%). The majority of participants felt that the imagery used by NAS was disrespectful to Native culture (82%). Participants felt that NAS or other brands that used American Indian imagery were not healthier (85%), more natural (76%), less harmful (8%), or less addictive (8%) than other commercial tobacco products. Participants were unclear about whether NAS was produced by an American Indian organization.

Conclusions: Unlike research done in the general population, few participants in our study felt NAS was less harmful than other commercial cigarette brands. Results suggest a need for additional consumer education and transparency on NAS as a non-native-owned brand selling commercial tobacco products. Ongoing advocacy efforts to counter and restrict the use of Native imagery in commercial tobacco marketing are warranted.

FUNDING: Unfunded

POS4-110

RACIAL, ETHNIC, AND INCOME DISPARITIES IN RESIDENTIAL PROXIMITY TO MULTIPLE TOBACCO RETAILERS

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Significance: Living near a tobacco retailer is associated with increased risk of smoking, higher smoking intensity, and decreased odds of abstinence. To date, 'proximity' is operationalized by measuring the distance from a sample of residences to the nearest single tobacco retailer. However, adult smokers have contact with multiple retailers. This study measures residential proximity to the nearest one, five, and ten tobacco retailers (multi-retailer proximity) by neighborhood race, ethnicity, and income. **Methods:** We built a state-wide list of probable tobacco retailers using 2012-2015 lists from NC Alcohol Law Enforcement and by verifying retailers through in-person visits. We calculated average street-network proximity (miles) from each residential address in Mecklenburg County, NC (N=427,346) to the nearest one, five, and ten retailers by neighborhood demographic quintiles. **Results:** Residences in the poorest neighborhoods were less than a mile away from ten retailers while those in the wealthiest areas were over two miles away. On average, those in the highest income areas were 1.25 miles away from



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a single retailer while those in the lowest income areas were just 0.98 miles away from a total of ten retailers. As quintile of Black, Other Race, and Hispanic increased, single and multi-retailer proximity decreased. While residences in areas with the lowest proportion of Black people were a mile away from a single retailer, those in areas with the highest proportion of Black people were on average 0.67 miles away from a single retailer and a mile away from five. **Conclusions:** Our study replicates racial, ethnic and income disparities in proximity to tobacco retailers. By measuring multi-retailer proximity, we find that those living in poorer and more minority neighborhoods may be at an even greater risk of tobacco retailer exposure. Living close to several tobacco retailers may have a differential impact on tobacco use behaviors, especially if multi-retailer proximity differs in some neighborhoods.

FUNDING: Federal; Nonprofit grant funding entity

POS4-111

INFLUENCES ON REPORTED CIGARETTE CONSUMPTION

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Aim: Australia is unusual in that cigarettes come in a range of pack sizes from a statutory minimum of 20 up to 50. Recently some brands have been marketed with one or two additional cigarettes to the normal pack size. In this study we look at the relationship between pack size, purchase type (cartons or single packs) and two measures of reported consumption: reported cigarettes smoked per day (CPD), and daily consumption calculated from reported number of packs smoked per week (PPW). **Methods:** 623 at least weekly smokers who completed the 2013 or 2014 waves of the Australian arm of the ITC four country survey and who provided adequate data to compute cigarette consumption using both measures were included in the analysis. We also related the measures to self-estimated addiction, reported urges to smoke, and time to first cigarette (TTFC). **Results:** Overall, consumption estimates using packs per week resulted in higher consumption estimates than the direct cigarettes per day question (17.34 vs 17.97, $p<.001$). On both self-report measures those purchasing cigarettes in cartons reported higher consumption than those purchasing in packs (23.20 vs 16.27, $p<.0001$, for PPW measure). Also those using packs with 30 or more cigarettes reported higher consumption than those using smaller packs (20.04 vs 17.72, $p<.0001$, for PPW), but the difference between the two measures was greater for the larger pack smokers (0.73) than for the smaller pack smokers (0.17). Overall, all measures were positively associated with the addiction-related measures, and at similar levels. There is a hint that consumption measures in those buying packs and using smaller packs may be more strongly correlated with TTFC than carton and big pack buyers respectively. **Conclusions:** Ways of estimating pack size does affect estimated cigarette consumption, but the effects are not large. It is largest for those smoking from larger packs. Those who buy larger packs or buy in cartons report smoking more, that likely reflects reality, but the causal direction, if any, is uncertain.

FUNDING: Federal; State; Nonprofit grant funding entity

POS4-112

EXPLORING THE ASSOCIATION BETWEEN E-CIGARETTE RETAILER PROXIMITY AND DENSITY TO YOUTH E-CIGARETTE USE IN CANADA

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Significance: Multiple studies suggest there is an association between tobacco retailer density and tobacco use among youth; however, limited evidence exists for a similar association between e-cigarette retailer density and e-cigarette use among youth. The objectives of this study are to explore whether e-cigarette retailer proximity and density are associated with youth ever and past-30 day use of e-cigarettes in 4 Canadian provinces. **Methods:** An online search was conducted between October and December 2017 for exclusive e-cigarette retailers surrounding secondary schools that participated in the COMPASS study in 2017-18. School and retailer locations were geocoded to create 500m, 1000m, and 1500m circular buffer zones around each school to identify the number of e-cigarette retailers within each buffer zone. Retailer proximity/density data for each school were linked to student-level data. Multilevel regression models examined whether e-cigarette retailer proximity and density were associated with ever and past-30 day use of e-cigarettes, while controlling for relevant covariates. **Results:** School-level differences accounted for 6.2% and 7.1% of the variability in ever and past-30 day use of e-cigarettes, respectively. 2.4%, 13.8%, and 20.3% of schools had

an e-cigarette retailer within a 500m, 1000m, and 1500m circular buffer, respectively, while each school had an average density of less than 1 (maximum 8) e-cigarette retailer within a 1500m circular buffer. Neither e-cigarette retailer proximity nor density were significantly associated with ever or past-30 day use of e-cigarettes in multilevel models. Results were similar even after including gas stations and convenience stores, which may also sell e-cigarettes. **Conclusions:** This study represents the first Canadian study to explore the association between e-cigarette retailer proximity and density and youth e-cigarette use. The e-cigarette market in Canada continues to evolve, and future studies should further explore aspects of the environment that are associated with youth e-cigarette use given the significant between-school variability identified here.

FUNDING: Federal

POS4-113

PATTERNS OF NICOTINE CONCENTRATIONS IN ELECTRONIC CIGARETTES SOLD IN THE UNITED STATES, 2013-2017

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Significance: Although progress has been made in reducing cigarette smoking in the U.S. over several decades, new generation e-cigarettes have recently entered the marketplace. Nicotine content in e-cigarettes is an important factor in weighing the potential public health benefits and risks of e-cigarettes on individual and population level health. This study assessed patterns of nicotine concentrations in e-cigarettes sold in the U.S. during 2013-2018. **Methods:** E-cigarette sales data from March 2013 to February 2018 were obtained from the Nielsen Company. Data included sales from independent, chain and gas station convenience stores, as well as supermarkets, discount stores, club stores, dollar stores, and military commissaries; sales from the Internet and vape shops were not available. Internet searches were used to supplement information for nicotine concentration and flavor. Products were categorized by nicotine concentration, flavor, type (disposable or rechargeable), and brand. Dollar sales, unit sales, and average nicotine concentration were assessed. **Results:** During 2013-2017, e-cigarette sales in the assessed venues increased from \$746 million to \$1,434 million. The average nicotine concentration in e-cigarettes increased overall, for all flavor categories, and for rechargeable e-cigarettes. The proportion of dollar sales in these channels represented by products with nicotine concentrations >4% increased from 12.3% in 2013 (\$91.7 million) to 52.5% in 2017 (\$752.3 million), with a similar percentage increase in unit share. While products with nicotine concentrations of 5% or greater first entered the market in 2015, by February 2018, more than 30% of sales were attributed to products in this category (\$455.5 million). **Conclusions:** E-cigarettes with higher nicotine concentrations comprise a substantial and increasing portion of e-cigarette sales in U.S. convenience stores and mass merchandisers. Higher nicotine concentrations could influence the public health impact of e-cigarettes, including potential health benefits from adult smokers switching completely to e-cigarettes and harms from e-cigarette initiation among youth.

FUNDING: Nonprofit grant funding entity

POS4-114

IDENTIFYING ADOLESCENT E-CIGARETTE USERS MOST SUSCEPTIBLE TO CONVENTIONAL CIGARETTE SMOKING

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Significance: A sizeable proportion of adolescent e-cigarette users are susceptible to conventional cigarette smoking. This study aims to (i) classify adolescent e-cigarette population into subgroups using their smoking-related characteristics, and (ii) identify e-cigarette user subgroup that is most susceptible to conventional cigarette smoking. **Methods:** Cross-sectional data on 8th and 10th grade students were obtained from Monitoring the Future surveys, 2014-2016. We selected past 30-day e-cigarette users who had never smoked conventional cigarettes, N=1021. Latent class analysis was conducted in Mplus software to identify homogenous subgroups of adolescent e-cigarette users using smoking-related perceptions (perceived addictiveness of conventional cigarette smoking, perceived harm of conventional cigarette smoking, and perceived influence of antismoking ads), peer smoking, friends' approval/disapproval of smoking, ownership of tobacco promotional items, access to cigarettes, parental monitoring, and risk-taking propensity. A latent class regression analysis was then conducted



to examine association between e-cigarette user subgroups and intention to smoke conventional cigarettes while controlling for sociodemographic variables. **Results:** A three-class solution was best-fit to the data—namely informed risk-takers (46.5%), uninformed risk-takers (41%), and uninformed risk-avoiders (12.5%). The subgroups were primarily differentiated by smoking-related perceptions and risk-taking propensity. Smoking-related perceptions were better among informed risk-takers and worse among the two uninformed subgroups. Risk-taking propensity was lowest among uninformed risk-avoiders. Compared to informed risk-takers, uninformed risk-takers and uninformed risk-avoiders were more likely to have intentions to smoke conventional cigarettes in the current year (OR=2.11, 95% CI: 1.53-2.90, p<.001; OR= 1.67, 95% CI: 1.02-2.68, p<.05, respectively), after controlling for sociodemographic variables. **Conclusion:** Adolescent e-cigarette users can be classified into subgroups based on their smoking-related characteristics. Adolescent e-cigarette users with poor smoking-related perceptions are most susceptible to conventional cigarette smoking. The study findings provide insights on possible facilitators of conventional cigarette smoking among adolescent e-cigarette users, and highlight potential areas of emphasis for adolescent smoking prevention programs.

FUNDING: Unfunded

POS4-115

EXAMINING TOBACCO SMOKE EXPOSURE TRENDS AS MEASURED BY SERUM COTININE IN US CHILDREN: FINDINGS FROM NHANES 1999-2014

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Significance: Tobacco smoke exposure (TSE) is a common modifiable hazard to children. Despite a national downwards trend in TSE over time, it is unclear if the reduction is equitable among all children and if not, what specific groups should be targeted in future efforts. The study aim was to examine how TSE prevalence, as measured by serum cotinine, varied from 1999-2014 among children, and to calculate differences in TSE trends between sociodemographic groups. We assessed the associations between sociodemographics and TSE in 2013-2014 to identify disparities. **Methods:** We analyzed data on U.S. children 3-11 years old (N=14,199) from the 1999-2014 National Health and Nutrition Examination Survey. Relative percent declines were calculated and logistic regression models were built to examine TSE trends. Using 2013-2014 data, we built a multivariable logistic regression model to assess the association between TSE and sociodemographics (i.e., sex, age, race/ethnicity, family poverty level [FPL], and house status). **Results:** The overall TSE prevalence declined from 64.5% to 38.1% during 1999-2014 (relative decline = 44.4%). We observed a reduction in TSE in all sociodemographics, with odds ratios (ORs) ranging between 0.80-0.90. Results indicated non-Hispanic black children were 1.85 times more likely (95%CI[1.39-2.47], p<0.001) to be exposed than non-Hispanic white children, whereas Non-Hispanic other (OR=0.71, 95%CI[0.52-0.96], p=0.03), Hispanic other (OR=0.42, 95%CI[0.30-0.59], p<0.001), and Hispanic Mexican (OR=0.27, 95%CI[0.21-0.35], p<0.001) children were less likely to be exposed. Children with FPL ≤130% were 3.37 more likely (95%CI[2.73-4.15], p<0.001) and children with FPL 131-185% were 1.80 times more likely (95%CI[1.31-2.49], p<0.001) to be exposed than those with FPL >185%. Children living in rented homes were 2.23 times more likely (95%CI[1.85-2.69], p<0.001) to be exposed than children who lived in owned homes. **Conclusion:** Children at higher risk of being exposed were: non-Hispanic blacks, of lower socioeconomic status, and rental home occupants. Although TSE declined, disparities persist and targeted tobacco control efforts are needed.

FUNDING: Federal

POS4-116

DOES SOCIAL MEDIA ACTIVITY PREDICT OR REFLECT INDIVIDUAL BEHAVIOR OVER TIME? E-CIGARETTE PURCHASING AS A CASE EXAMPLE

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Significance: The broad interest in and the importance placed on social media by industry, policymakers, researchers, and others is based on the assumption that social media activity must impact - or at least reflect - individual behavior. However, there is little

empirical research explicitly examining whether this is true. E-cigarettes have emerged in the U.S. market in the past 5 years alongside a strong online presence, including within social media, making them an appropriate topic for examining this issue. **Methods:** Drawing from a socioecologic perspective, we examined monthly Twitter activity (i.e., tweet volume) regarding e-cigarettes in relation to monthly e-cigarette purchasing (per Nielsen Consumer Panel data) from October 2012 to September 2015, accounting for e-cigarette adspend (national, DMA-specific); state-level tobacco control environment (adult smoking prevalence, cigarette tax rate, % CDC-recommended funding for tobacco control, level of smoke-free policies); and consumer household characteristics. **Results:** Of the 2105 households included in the analyses, average number of e-cigarette purchase incidents was 2.29 times over the 36-month study period; 62.1% recorder one purchase, 16.4% two, and 6.2% three. Average number of households with e-cigarette purchases per month was 134.1 (SD=35.0). Bivariate analyses indicated that e-cigarette purchases increased over time (p<.001); that the relationship between e-cigarette purchases and tweet volume was cubic, suggesting overall positive relationship with varying degree of effects over different amounts of tweets; and that other predictors of e-cigarette purchases within a month were DMA-specific adspend (p=.025), higher cigarette taxes (p=.015), and older age (p=.001). Multivariate analyses indicated that tweet volume was positively associated with e-cigarette purchases, specifically highest impact around 400,000 tweets within a month, controlling for all other covariates. **Conclusions:** Social media, specifically Twitter activity, may influence - or reflect - individual behavior, in this case e-cigarette purchasing behavior. Social media may be an important channel for intervening on tobacco use.

FUNDING: Federal

POS4-117

NEIGHBORHOOD DISORDER AND RACIAL/ETHNIC DISPARITIES IN YOUNG ADULT E-CIGARETTE USE

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Significance The rapid introduction of new devices and aggressive marketing are transforming the landscape of tobacco products and tobacco use, particularly with respect to electronic cigarettes. Little research exists on racial/ethnic disparities in e-cigarette use, and to our knowledge, no studies have evaluated neighborhood-level disparities in e-cigarette use, especially among young adults, the most avid group of adopters. We evaluated differences in e-cigarette use by race/ethnicity and neighborhood among young adults in the SF Bay Area, focusing specifically on perceived and observed neighborhood disorder. **Methods** We utilized probabilistic household survey and neighborhood-level audit data from the 2014 San Francisco Bay Area Young Adult Health Survey (BAYAHS; N=1363), along with 2014 TIGER/Line shapefiles from the U.S. Census Bureau. First, we conducted logistic regression in Stata v14.2 to examine racial/ethnic disparities in current e-cigarette use. Second, we performed Moran's I spatial autocorrelation analyses in ArcGIS 10.6 through which we determined that e-cigarette use, perceived disorder and observed disorder were each spatially autocorrelated (p<.05). We therefore performed a geographically weighted regression (GWR) analysis using GWR 4.0 and ArcGIS 10.6, regressing e-cigarette use on race/ethnicity and covariates adjusting for perceived and observed neighborhood disorder. **Results** In the logistic regression model, being Latino increased the odds of e-cigarette use by 87% compared to non-Latino Whites. The GWR results also showed significant local associations between e-cigarette use and race/ethnicity for all nonwhite groups. After adjusting for perceived and observed neighborhood disorder at the local level, we found that perceived neighborhood disorder was positively associated with e-cigarette use across all study block groups, and erased previously observed local associations between race/ethnicity and e-cigarette use. There were no significant associations with observed disorder. **Conclusion** Racial/ethnic disparities in e-cigarette use may be substantially influenced by perceptions of neighborhood disorder. Most of the geographic areas identified by the GWR results as having significantly higher young adult e-cigarette use have also recently passed flavored tobacco restrictions; these patterns of use should be tracked.

FUNDING: Federal



SRNT

POS4-118

PREFERENCES FOR ELECTRONIC NICOTINE DELIVERY SYSTEMS AMONG YOUNG ADULTS. RESULTS FROM AN ONLINE DISCRETE CHOICE EXPERIMENT

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Objective: To examine the impacts of flavor, device types, and health warning messages on young adult preferences for electronic nicotine delivery systems (ENDS). **Methods:** In May 2016, using an online panel, we conducted an online discrete choice experiment (DCE) among a convenience sample of 400 young adults aged 18-24. We gave each study participant 9 choice sets and asked them to choose from either two hypothetical ENDS products or not using any ENDS. If the participants had ever used ENDS, they were given an additional choice of their most-used ENDS products. To measure participants' willingness-to-pay (WTP), prices of devices and refills, varying at different levels, were also provided along with three attributes: flavor, device types, and health warning messages. Participants' tobacco use history and their related behaviors following the experiment were also surveyed. The impacts of flavor, device types, and health warning messages on participants' probability of choosing ENDS were examined using conditional logit regressions, while controlling for individuals' socio-demographic characteristics and current smoking status. **Results:** We document that fruit/sweet/beverage and menthol flavors significantly increased the probability of choosing ENDS among young adult ENDS ever users. Higher prices of devices and refills also significantly decreased the probability of choosing ENDS. The effect of refill prices on ENDS use is more pronounced than the impact of device prices. The results further indicate a marginal WTP of \$13 for fruit/sweet/beverage flavors and a marginal WTP of \$6.42 for menthol flavor. Device types and health warning messages did not significantly influence ENDS choices among young adult ENDS never users. **Conclusions and Relevance:** Flavors (i.e. menthol and fruit/sweet/beverage flavors) and device and refill prices are the main factors that influence the probability of choosing ENDS among young adults. Restricting flavors in ENDS and increasing device and refill prices may decrease the probability of choosing ENDS among young adult ever-users. **Funding:** Dr. Shang was funded by grant 1K99AA024810. The project was funded by grant number P50DA036128 from the NIH/NIDA and FDA Center for Tobacco Products (CTP).

FUNDING: Federal

POS4-119

AMERICAN INDIAN IMAGERY IN NATURAL AMERICAN SPIRIT CIGARETTES: ASSOCIATIONS WITH BELIEFS OF A HEALTHIER WAY TO SMOKE AND PURCHASE INTENTIONS

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Significance The tobacco industry has a well-documented history of appropriating American Indian imagery for marketing cigarettes. Natural American Spirit (NAS) cigarette packs feature an American Indian (AI) warrior with headdress, peace pipe and soaring eagle. The current study examined misperceptions that NAS is AI owned and grown and tested associations with brand health perceptions and purchase intentions. **Methods** In a web-based randomized controlled experimental study focusing on brand perceptions, never (n=421), former (n=135), and current (n=358) smokers viewed images of NAS and Pall Mall cigarette packs, both brands manufactured by Reynolds American. The pack images were presented separately; pack order and color (green, blue, orange/gold) were randomized. After viewing each pack, participants were asked about the company behind the brand and perceived AI affiliation; analyses compared NAS and Pall Mall. Among smokers, perceptions of an AI connection for NAS were tested in relation to health perceptions and future purchase intentions. Results McNemar tests indicated that beliefs that the brand is AI owned (42% vs 12%), tobacco grown on AI lands (48% vs 14%), and company profits donated to AI organizations (50% vs 16%) were common and significantly greater for NAS than Pall Mall, found for current, former and never smokers ($p<.001$). In multivariate logistic regression models controlling for sociodemographic variables and study design features (pack order and color), current smokers who reported more AI affiliation beliefs for NAS were more likely to report that smoking NAS shows concern about their own health ($\beta=0.21$ $p<.001$) and the health of their friends and family ($\beta=0.23$ $p<.001$). Path analyses indicated that perceived AI affiliation for NAS had a significant indirect effect on purchase intentions mediated by health perceptions for self ($\beta=0.09$ $p<.05$). **Conclusion** Findings from this brand

perceptions study indicate that consumers commonly misperceive the NAS brand to be AI owned and/or grown. These misperceptions are associated with beliefs among smokers of reduced health harm and in turn with intentions to purchase the brand.

FUNDING: Academic Institution

POS4-120

WHOSE RESPONSIBILITY IS IT? AN EXPERIMENTAL STUDY EXAMINING THE EFFECT OF FOUR DISCRETE EMOTIONS ON SMOKING-RELATED PERCEPTIONS

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Significance: The utility of emotions in graphic health warnings (GHWs) has been debated. One argument views emotions as coercive, with the inability to provide useful information. However, empirical evidence has demonstrated emotions are important in processing information. According to health advocates, emotions are salient in information processes and health outcomes. The Appraisal-Tendency Framework (ATF) explains the differential effects emotions have on decision-making and judgments, and has been used to explain effects of discrete emotions on outcomes related to risks such as terrorism and driving. However, studies on emotions and their effect on smoking are scarce. **Methods:** The Emotions and Health Study, an online experimental study, was conducted to test the causal effect of fear, anger, sadness, and disgust on smoking-related cognitions (ie perceptions). Emotions were elicited through short movie clips that were pre-tested. Participants (N=513; 61.6% female, 71.3% non-Hispanic White) were adults (mean age=36.7 (SD=13.2)) recruited online through Mechanical Turk. **Results:** Analysis of variance showed anger increased perceptions of health risk of smoking ($F(2,510)=3.83$, $p=.02$, partial $\eta^2=.02$) and perceptions of responsibility of tobacco companies ($F(2,510)=3.41$, $p=.03$, partial $\eta^2=.01$). Sadness also had an effect on perceptions of health risk of smoking ($F(2,510)=5.49$, $p=.00$, partial $\eta^2=.02$) and perceptions of responsibility of tobacco companies ($F(2,510)=6.16$, $p<.00$, partial $\eta^2=.02$), as well as perceptions of responsibility of public policies ($F(2,510)=2.96$, $p=.05$, partial $\eta^2=.01$). Perceptions of health risk are important in decreasing smoking initiation and perceptions of responsibility may be helpful in advocating for tobacco policy changes. Surprisingly, fear and disgust, most common emotional-appeals used in GHWs, were not associated with perceptions in this study. **Conclusion:** Although effects were small, anger and sadness had an increased effect on smoking-related perceptions. Use of anger- and sadness-appeals can be useful in keeping GHWs and anti-smoking ads novel and effective. Lastly, emotions are helpful in processing information related to smoking.

FUNDING: Academic Institution

POS4-121

PAYING FOR QUITTING SMOKING PAYS OFF. RESULTS FROM A CLUSTER RANDOMIZED CONTROLLED TRIAL AND QUALITATIVE INTERVIEWS

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Background This study examined whether financial incentives combined with a smoking cessation group training programme organized at the workplace are effective in increasing smoking cessation in employees with different education and income levels. **Methods** In this cluster randomized trial, 61 companies with 604 participating smokers from the Netherlands were enrolled. Eligible participants were adult employees who were current smokers. All participants received seven 90-minute sessions of smoking cessation group training at the workplace. Participants in the intervention arm received vouchers for being abstinent, totalling €350. The main outcome was CO-validated continuous abstinence at 12 months. In addition to the trial, qualitative interviews were conducted with 15 successful and 9 unsuccessful quitters from the intervention group, to investigate what according to them had contributed to their quit success, and whether the vouchers had motivated them to quit smoking. **Results** Twelve months after finishing the smoking cessation programme, abstinence rates in the intervention group were significantly higher (41.1%) than in the control group (26.4%) (AOR 1.93, 95% CI 1.31 to 2.85, $p<0.001$, adjusted for education level, income level, and Fagerström score). The analyses comparing different income and education groups showed comparable effects for these subgroups. According to the interviewees, the success factors for quitting smoking were the workplace setting, quitting with colleagues, motivation, family



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support, and strategies. The incentives were considered as more attractive to smokers with a low income, but were not a main motivator to quit smoking: 'Yes, I see it as a little extra. I see it as a bonus. But it's definitely not a motive to quit smoking.' Participant 5, successful quitter. This contradicts the results from the RCT. **Conclusion** Financial incentives on top of a smoking cessation group training programme can significantly increase long-term smoking abstinence rates in employees with a low education and income. Smokers do not perceive the incentives as effective in changing their behaviour. **Funding** Dutch Cancer Society: UM2015-7943.

Funding: Academic Institution; Nonprofit grant funding entity

POS4-123

EVER USE, CURRENT USE, AND REASONS FOR USE OF ELECTRONIC CIGARETTES SHAPED LIKE USB FLASH DRIVES AMONG US ADULTS

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Significance: The landscape of electronic cigarettes (e-cigarettes) and other electronic vapor products (EVPs) is continually evolving. In recent years, sales of EVPs shaped like USB flash drives have rapidly increased in the US, and discreet use of these products by students in schools has been reported. Some research has assessed self-reported use of these products among youth; however, the extent of and reasons for use among US adults is unknown. **Methods:** Data came from *SummerStyles*, an Internet survey of US adults aged ≥ 18 fielded in June-July 2018 (N=4,088). Respondents were provided images of product examples and asked about ever use, current (past-30 day) use, and reasons for use of "an electronic vapor product shaped like a USB flash drive, such as JUUL, MarkTen Elite, or myBlu." Weighted point estimates were assessed overall and by sex, age, race/ethnicity, education, cigarette smoking status, and EVP use status. Adjusted odds ratios (OR) were calculated using logistic regression. **Results:** In 2018, 7.9% of adults reported ever use of USB flash drive-shaped EVPs, including 27.4% of current cigarette smokers and 46.0% of current EVP users. Moreover, 2.0% reported current use of the products, including 8.3% of current smokers and 34.3% of current EVP users. Adjusting for covariates, ever use was higher among: adults ages 18-24 (OR: 10.2), 25-44 (OR: 5.0), and 45-64 (OR: 2.8) than adults 65+; non-Hispanic other races (OR: 2.0) than non-Hispanic whites; and former (OR: 7.2) and current smokers (OR: 15.9) than never smokers. Among ever users, "to deliver nicotine" was the leading reason for use (30.7%), followed by "friend or family member used them" (30.2%), "to quit other tobacco products" (22.6%), other reasons (22.1%), "to deliver marijuana or cannabis" (18.7%), and "its shape lets me use it unnoticed" (5.4%). **Conclusions:** About 1 in 13 US adults have ever used a USB flash drive-shaped EVP, including half of ever e-cigarette users. More than one-third of adult current e-cigarette users currently use these products. Understanding patterns of use by EVP product type can inform strategies to maximize any potential benefits and minimize health risks.

Funding: Unfunded; Federal

POS4-124

TOBACCO SMOKING AND SECOND HAND SMOKE EXPOSURE AMONG WOMEN OF REPRODUCTIVE AGE IN TWENTY-THREE COUNTRIES: RESULTS FROM GLOBAL ADULT TOBACCO SURVEY, 2008 TO 2016

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Significance: Tobacco smoking among women in many low and middle income countries is on the rise. Tobacco smoking and exposure to secondhand smoke (SHS) during pregnancy also has significant health risks for the fetus and newborn. We examined the data on tobacco smoking and SHS exposure in the home among women of reproductive age (WRA) from 23 low and middle income countries. **Methods:** Data were analyzed from 23 countries that completed the Global Adult Tobacco Survey (GATS) during 2008-2016, including all waves of data from five countries who completed the survey more than once during this period. GATS is a nationally representative cross-sectional household survey of adults ≥ 15 years. National sample sizes ranged from n=4250 (Malaysia, 2012) to n=69296 (India, 2009). The number of WRA in these countries ranged from 0.7 million (Uruguay, 2009) to 328 million (China, 2010). Respondents were categorized as current tobacco smokers if they reported currently smoking any tobacco product "on a daily or

less than daily basis." Respondents were categorized as exposed to SHS in the home if they reported anyone smoking inside their home on a monthly or more frequent basis. Characteristics of WRA's exposure were assessed using descriptive statistics for four levels. **Results:** Overall, current tobacco smoking among WRA ranged from 0.5% (Egypt, 2009) to 25.7% (Greece, 2013). Among WRA who did not currently smoke tobacco, more than 50% of WRA nonsmokers were exposed to SHS at home in 6 of the 23 countries surveyed (26.0% of countries), and more than 25% were exposed to SHS at home in 14 countries (60.8% of countries). Overall, among WRA who did not currently smoke tobacco, SHS exposure in the home ranged from 2.8% in Panama (2013) to 74.2% in Indonesia (2011). Among those who currently smoked tobacco, SHS exposure ranged from 0.1% in Nigeria (2012) to 28.3% in Greece (2013). **Conclusions:** WRA in many low and middle income countries have a high prevalence of both tobacco smoking and of SHS exposure in the home. These findings could inform efforts to prevent and reduce tobacco use and SHS exposure in the home among WRA.

Funding: Nonprofit grant funding entity

POS4-127

JUUL USERS' PERCEPTIONS OF HARM AND DESCRIPTIONS OF THE PRODUCT

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Significance: Introduced to the market in 2015, JUUL, a small, rechargeable, closed-system e-cigarette (EC) has been gaining in popularity, now with 70% of the current market. While news about JUUL has been widespread in the press, only a handful of studies have examined it. Past research shows that JUUL is highly recognizable and prominent on social media. However, little is known about users' harm perceptions of the product and how they describe it using positive and negative words. The current study examined harm perceptions of JUUL among users and examined how the product was described. **Method:** Survey participants (N=979; $M_{age} = 33.2$) who reported ever using JUUL were recruited from Amazon's Mechanical Turk. Survey items included use status, harm perceptions of JUUL and other tobacco products, and a checklist of positive and negative words that they chose to describe JUUL. **Results:** The majority of participants reported only trying JUUL once or twice (triers; 60%), while 29% reported regular non-daily use, and 10% reported daily use. Paired samples t-tests revealed that participants perceived JUUL to be significantly less harmful than combustible cigarettes, cig-a-likes, smokeless chewing tobacco, snus, hookah, cigars, and cigarillos (all $p < .001$). Participants did not perceive JUUL to be less harmful than tank ($p = .051$) or mod systems ($p = .67$). Analysis of Variance revealed a significant association between JUUL use status and JUUL harm perceptions [$F(2, 834) = 9.34, p = .02$] such that daily users perceived JUUL as the least harmful followed by non-daily users, and triers. Participants overwhelming described JUUL with positive word associations such as "trendy" (43%) and "cool" (38%) and described JUUL less with negative word associations such as "disgusting" (4%) and "gross" (4%). **Conclusion:** JUUL users and triers perceived JUUL to be significantly less harmful than most tobacco products except tank and mod system ECs. The greater the use, the less harm was perceived, and the majority viewed JUUL in a very positive way. This suggests that the propensity for JUUL's popularity may be driven by lesser harm perceptions and positive views about the product.

Funding: Federal; State

POS4-128

THE 20-YEAR IMPACT OF REDUCING CIGARETTE USE IN MINNESOTA: A SIMULATION STUDY

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Significance: Minnesota has been at the forefront of many tobacco control policies, including being the first state to enact clean indoor air legislation, one of a few states that taxes e-cigarettes as tobacco products, and one of the first to sue tobacco companies. That tobacco lawsuit established ClearWay Minnesota™ in 1998 to implement tobacco control programs and fund research. In that time, adult smoking prevalence in Minnesota fell from 21.8% in 1997 to 15.2% in 2016. While prior studies have estimated lives lost from tobacco along with the cost of smoking, the prevented heart attacks,



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cancers, tobacco related deaths and medical expenses resulting from a decline in tobacco use have not been counted. This study uses a simulation model to quantify these invisible gains to account for the impact of tobacco control programming and help inform decisions on future tobacco control investments. **Methods:** 1.3 million individuals were simulated in a tobacco policy model to estimate the gains to Minnesotans from 1998 to 2017 in health, medical spending reductions and productivity gains due to reduced cigarette smoking. A constant prevalence scenario was created to simulate the tobacco harms that would have occurred had smoking prevalence stayed at 1997 levels. Those harms were compared with tobacco harms from a scenario with realized prevalence in Minnesota from 1998 to 2017. **Results:** The simulation model predicts that reducing cigarette smoking from 1998 to 2017 has prevented 4,560 cancers, 31,691 hospitalizations for cardiovascular and diabetes, 12,881 respiratory disease hospitalizations and 4,118 smoking-attributable deaths. Minnesotans spent an estimated \$2.7 billion less in medical care and gained \$2.4 billion in paid and unpaid productivity, inflation adjusted to 2017 US dollars. **Conclusions:** Minnesota's investment in comprehensive tobacco control measures has driven down smoking rates, saved billions in medical care and productivity costs and prevented tobacco related diseases of its residents. The simulation method employed in this study can be adapted to other states and time periods to bring to light the unmeasured benefits of tobacco control.

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POS4-129

THE ESSENTIAL COMPONENTS OF A PEER CROWD, PLACE-BASED TOBACCO INTERVENTION FOR YOUNG ADULTS

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Significance: Young adults are less likely to receive smoking cessation assistance than older adults. A novel approach to engaging high risk young adults in tobacco cessation and denormalization is to use psychographics and social branding campaigns targeting young adult peer crowds. This approach was implemented in two, multi-State young adult anti-tobacco interventions: 1) 'COMMUNE', designed for 'Hipsters' as a movement of artists and musicians against Big Tobacco, 2) 'HAVOC', designed for 'Partiers' as an exclusive, smoke-free clubbing experience. We explored the perspectives of young people involved in these interventions to understand how and why the interventions affect smoking behavior. **Methods:** We conducted semi-structured interviews with key informants (n=27) who were involved in COMMUNE or HAVOC as organizers (e.g., musicians, event coordinators) or attendees. Interviews prompted description of intervention events and experiences, and discussed intervention components that participants believed worked/did not work well. We used an inductive-deductive approach to thematically code transcripts, integrating concepts from intervention design literature and emergent themes. **Results:** Participants emphasized the importance of intervention events being held in fun, interactive, social environments that encouraged a sense of belonging and connection. They perceived the anti-tobacco messaging as subtle and non-judgmental and noted that the messages resonated with their interests, values and aesthetics. They found it important that the young adults who represented the intervention (e.g., HAVOC brand ambassadors; COMMUNE band members) were admired and influential among peers, and that promotional materials encouraged brand recognition and experiences of exclusivity. Events were perceived negatively when social brand announcements were not made, promotional materials were obscurely located, and/or it was too loud to converse with brand ambassadors. **Conclusion:** Social branding anti-tobacco interventions denormalize tobacco use and promote cessation by creating fun experiences that resonate with high risk young adults and deliver subtle, non-judgmental messages.

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POS4-130

IMPACT OF ENDS MARKETING ON ENDS INITIATION AMONG YOUNG ADULTS: A MEDIATION MODEL

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Significance. Little is known about how ENDS marketing influences ENDS use. The purpose of this study was to examine if the association between ENDS marketing and ENDS initiation is mediated through important psychosocial mediators among young adults. **Method.** Participants were 2,134 students (M age=20.2, SD age=0.05; 65.8%

Non-white; 67% female) from 24 Texas colleges (12 2-year and 12 4-year schools) who reported never using ENDS at wave 1 or 2. Students completed an online survey in fall 2014 and five subsequent surveys six months apart. ENDS marketing exposure was measured at wave 1 and included exposure via five independent items: TV, radio, billboards, retail tobacco outlets, and internet (1=exposed, 0=not exposed). Mediators were measured at wave 2 and included social acceptability of ENDS, ENDS harm perceptions, and ENDS perceived addictiveness. The outcome was ENDS initiation after wave 2 through wave 6 (16% of the sample initiated). A multi-level mediation model, using Mplus 7.4, was used to examine the direct and indirect effects between ENDS marketing and ENDS initiation, controlling for socio-demographics and school type. **Results.** At wave 1, 56.0% were exposed to ENDS marketing on the internet, 54.0% at retail outlets, 27.8% on TV, 25.2% on billboards, and 24.3% on the radio. The mediation model fit the data well. ENDS marketing exposure at retail outlets predicted an increased likelihood of ENDS initiation directly ($\beta=.11$) and indirectly through greater social acceptability ($\beta=.007$). Radio exposure predicted a decreased likelihood of ENDS initiation indirectly through greater perceived addictiveness ($\beta=-.017$). Internet and TV exposure predicted the psychosocial mediators but did not indirectly predict ENDS initiation. **Conclusion.** ENDS marketing impacts ENDS initiation through modifiable psychosocial mediators that should be targets of interventions aimed at preventing young adult ENDS use. Only ENDS marketing at the retail outlet directly predicted ENDS initiation, it may, therefore, be the most influential form of marketing for young adults. Policies to reduce marketing through this channel are especially warranted.

FUNDING: Federal

POS4-131

SMOKING CESSATION AS A MULTIDIMENSIONAL CONCEPT: IDENTIFYING COMMON PATTERNS OF EXPERIENCE AMONG CURRENT AND FORMER SMOKERS

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Significance: While many smokers report quitting on their own, research shows that smokers are using a variety of cessation strategies and often using more than one method at a time. A breadth of literature exists on the effect of individual methods, but less is known about the varying combination of strategies that smokers report using to help them quit. **Methods:** This study combined several years of the Vermont Adult Tobacco Survey (2012, 2014, 2016) to uncover core patterns of cessation method combinations used among current (n=1,339) and recently quit former smokers (n=452) in their most recent quit. Chi-square tests of association were used to determine statistical differences in cessation patterns based on demographics (gender and age) and smoking status. **Results:** Results showed up to 16 cessation strategy combinations, with a core of seven that comprised 90% of all the patterns identified. As expected, four of the core patterns included identifying quitting on their own: 1) quit on own only; 2) quit on own and used a cessation product (i.e., NRT, medications, or electronic cigarettes); 3) quit on own and talked with a health care provider (HCP); 4) quit on own, used a product, and talked with a HCP. Only 33% of current smokers and 47% of former smokers reported quitting on their own as their *only* method. Former smokers were significantly more likely than current smokers to report quitting on their own without another strategy, although this was still the method used most often for both groups. Young adult (age 18-25) current smokers were also more likely to report trying to quit on their own without another strategy than adults who were older ($\chi^2 = 4.28$ (12); $p<.01$). Two additional patterns included HCP interaction, one with a cessation product and one with a product and cessation service (i.e., Quitline, in-person class, or individual counseling). Although used least often among the core patterns, current female smokers were significantly more likely than males to use a combination of cessation product and service while talking with a HCP ($\chi^2 = 3.74$ (6); $p<.01$). The final core pattern was using only a cessation product. **Conclusion:** This study extends our knowledge of smoking cessation as a more complex and multidimensional concept. Findings provide an example for public health professionals in using state-level data to guide program and policy efforts, as well as to inform future studies on current cessation trends.

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POS4-132

CHILDREN'S RISK OF NICOTINE POISONING FROM TOBACCO PRODUCTS

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There are no analyses of the potential acute toxicity to children from a single exposure to different tobacco products based on relevant nicotine concentrations. Tobacco use in the United States is increasingly diverse, with approximately 37 million adults and 1.6 million middle and high school students classified as current cigarette smokers, while approximately 8.6 million U.S. adults and 3 million middle and high school students were current e-cigarette users in 2015. Given the continued popularity of these products and their presence in U.S. homes, an analysis of the amount of nicotine that will produce illness or death is important. Using published literature, we estimated potentially toxic nicotine exposures, based on the content and characteristics of five major tobacco product types. After adjusting for interindividual variability, some preliminary exposure levels have been estimated. The lowest observable effect level in children aged six months to six years is estimated at 0.04 mg/kg for oral exposure. For a one-year old child weighing 10 kg, the lethal dose of orally-ingested nicotine is estimated to be between 1 and 14 mg/kg, depending on strength and not adjusting for interindividual variability. If the liquid contains 30 mg nicotine/ml, then consuming only 0.3 mL (less than or equal to 0.1 teaspoon) liquid could be fatal. Although all tobacco-containing products have caused poisonings in children, poisoning by e-cigarette liquid likely poses a greater risk to small children than other tobacco products. Disclaimer: This information is not a formal dissemination of information by FDA and does not represent agency position or policy.

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POS4-133

DECIDETEXTO: DEVELOPING A CULTURALLY- AND LINGUISTICALLY-APPROPRIATE SMOKING CESSATION TEXT MESSAGE LIBRARY FOR LATINO SMOKERS

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INTRODUCTION: Latinos, the largest and fastest growing minority group in the U.S., suffer from tobacco-related disparities, including low access to cessation resources. Evidence supports the efficacy of text messages for smoking cessation, which may be greater among Latinos, the highest users of text messaging.

OBJECTIVE: To develop *Decidetexto*, a culturally- and linguistically-appropriate smoking cessation text message library for Latino smokers.

METHODS: Development of the text message library was guided by Social Cognitive Theory. Text messages were organized along a timeline designed to support a personalized quit plan (pre-quit, quit-date, and post-quit). Following the Cultural Accommodation Model, text message development was informed by literature reviews, feedback from key stakeholders, focus groups with Latino smokers and ex-smokers, and results from pilot studies with Latino smokers. Messages were translated into Spanish, reduced to 140 characters, and linguistically refined by a multidisciplinary Community Advisory Board from different Latin American countries. Readability of final messages was assessed using the Flesch-Kincaid and Fernandez-Huerta tests for English and Spanish, respectively.

RESULTS: The *Decidetexto* text message library consists of four consecutive phases:

1) Pre-quit (30 days), 2) Quit-Day, 3) Post-quit Intensive (28 days), and 4) Post-quit Maintenance (20 weeks). The library includes a Relapse track (8 days), and sets of keyword-triggered messages (Stress, Crave, Family, and NRT). The final library consists of 712 messages covering 10 themes: Education (18.8%), Logistics (15.7%), Intra-treatment social support (15.5%), Coping with triggers (11.2%), Extra treatment social support (8.4%), Stimulus control (8.1%), Vicarious experience (7.0%), Relapse prevention (6.5%), Social norms (5.1%), and Reward (3.7%). Readability scores averaged 3.9 (4th grade level) in English, and 77.4 (easy/very easy) in Spanish.

DISCUSSION: Developing a culturally- and linguistically-appropriate smoking cessation library for Latinos requires research and community participation. An ongoing randomized clinical trial will test the efficacy of *Decidetexto*.

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POS4-134

EVALUATING THE ONEFLORIDA CLINICAL DATA RESEARCH NETWORK AS A POTENTIAL RESOURCE TO INVESTIGATE SMOKING-RELATED EFFECT MODIFICATION IN CANCER PATIENTS

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Significance. Limited surveillance data exist to examine smoking-related effect modification of treatment outcomes among cancer patients. The OneFlorida Clinical Research Consortium is a statewide clinical data research network that collects claims and electronic health record (EHR) data from over 15 million patients in Florida. By examining longitudinal properties of smoking status assessment in the data, our objective was to demonstrate the potential opportunity for OneFlorida to be used for investigating how changes in smoking status could affect cancer treatment outcomes. **Methods.** Adult cancer patients were identified in the OneFlorida Data Trust (2012-2017) as having ≥ 1 encounter with an ICD-9-CM or ICD-10-CM diagnosis code for cancer and ≥ 1 EHR-documented assessments of smoking status within 1 year of diagnosis. Patients meeting inclusion criteria were tabulated. Current and former smoking prevalence was reported by patient demographics, cancer site, and phase of care (1 year to >30 days pre-diagnosis, within 30 days of diagnosis date, >30 days to 1 year post-diagnosis).

Results. Among the 102,048 cancer patients who met inclusion criteria, 50% were female, 60% were \geq age 65, and 64% were Caucasian. Overall, 16% were current smokers and 43% former smokers. Across cancer sites, prevalence of current smoking at diagnosis was highest for cervical cancer (30%), followed by lung cancer (27%) and liver cancer (24%). Among 16,683 cancer patients reporting current smoking at last assessment, 62% had a final smoking assessment >30 days after diagnosis and 49% had ≥ 2 assessments at or following a cancer diagnosis. Among patients who were current smokers at earliest available assessment in the EHR (n=18,664), 51% remained current smokers and 15% transitioned to former smokers. **Conclusions.** Clinical data from the OneFlorida Clinical Research Consortium representing usual care for Floridians with cancer allow for longitudinal tracking of smoking status in cancer patients that is not captured by traditional surveillance methods. Leveraging existing OneFlorida data linkages with tumor registry, healthcare utilization and health outcomes could facilitate improved understanding of how effect modification from changes in smoking behavior could affect cancer treatment.

FUNDING: Federal; State

POS4-135

HIGHER CIGARETTE TAXES UNLIKELY TO REDUCE SOCIOECONOMIC AND RACIAL/ETHNIC DISPARITIES IN SMOKING AMONG U.S. ADOLESCENTS

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SIGNIFICANCE: Smoking disparities by socioeconomic status (SES) and race/ethnicity are pervasive among adolescents. Despite the well documented literature on the effectiveness of cigarette taxes for reducing smoking, there is little evidence about how taxes affect disparities among adolescents. **METHODS:** We used nationally-representative, repeated cross-sectional data from the 2005-2016 Monitoring the Future (MTF) study to evaluate the relationship between state cigarette taxes and the probability of recent smoking initiation, past 30-day current smoking, and smoking frequency for 8th, 10th, and 12th graders separately using modified Poisson and linear regression models. To evaluate differential effects of tax on smoking, we included two-way interactions between tax and race/ethnicity, the highest level of education of either parent, and whether the respondent probably or definitely planned to attend college for a four-year degree (available for 12th graders only). We tested the significance of these interactions using average marginal effects and assessed the overall associations between higher tax and smoking by racial/ethnic and socioeconomic group. **RESULTS:** Higher taxes were associated with lower probability of initiation and current smoking for 8th and 12th graders, but not for 10th graders. In models predicting current smoking among 12th graders, there were statistically significant interactions between tax and socioeconomic status, with tax being associated with lower probability of current smoking only for students with a college-educated parent or who planned to attend a four-year college, but not for those with no parent who graduated from college or



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less definitive college plans. We did not find statistically significant interactions between tax and race/ethnicity or socioeconomic status for any other grades/outcomes. **CONCLUSION:** Higher taxes were associated with reduced smoking among adolescents. There were generally similar effects for adolescents in different racial/ethnic and socioeconomic groups, with the possible exception of higher taxes being protective for older adolescents from higher SES backgrounds, therefore exacerbating disparities.

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POS4-136

VARIATION IN DEMOGRAPHIC CHARACTERISTICS OF TOBACCO QUITLINE REGISTRANTS BY TYPE OF MEDIA EXPOSURE

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Significance: Research has shown that media such as TV, Internet, and radio, is the most common way tobacco quitline callers report hearing about quitlines. This study assessed whether there are significant differences in quitline caller characteristics based on the type of media they reported hearing about quitlines. **Methods:** We analyzed individual-level data for quitline callers from the CDC's National Quitline Data Warehouse during 2010-2017 for 1,209,992 quitline callers aged 18 years and older from 49 U.S. states (excluding Massachusetts[KBa(1) [MN2]) and the District of Columbia. These callers had called the quitline for themselves and reported hearing about quitlines primarily from TV, the Internet, or radio. We compared caller age group, sex, race/ethnicity, and education across the three media types and used chi-squared tests to determine whether sociodemographic characteristics of callers varied across self-reported type of media exposure. **Results:** Callers who heard about quitlines through TV were most likely to be aged 45-64 years (50.5%), female (58.5%), non-Hispanic black (43.0%), and have a high school degree or less (55.0%) ($p < 0.001$). Those who heard through the Internet were most likely to be non-Hispanic white (69.1%) and to have at least some college education (33.8%) ($p < 0.001$). Callers who learned about quitlines through radio were most likely to be aged 18-44 years (62.6%), male (55.8%), non-Hispanic Asian (6.5%), and Hispanic (10.2%) ($p < 0.001$). **Conclusion:** Quitline caller demographics vary by the media in which they heard about quitlines, which may be due to different media exposure patterns, different receptivity to media, or a combination of both. Utilizing multiple media types may improve the reach of cessation media, both overall and among select populations. Thus, these findings may help tobacco control programs to more effectively target the reach of antismoking campaigns, particularly among key groups of smokers.

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POS4-137

ATTITUDES TOWARD INDOOR SMOKE-FREE POLICIES AMONG PERMANENT SUPPORTIVE HOUSING RESIDENTS

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Significance: Smoking remains a leading cause of morbidity and mortality in homeless populations. Interventions for tobacco dependence are most effective when combined with smoke-free policies, yet such policies are absent in permanent supportive housing (PSH) for formerly homeless adults. We collaborated with six San Francisco Bay Area PSH agencies to identify barriers to and facilitators of implementing smoke-free policies in supportive housing. **Methods:** Residents living in PSH who currently smoked ($N = 36$) completed a questionnaire and participated in in-depth, semi-structured interviews on smoking history, attitudes toward smoke-free policies, and perceived barriers to cessation. Major themes were identified using content analysis. **Results:** Of the 36 residents who participated, 33.3% ($n = 12$) were female, 50% ($n = 19$) reported depression, 97.2% ($n = 35$) reported current substance use, and median percent weekly income spent on cigarettes was 11.3% (IQR 5.0 - 26.3). Support for indoor smoking bans in living areas was modest (33.1%; $n = 12$), although most residents anticipated cutting down (61%, $n = 22$) and reported they would not move because of a smoking ban (77.8%, $n = 28$). Major themes included: 1) Attitudes toward smoke-free policies, 2) Substance use as a facilitator of cigarette smoking, 3) Quitting experiences, and 4) Economic impact of smoking. While some participants perceived

an indoor smoking ban in living areas as an encroachment on their rights, most acknowledged that smoke-free policies are necessary to reduce harm from secondhand smoke and their smoking behaviors. There was interest in quitting smoking, although co-use of tobacco with other substances was a barrier. Cigarette purchases represented a substantial financial burden and had the potential to threaten housing stability. **Conclusion:** Residents in PSH support smoke-free policies and consider them feasible if the processes of implementation are sound. Our findings underscore the need to address barriers to adopting smoke-free homes and accessing smoking cessation services. In particular, interventions must address the co-use of tobacco with other substances and the impact of smoking on financial and housing stability.

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POS4-138

EXPLORATION OF POLICY MAKERS' VIEWS ON THE IMPLEMENTATION OF THE FRAMEWORK CONVENTION ON TOBACCO CONTROL IN THE GAMBIA: A QUALITATIVE STUDY

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Background: The World Health Organization's Framework Convention on Tobacco Control (WHO FCTC) is the first international health treaty and has now been ratified by 181 countries. However, there are concerns that in many countries, and particularly in Sub-Saharan African countries, FCTC legislation and implementation are weak. In this study we report a qualitative study undertaken to assess policy makers' awareness of the FCTC and national tobacco control policies, and assess the achievements and challenges to the implementation of the FCTC in The Gambia. **Methods:** The study involved semi-structured one-to-one interviews with 28 members of the National Tobacco Control Committee (NTCC) in The Gambia, which is responsible for formulating tobacco control policies and making recommendations for tobacco control. We used the Framework method and NVivo11 software for data analysis. **Results:** Our findings demonstrate that The Gambia has made modest progress in tobacco control before and since ratification of the FCTC, particularly in the areas of policy formulation, bans on tobacco advertisement and promotion, smoke free laws and tobacco taxation. Whilst several pieces of tobacco control legislation exist, enforcement and implementation remain a major challenge. We found that policy makers' awareness of policies covered in the FCTC was limited. **Conclusion:** Our findings highlight several challenges to FCTC implementation in The Gambia and the need to step up efforts and implement effective tobacco control policies that are fully compliant with the FCTC requirements. To achieve this, The Gambia should prioritise the enforcement of existing legislation, mobilise resources for tobacco control, implement the articles of the FCTC measures and conduct more research to inform policy.

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POS4-139

HOW IS EXPOSURE TO TOBACCO OUTLETS WITHIN ACTIVITY SPACES ASSOCIATED WITH YOUTH TOBACCO USE? A MEDIATION ANALYSIS

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Little is known about the mechanisms by which youth exposure to tobacco outlets is associated with tobacco use. We investigated (1) whether daily exposure to tobacco outlets within activity spaces is associated with tobacco use and (2) whether perception of tobacco use community norms mediate this relationship. We used Geographic Ecological Momentary Assessment (GEMA) data from youth aged 16-20 years ($n=101$ participants, $n=1483$ observations) in 8 mid-sized California cities. Participants completed an initial survey, daily surveys, and carried GPS-enabled phones for 14 days. GPS locations were geocoded and activity spaces were constructed by joining sequential points (excluding days in which participants were tracked for less than 360 hours). Exposure measures included the number of tobacco outlets within 50m or 100m of these polylines. Data from the brief daily surveys included questions about daily use of tobacco products and whether participants saw (1) adults (other than their parents/guardians) and (2) people their age using tobacco on that day. We used multilevel mixed effects models to control for clustering of observations within participants over time and examined the significance of mediation pathways using a Sobel test (Aroian formula). Controlling for



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demographics, we found no association between exposure to tobacco outlets within 50m of polylines and tobacco use (aOR: 1.03, 95% CI: 0.92, 1.17). However, we found evidence of an indirect effect ($p=0.01$) through daily exposures to peers who use tobacco. Specifically, increasing exposure to tobacco outlets within 50m of polylines was associated with higher odds of seeing peers use tobacco (aOR: 1.11, 95% CI: 1.05, 1.18). In turn, seeing peers use tobacco was associated with higher odds of tobacco use on that day (aOR: 5.13, 95% CI: 2.12, 12.45). Similar results were found when we examined exposure to tobacco outlets within 100m of polylines. We found no evidence of a mediated effect for seeing adults using tobacco. Results suggest that exposure to tobacco outlets within activity spaces affects youth tobacco use through exposure to peers who use tobacco (i.e., role models).

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POS4-140

AVAILABILITY AND CHARACTERISTICS OF HOSPITAL-BASED SMOKING CESSATION PROGRAMS IN THE US

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Significance: Smoking is the leading preventable cause of disease and death in the U.S. Adoption of systematic hospital-based cessation interventions has potential to increase successful quitting, reduce hospital readmissions, reduce health care costs, and enhance patient well-being. Little is known about the availability of hospital-based smoking cessation programs in the U.S. Therefore, this study assessed hospital characteristics associated with having a hospital-based cessation program during 2000-2016. **Methods:** The American Hospital Association (AHA) annual survey collects comprehensive information on hospital-based services, including tobacco cessation programs. The survey was sent to all hospitals in the U.S. (about 6,300 hospitals) with an average response rate around 80% each year. We used 2000-2016 AHA data to assess the availability of cessation programs provided by U.S. hospitals over time. Using 2016 AHA data, logit regression was used to estimate the association of hospital characteristics (bed size, location, ownership, and teaching status) with having a hospital based cessation program. **Results:** The percent of U.S. hospitals providing a tobacco cessation program increased over time, from 23.4% in 2000 to 46.0% in 2016. This upward trend was greater during 2000-2007 (80.9% increase), but slowed during 2008-2016 (8.2% increase). In 2016, urban hospitals (vs rural; OR=1.7; 95% CI 1.4-2.0), hospitals with ≥ 200 beds (vs < 200 beds; OR=2.5; 95% CI 2.1-3.0), teaching hospitals (vs nonteaching; OR=1.7; 95% CI, 1.5-2.1), and private not-for-profit hospitals and public hospitals (vs private for profit OR=5.6; 95% CI, 4.8-6.7, and OR=3.6; 95% CI, 3.0-4.5, respectively) had greater odds of having hospital-based tobacco cessation programs. **Conclusions:** Despite a doubling of the percent of hospitals having cessation programs during 2000-2007, growth of these programs has slowed in recent years. Continued efforts to promote and support hospital based cessation programs could be beneficial, especially in smaller, rural, non-teaching, and private for profit hospitals.

POS4-141

TRENDS IN TOBACCO PRODUCT USE PATTERNS BY RACE AND ETHNICITY, 1999-2017

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OBJECTIVE: Examine racial/ethnic differences in tobacco product use patterns (tpups) among US youth over time and age. Tpups classifies tobacco use based on number (single, dual, poly) and categories (cigarettes, noncigarette combustible, noncombustible) products used resulting in five mutually exclusive patterns: cigarette use (CIG), noncigarette combustible use (NCC), non-combustible use (NCom), dual and poly use, which refers to use of any two or all three product categories. **METHOD:** Data were from the National Youth Tobacco Survey, 1999-2017 ($N=45,879$, 9-17 years). We used time-varying effects modeling to estimate tpups regression coefficients for each racial/ethnic group as non-parametric function of time (1999-2017) and age (9-17 years) adjusted for gender, school, and living with a cigarette user. **RESULTS:** Compared to Whites, Blacks were less likely to be CIG users (23.4% vs. 16.4%, adjusted odds ratio [AOR] 0.61). Since 2015, Latinos (15.6%) did not differ from Whites in CIG use. Blacks (41.9%, AOR 7.89) and Latinos (24.3%, AOR 2.64) were more likely to be NCC users but less likely to be NCom users (9.6%, AOR 0.31; 14.9%, AOR 0.52) than Whites (NCC: 13.7%, NCom: 18.5%). Blacks (24.5%, AOR 0.66) were less likely to be dual users from 2000-2016 whereas starting 2009 Latinos (30.5%) did not differ from Whites (30%) as dual users. Blacks (7.4%, AOR 0.36) were less likely to be poly users whereas Latinos

(14.5%) did not differ from Whites (14.2%) in poly use since 2011. Compared to Whites, Blacks and Latinos ages 9-17 were less likely to be CIG (AOR 0.59, 0.90) and NCom (AOR 0.38, 0.70) users. At age 10-11, Blacks (AOR 2.90) and Latinos (AOR 1.73) were more likely to be NCC users. Blacks ages 9-17 were less likely dual users (AOR 0.77). Latinos ages 11-15 were more likely to be dual users (AOR 1.24) but less likely to be poly users at age 14 (AOR 0.89). **CONCLUSION:** Trends show an increase in dual and poly use among Latinos. Use of noncigarette combustibles occurs in early adolescence among Blacks and Latinos whereas dual use peaks mid adolescence for Latinos. Identifying trends and age of use is critical to tobacco control efforts targeting racial/ethnic youth. This research was supported [in part] by the Intramural Research Program of the NIH, NIMHD

FUNDING: Federal

POS4-142

SENSITIVITY OF HYPOTHETICAL PURCHASE TASKS TO INDIVIDUAL DIFFERENCES IN RISK AMONG SUBSTANCE USING POPULATIONS: A LITERATURE REVIEW

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Aims: Hypothetical Purchase Tasks (HPTs) are behavioral economic tasks that have consumers estimate their demand for a commodity (e.g. cigarettes or other substances) across escalating hypothetical prices. Despite growing use of purchase tasks in the study of substance using populations, we know of no systematic literature reviews examining their sensitivity to individual differences in substance use relating to risk and response to interventions. The aim of this review was to examine the sensitivity of HPT indices (Intensity, Omax, Pmax, Breakpoint, Elasticity) to individual differences in vulnerability to risky substance use and response to interventions. **Methods:** Reports were identified using the search term "purchase task" in PubMed and Web of Science. For inclusion, reports had to be in English, appear in a peer-reviewed journal through December 31, 2017, and examine the relationship between HPT and substance use-related outcomes.

Results: The search identified 1,274 reports, of which 111 (9%) were included for full-text review and 79 (6%) met final inclusion criteria. Of these, 41 examined associations between HPT indices and alcohol, 31 examined cigarettes and other nicotine products, and 10 examined other substances. Significant associations with outcomes were most frequently reported for Intensity (84%), followed by O_{max} (67%), Elasticity (58%), Breakpoint (41%), and P_{max} (22%). **Conclusions:** Overall, HPTs are sensitive to individual differences in risk among substance using populations, with maximum consumption and expenditure (i.e., Intensity and O_{max}) and overall sensitivity to price (i.e., Elasticity) having the most predictive utility. These associations suggest that HPTs can provide useful information regarding individual differences in substance use risks and response to interventions.

FUNDING: Federal

POS4-143

TOBACCO USE TREATMENT FOR PATIENTS WITH CANCER: EXPANDING TREATMENT REACH BY MOVING FROM AN INDIVIDUAL TO A POPULATION HEALTH APPROACH

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Significance: Patients undergoing cancer treatment who use tobacco have been shown to experience decreased treatment effectiveness, increased treatment side effects, primary cancer recurrence and occurrence of secondary cancers. A Tobacco Treatment Program (TTP) available to cancer patients is critical, but research on best practices to disseminate such interventions is limited. In 2017, the University of North Carolina received funding from the National Cancer Institute as part of the Cancer Center Cessation Initiative (C3I) to transition from a provider referral (PR) program to a population health (PH) opt-out model. We compare differences in 1) access to eligible patients at the North Carolina Cancer Hospital (NCCH), 2) patients reached using the PR and PH approach, and 3) engagement in treatment. **Methods:** Single site implementation study at a NCI-designated comprehensive cancer center serving those ≥ 18 years of age. We compared patient access, reach and engagement from baseline, PR model (Jan-Jun 2017) to PH model (Jan-Jun 2018). **Results:** At baseline, 138 provider referrals were made to TTP. The PH model gave TTP access to all 1883 patients with a positive



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tobacco use status at the NCCH. At baseline, 16% (n=138) of patients that used tobacco and presented with a cancer diagnosis were reached with treatment, compared to 27% (n= 328) using a PH approach. In addition, total patients who engaged in TTP (one or more counseling sessions) more than doubled. Current service delivery modes include in-person and phone contact. Reach will further increase when an automated electronic intervention is implemented (Fall 2018). **Conclusions:** The PH approach dramatically expanded the TTP with cancer patients. Now clinicians receive a weekly list of eligible patients who have an appointment at the NCCH. This report was the "switch," which increased access, reach and engagement. The program now offers services to eligible patients without a provider referral and has increased its staff to accommodate more patients. Broader dissemination of the PH approach for tobacco cessation in cancer care is necessary to increase engagement and reach among this high-risk population.

FUNDING: Federal

POS4-144

AUTOMATED CONTENT ANALYSIS TO QUANTIFY THEME MENTIONS IN E-CIGARETTE AND OTHER TOBACCO COVERAGE ACROSS MASS MEDIA AND SOCIAL MEDIA SOURCES

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Significance: Exposure to media content can shape public perceptions and opinions about tobacco. Accurately describing content is a first step to showing such effects. Typically, content analyses hand-coded tobacco-focused texts from a few media sources, ignoring social media sources and texts with brief mentions, and could not capture complex variation across time. This study is unique in collecting the population of all e-cigarette (ecig) and other tobacco-related texts (including cigarettes, hookah, cigars, etc.) across a comprehensive list of media sources and labeling them for 4 tobacco control themes. **Methods:** We used both supervised machine learning and dictionary methods to label (1) 135,764 long-form texts from 50 major US newspapers, the AP, broadcast news transcripts, and over 100 websites popular among youth, (2) 75,322,911 tweets, and (3) 12,262 YouTube videos collected May 2014-June 2017. We measured coverage of health effects, policy, addiction, and youth use/access in this corpus of ecig and other tobacco texts. **Results:** Long-form and Twitter theme coding had good validity. The coding was sensitive to both long-term and short-term (even daily) variations in coverage frequency and showed that over time variation differed by product and by theme; it effectively captured theme coverage in brief mention (33% of ecig and 84% of other tobacco long-form texts) as well as more tobacco- and ecig-focused texts. The 4 themes were frequent in ecig long-form (26-55%) but not in social media texts (1-8%). Themes were less common overall in other tobacco coverage, although more in YouTube (2-28%) than in long-form sources (5-16%) or in Twitter (2-4%). **Conclusions:** This study shows that automated methods can be applied to any tobacco or ecig reference, no matter how brief. It also shows that social media sources paint a different picture of tobacco control theme coverage than long-form media sources. Only examining parts of the communication environment may bias our assessment of tobacco-relevant content. One important benefit of capturing this large amount of coverage over 3 years is that we are able to reliably estimate the effects of coverage over time.

FUNDING: Federal

POS4-145

THE LESSER DEVIL YOU DO NOT KNOW. A QUALITATIVE STUDY OF HOW SMOKERS RESPOND TO MESSAGES COMMUNICATING COMPARATIVE RISK OF ELECTRONIC AND COMBUSTED CIGARETTES

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Introduction: Electronic cigarettes could reduce population level harms of tobacco if smokers unwilling to quit smoking switched to them completely. Research is needed

to identify effective messages that will communicate lower risk of e-cigarettes with minimal unintended consequences. This study was conducted to explore smokers' interpretations of different ways of communicating the risk of e-cigarettes relative to cigarettes. **Method:** Working with a social marketing agency, we developed 12 comparative risk messages (print, full-color) and evaluated them in 12 focus groups with 72 adult smokers (18+ years) in Atlanta, GA (68% male, 74% Black). **Results:** Messages comparing risks of e-cigarettes and combusted cigarettes generated animated discussions among smokers, with the central themes of uncertainty about health effects of e-cigarettes and resultant skepticism about some of the message claims, which some participants used as arguments to rationalize continued smoking. Participants thought that the unknown health effects of e-cigarettes may be more severe than known effects of cigarette smoking (such as cancer and heart disease). Yet, message that emphasized the severe harms of smoking were perceived as effective and convincing. Participants often misinterpreted what "switching completely" or "switching 100% of the time" means, perceiving switching as compatible with dual use. When chemicals were mentioned, such as nicotine or formaldehyde, participants viewed e-cigarettes as very harmful and had difficulty reconciling this belief with the claim that they are less harmful than smoking. Participants appreciated messages that offered them an option to switch if they cannot quit. Participants made recommendations for message improvement, particularly, by including a credible source of the message and more facts and statistics. **Conclusion:** Messages about relative harm of e-cigarettes may resonate with smokers if they are accompanied by direct comparisons of the number of toxins in cigarettes and e-cigarettes, attributed to a credible source(s), and emphasize the harms of combustible cigarettes.

FUNDING: Unfunded; Federal

POS4-146

QUERYING ABOUT SPECIFIC E-CIGARETTE PRODUCT USE MAY ENHANCE ACCURATE MEASUREMENT OF ADOLESCENT E-CIGARETTE PREVALENCE RATES

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Introduction. E-cigarettes are the most popular tobacco product among youth, but current prevalence estimates may underestimate actual use. Most studies assess e-cigarette use with a variant of the question: "Have you ever used an e-cigarette?" However, confusion resulting from the fact that many products fall under the umbrella term "e-cigarettes," different names are used to refer to e-cigarettes (e.g., vapes, ENDS), and different terminology is used to refer to use (e.g., vaping, JUULing) may lead some users to incorrectly indicate non-use. Thus, we compared rates of endorsing lifetime e-cigarette use when adolescents were asked about use in two different ways to examine the impact of terminology on prevalence rates. **Methods.** In May-June 2018, 1960 students from 2 Connecticut high schools completed a computerized, school-based survey. Participants first reported on lifetime e-cigarette use ("Have you ever tried an e-cigarette, even one or two puffs?" [accompanied by a picture of exemplar e-cigarette devices]). Participants then reported on lifetime use of 5 different e-cigarette devices, respectively: Disposables, Cig-a-Likes, or E-hookahs; Vape-pens/Egos; JUULs; non-JUUL pod (e.g., PHIX, Suorin); and Advanced Personal Vaporizers/Mods. Descriptive statistics were run for lifetime "e-cigarette" use, lifetime use of each product, and lifetime e-cigarette use calculated from endorsement of lifetime use of one or more e-cigarette products. **Results.** 35.8% of students endorsed lifetime "e-cigarette" use. 51.3% endorsed lifetime use of ≥ 1 product. JUULs were used most commonly (44.0%), followed by Vape-pens/Egos (28.5%), non-JUUL pod systems (26.5%), APVs/Mods (25.2%), and Disposables, Cig-a-likes, or E-hookahs (12.4%). 31.5% of adolescents who endorsed lifetime product use did not endorse lifetime "e-cigarette" use. **Conclusions.** Our findings suggest that assessing the use of specific e-cigarette devices may yield more accurate use rates than assessing "e-cigarette" use. If our findings are replicated in a nationally representative sample, regulatory efforts requiring all e-cigarette devices to be labeled as "e-cigarettes" may help reduce confusion.

FUNDING: Federal

**POS4-147****THE USE OF ELECTRONIC CIGARETTES TO VAPORIZE CANNABIS: REPRESENTATIVE DATA ON CONSUMER BEHAVIOR AND ASSOCIATED FACTORS IN THE GERMAN POPULATION (THE DEBRA STUDY)**

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Significance Electronic cigarettes (e-cigarettes) were developed to vaporize a liquid, usually comprising propylene glycol and glycerine, and optionally nicotine and flavors. It is of concern that e-cigarettes can be modified to also vaporize cannabis oil, leaves or buds. However, there is little evidence on the prevalence of e-cigarette cannabis use and associated sociodemographic characteristics and smoking status of consumers. **Methods** We analyzed aggregated data from two years (Aug/Sep 2016 to June/July 2018, 12 study waves) of the German Study on Tobacco Use (DEBRA: www.debra-study.info): a nationally representative face-to-face household survey in people aged 14 and older. The question on ever use of cannabis in e-cigarettes to obtain mood changing effects was asked to the 397 respondents of the total sample (N=24,531) who were current e-cigarette users at the time of the survey and who were aged 18 years or older. Ever use was defined by: (a) occasional or regular consumption, or (b) experimental use. Associations between ever use (yes/no) and sociodemographic characteristics (age, sex, net household income, education) and smoking status (current vs. ex- and never smoker) were analyzed using multivariable logistic regression. **Results** Amongst current e-cigarette users (18 years and older), 8.2% (95%CI=5.5-10.5) had ever used an e-cigarette to vaporize cannabis: 2.6% (95%CI=1.1-4.0) reported occasional or regular consumption (a), and 5.6% (95%CI=3.4-7.6) experimental use (b) (weighted data). In the subgroup of 18-24-year-olds, these figures were highest with 8.9% and 7.2%, respectively. 88.9% of ever e-cigarette cannabis users were also current tobacco smokers. In the multivariable analysis, the only sociodemographic characteristic associated with ever e-cigarette cannabis use was age (OR= 0.96 per year increase, CI = 0.93-0.99, P=0.003). **Conclusions** Our findings suggest that almost one out of 10 current e-cigarette users in Germany ever used their device to vaporized cannabis, although regular use seems low. E-cigarette cannabis use occurs almost exclusively in current smokers and highest rates of usage can be observed in young adults. Such misuse of e-cigarette devices needs to be monitored consequently to explore whether these products could provide a gateway to smoking cannabis, particularly in young people. **Funding** The DEBRA study is funded by the Ministry of Culture and Science of the German State of North Rhine-Westphalia.

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POS4-148**CIGARETTE SMOKING AMONG PEOPLE LIVING WITH HIV IN SOUTH AFRICA**

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Significance: People living with HIV/AIDS (PLWH) and smoke tobacco are particularly vulnerable to tobacco-induced diseases due to an already compromised immune system. This study aimed to determine prevalence and predictors (among demographic factors and HIV treatment outcomes) of cigarette smoking among PLWH in a study investigating the efficacy of an alcohol-focused intervention in improving adherence to antiretroviral therapy (ART) and HIV treatment outcomes. **Methods:** Participants were from six hospitals in Gauteng Province, South Africa comprising 623 PLWH (57.5% female) identified to be low risk, harmful/hazardous drinkers using the Alcohol Use Disorders Identification Test (AUDIT) and AUDIT-C. Smokers were categorized into non-mutually exclusive groups: "ever smoker" (ever experimented smoking even one or two puffs), "lifetime smoker" (smoked 100 sticks of cigarettes in a lifetime), "current smoker" (past 30 days smoking) and "regular smoker" (smoked on 20 of the past 30 days). Fagerstrom test for nicotine dependence (FTND) was used to assess nicotine dependence and results categorized as "minimally dependent" and "moderately/highly dependent." Chi Square test and logistic regression analysis were conducted using STATA 14.0. **Results:** Almost half of the participants reported ever smoking (44.2%) of which lifetime smokers were 77.8% and former smokers 18.1%. Current smokers were 34.5% with 79.7% being regular smokers. Of current smokers, 36.7% were moderately/highly dependent on nicotine. Compared to females, males were about 8, 9, 13, and 3 times more likely to be ever smokers, lifetime smokers, current smokers, and regular

smokers respectively. Other demographic characteristics most significantly associated with smoking include; ever smokers: less likely to have completed secondary education (OR=0.41; CI: 0.21-0.78); lifetime smokers: less likely to have completed a tertiary education not a degree (OR=0.06; CI: 0.01-0.57); current smokers: more likely to be employed (OR=1.79; CI: 1.23-2.60), and regular smokers: more likely to be aged 35-44 years (OR=27.43; CI: 2.50-300.51). Years on ART and viral load were not significantly associated with smoking. **Conclusion:** Smoking prevalence in this study is 12% higher than the general population in South Africa. Smoking cessation interventions tailored for PLWH who smoke are needed.

FUNDING: Other

POS4-149**PREVALENCE AND CORRELATES OF EXPOSURE TO E-CIGARETTE AND CIGARETTE ONLINE ADVERTISEMENT AMONG ADOLESCENTS IN A COUNTRY WHERE E-CIGARETTES ARE BANNED**

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ABSTRACT **Background:** Given relatively weak ad regulations for e-cigarette and cigarettes and increasing exchange of e-cigarette-related information on social media, it is important to understand the prevalence and correlates of online ad exposures among youth. This study examined this issue among adolescents in Mexico, among whom e-cigarette use is unexpectedly high. **Methods:** We analyzed data from a 2016 representative survey of 8030 middle-school students in Mexico. Students reported on the frequency of exposure to online ads for cigarette and, separately, for e-cigarettes in the last 30 days (any vs. none). Adjusted odds ratios (AOR) were estimated using generalized estimating equation (GEE) models that regressed exposure to online ads for cigarettes and e-cigarettes on sex, socioeconomic status (SES), sensation seeking, alcohol use, drug use, smoking, e-cigarette use, network member use of e-cigarettes and/or cigarettes, e-cigarette social acceptability, use of social media, and positive orientation toward new technologies (technophilia). **Results:** Results indicate that independent correlates of exposure to both e-cigarette and cigarettes online ads included: being female, having higher SES, higher sensation seeking, higher technophilia, having family members who used both products, using drugs or alcohol, and using social media. Independent associations that were unique to exposure to online e-cigarette ads included e-cigarette use (AOR=2.21), friend use of e-cigarettes (but not cigarettes) (AOR=1.50) and e-cigarette social acceptability (AOR=1.31). Although smoking was not associated with exposure to online e-cigarette advertisement, it was independently associated with exposure to online cigarette ads (AOR=1.30). **Conclusions:** This study suggest that most risk factors for exposure to e-cigarette and cigarette ads are shared, although some risk factors appear unique to e-cigarette ad exposures. Future studies should evaluate whether companies market their products to youth, including relatively low risk adolescents who enjoy new technologies and use social media.

FUNDING: Federal

POS4-150**PREVALENCE, MOTIVATIONS, AND CORRELATES OF THE FREQUENCY OF E-CIGARETTE USE AMONG MEXICAN ADOLESCENTS**

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Significance: E-cigarette advertising and sales are banned in Mexico. Nevertheless, adolescents can easily acquire e-cigarettes from convenience stores and friends. Most research on youth use of e-cigarettes has been conducted in high-income countries, with little known about this phenomenon in middle-income countries. The aim of this study was to estimate the prevalence of e-cigarette use and to assess the correlates of more frequent e-cigarette use among Mexican adolescents, including motivations for use. **Methods:** Data come from a representative sample of 8718 students who participated in a school-based survey in 57 public middle schools randomly selected from the three largest cities in Mexico. The prevalence of e-cigarette use and conventional cigarettes



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were estimated. Then, among current e-cigarette users (n=1080), we estimated the main reasons for e-cigarette use. Finally, we estimated adjusted censored truncated Poisson models among current users to determine the independent correlates of more frequent use. **Results:** The prevalence of e-cigarette use (12.4%) was higher than the prevalence of current smoking (10.9%). Among current users, the main motivations for e-cigarette use were curiosity (67.1%) and to smoke fewer cigarettes (16.4%). E-cigarette use frequency was positively associated with being male (ARR=1.63 95% CI 1.36-1.95), using illegal drugs, (ARR=1.32 95% CI 1.06-1.65), having a family member who uses e-cigarettes (ARR=1.26 95% CI 1.02-1.56), the perception of e-cigarettes as social acceptable (ARR=1.36 95% CI 1.02-1.55) and exposure to e-cigarette ads online (ARR=1.25 95% CI 1.01-1.54). **Conclusions:** More middle-school students use e-cigarettes than cigarettes in Mexico, in spite of its e-cigarette ban. Some correlates of e-cigarette use frequency were different among Mexican adolescents compared from youth to other countries with weaker e-cigarette regulations (i.e., being a current smoker and use of e-cigarettes with nicotine were unassociated with frequency of e-cigarette use). Other correlates (i.e., drug use, having a family member who uses e-cigarettes) appear to be important risk factors across sociocultural and regulatory contexts.

FUNDING: Academic Institution

POS4-151

THE AVAILABILITY AND PRICE OF THE VUSE SOLO RECHARGEABLE DIGITAL VAPOR CIGARETTE IN THE UNITED STATES, 2015

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Significance: R.J. Reynolds, the second largest US tobacco company, nationally launched the Vuse Solo Original Rechargeable Digital Vapor Cigarette in 2014. Vuse was the sales leader in this product category until 2017. This study examines retail availability of a product that could ostensibly replace cigarettes in a national sample of tobacco retailers in the US, with a focus on differences by neighborhood demography, and compares availability and price to leading cigarette brand Marlboro. **Methods:** Between 3 and 6 months after the Vuse national retail expansion was completed, data collectors recorded the availability, price and discounts of Vuse and Marlboro Red cigarettes in a national sample of 2,124 tobacco retailers that sold cigarettes in 2015. A multilevel generalized model (retailers clustered in 97 counties) was used to examine the availability of Vuse as a function of census tract demographic characteristics. Tract characteristics included percentage of Black, Asian/Pacific Islander, and Hispanic residents, youth, and persons living below the federal poverty line. **Results:** Vuse was sold in only 35% of all tobacco retailers and in 44% of retailers that sold any type of e-cigarette. By comparison, Marlboro cigarettes were available in 99% of retailers. Vuse prices ranged from \$5.60 to \$14.99, but 84% of retailers sold the product for \$9.99. Marlboro cigarettes were cheaper ($M=\$6.65$, $SD=1.55$). Although discounts on cigarettes were advertised in 73% of retailers, discounts for Vuse were offered in only 8.5% of retailers. Retailers had a lower odds of selling Vuse in neighborhoods with greater proportions of Black ($OR=.83$, 95% CI=.73, .94) and Hispanic ($OR=.83$, 95% CI=.72, .95) residents. There were no differences in the odds of Vuse availability by % Asian/PI, youth, or residents in poverty. **Conclusions:** Promotional strategies that encourage product adoption, such as widespread distribution and discounts were not evident in the introduction of Vuse. Availability was limited and less common in neighborhoods with a greater percentage of Black and Hispanic residents. A higher price than cigarettes would discourage product trial among price-sensitive smokers.

FUNDING: Federal

POS4-152

ENVIRONMENTAL DAMAGE FROM TOBACCO POLLUTION OF AIR AND WATER ON THAILAND BEACHES

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Background Cigarette butts are non-biodegradable plastic and contain dangerous chemicals in filter material. Pollution from secondhand smoke and cigarette butt waste on congested beaches in low- and middle-income countries (LMIC) has received relatively little attention, and its assessment is important for environmental protection and human health. **Methods:** We conducted an observational investigation to assess availability of cigarettes, population of smokers, warnings not to smoke, and number of cigarette butts on two popular public beaches in Thailand. We also took 88 point-source measures of PM 2.5 levels in beach lounge areas using equipment and protocols previously used for the assessment of secondhand smoke in outdoor locations. On an additional 11 beaches, sieved sand samples were collected to characterize butt counts at various beach locations. **Results:** Smoker density and child populations varied with up to 100 total population, 4 smokers and 15 children in a 400 square meter area. This translates to 50 or more smokers along a 250 meter beach front area. In less than eight hours of cigarette butt collection by 2 persons, 2,810 butts were collected at one beach and 3,666 butts collected at the second beach with 56% collected in beach lounge areas. Peak PM 2.5 exposure from the two beaches reached as high as 716 and 1,335 $\mu\text{g}/\text{m}^3$ in samples taken within 2 meters from active smokers. Also, butt counts from ten one meter square sieved sand samples collected on 11 beaches averaged from 0.25 to 13.3 per square meter. **Conclusion:** Pollution of beaches is evident by the number of cigarette butts and the level of secondhand smoke exposure in Thai beach areas. In Thailand and similar LMIC where beaches are heavily used, we recommend a consumer education approach which highlights pollution dangers to children and the natural environment, followed by a ban of smoking on beaches.

FUNDING: Academic Institution

POS4-153

IMPACT OF BRIEF NICOTINE EDUCATION ON NICOTINE RELATED BELIEFS IN A U.S. ONLINE SAMPLE

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SIGNIFICANCE

Public education about nicotine will be an essential complement to FDA's nicotine policies to move smokers away from combusted tobacco products and prevent non-users from trying nicotine and tobacco products, yet few studies have examined educational messages on nicotine beyond FDA's warning on nicotine's addictiveness. The goal of the current study was to test the effect of a single, brief exposure to nicotine education messages on beliefs about nicotine, nicotine replacement therapy (NRT), e-cigarettes, and reduced nicotine content (RNC) cigarettes. **METHODS**

In this study, 521 U.S. adults (aged 18+) on Amazon Mechanical Turk completed a 15-minute survey. After completing items on sociodemographics, literacy, and cancer risk behaviors, participants were randomized in a 2:1:1 ratio to one of three conditions: nicotine education (n=263), sun safety education (attention control, n=128), no message control (n=130). All participants completed items regarding nicotine, NRT, e-cigarette, and RNC cigarette beliefs, as well as norms about nicotine use, behavioral control regarding cigarette/tobacco use, and intention to use cigarettes, NRT, e-cigarettes, and low nicotine cigarettes in the next 12 months. **RESULTS**

Following exposure, participants in the nicotine education reported fewer false beliefs about nicotine ($p<0.001$), NRT ($p<0.001$), and RNC cigarettes ($p<0.05$) compared to the two control conditions. Importantly, the nicotine education condition doubled the probability of a correct response (false, 78.3% vs. 36.8%) to "nicotine is a cause of cancer" and dramatically reduced the probability of responding "don't know" to this item (5.3% vs. 26.0%). Of particular interest, the impact of the educational intervention was specific to nicotine; in the absence of intervention messages on e-cigarettes, there was no impact on false beliefs about e-cigarettes ($p=0.18$). **CONCLUSIONS**

These results support that a nicotine education intervention is likely to have a strong effect on nicotine, NRT, and RNC cigarette beliefs. They also suggest that adding targeted messages on e-cigarettes would reduce false beliefs about these products.

FUNDING: Federal; Academic Institution



POS4-154

JUST-IN-TIME REMINDERS AND Lapses AMONG ASIAN AMERICAN YOUNG SMOKERS

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SIGNIFICANCE: Just-in-time (JIT) and personalized reminders have been suggested as effective methods to induce behavioral changes. This study tests the JIT effect of personalized momentary implementation intention (II; "if-then" plan) reminders during a 4-week, mobile app-based, quit attempt (MyQuit USC, MQU), targeting young Asian American smokers (N=57). We hypothesized that 1) on average, participants would be less likely to lapse when receiving an II reminder during a personalized high risk smoking situations (HRSS) than when not receiving the reminder and 2) the effect of JIT reminder would be smaller for the latter period of the 4 weeks, as participants' familiarity with II action for each HRSS would increase. **METHODS:** Asian American current smokers ($M_{age} = 21.7$ yo, 21.5% female) participated in MQU (N=57). At each HRSS window, an II reminder was randomized to be sent out at a 75% rate. A series of generalized linear mixed models were conducted to assess the effect of the II reminder on lapse within 55 minutes of the reminder. **RESULTS:** On average, when receiving JIT reminders (vs. not receiving), participants were less likely to lapse, but not significantly ($b = -.14$, $p = .17$). During the first 2 weeks of MQU, the likelihood of momentary lapse did not differ between when receiving a JIT reminder and when not receiving ($b = -.003$, $p = .98$). Regardless of receiving an II reminder, they were significantly less likely to lapse if they followed their II plans ($b = -.02$, $p < .001$). In contrast, during the latter 2 weeks of MQU, participants were 25% less likely to lapse when receiving an II reminder ($b = -.30$, $p = .046$) than when not receiving the reminder. Also, upon following through with an II plan (vs. when not following), participants were significantly less likely to lapse ($b = -.31$, $p < .001$), controlling for momentary II reminder. **CONCLUSION:** Our findings suggest that the effect of JIT reminders to avoid smoking lapses might vary as a function of time. Contrary to our hypothesis, we found that the effect of JIT reminders in reducing lapses among our participants started to show approximately the 3rd week of cessation attempt. Furthermore, our findings emphasize the important role of carrying out the planned actions in the moment of potential lapses, independent of JIT reminders.

FUNDING: Nonprofit grant funding entity

POS4-155

ADOLESCENT SUSCEPTIBILITY TO CIGARETTE, E-CIGARETTE, AND HOOKAH BY RACE AND ETHNICITY

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OBJECTIVE: Susceptibility is receptivity to using tobacco is predictive of future use. This study examined synchronous susceptibility to cigarettes, e-cigarettes, and hookah in a nationally representative sample of US youth non-tobacco users (N=41,818). **METHODS:** Data were obtained from the 2015, 2016, 2017 National Youth Tobacco Survey (NYTS). Weighted regression models were used to examine susceptibility to smoking cigarettes, e-cigarettes, and hookah by race and ethnicity, adjusting for age, gender, and living with a tobacco (cigarette, e-cigarette, and hookah) user. **RESULTS:** Compared to Whites, Blacks (adjusted odds ratio [AOR]: 0.91) and Asians (AOR: 0.86) were less susceptible to cigarette smoking whereas Latinos were more susceptible to cigarettes (AOR 1.64), e-cigarettes (AOR: 1.53), and hookah (AOR: 1.50). Multi-racial individuals were also more susceptible to cigarette smoking (AOR: 1.05). Overall, adolescents susceptible to smoking cigarettes were more susceptible to e-cigarettes and hookah ($p < 0.0001$). Among those susceptible to cigarettes, Blacks were less susceptible to e-cigarettes and hookah compared to Whites. Among those susceptible to e-cigarettes, Latinos, American Indians and Alaskan Natives, and Multi-racial adolescents were more susceptible to cigarette smoking than Whites ($p < 0.001$). **CONCLUSION:** Susceptibility to tobacco use differed by race and ethnicity. Susceptibility to one tobacco product was associated with susceptibility to other products, which raises concerns about future tobacco use, particularly dual and poly use.

FUNDING: Unfunded; Federal

POS4-156

INVESTIGATING CHANGES IN PRICES OF TOBACCO PRODUCTS IN RELATION TO PLAIN PACKAGING IMPLEMENTATION IN THE UNITED KINGDOM

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Background and aims: In 2016 the United Kingdom implemented plain packaging legislation removing branding from tobacco packaging. The legislation was implemented in conjunction with the measures included in the European Tobacco Products Directive on minimum pack size of 20 for cigarettes and 30 grams for had-rolling tobacco (HRT) and updated health warning library. We investigated changes in the market and pricing of tobacco products in relation to implementation of plain packaging legislation before, during and after legislation was enforced. **Methods:** We used Nielsen Scantrack data on product diversification, volume of sales and pricing for manufactured cigarettes and HRT. We then analysed trends for the time period 2013-2018 to investigate changes in volume of sales and prices for cigarettes and HRT by pack size. We then used regression analysis to explore the association between the increased volume of sales in plain pack and changes in prices. **Results:** Volume of sales for cigarettes consistently reduced though HRT sales raised during the period analyzed. Prices of both cigarettes and HRT increased by about 7% (95% CI: 6 to 8%) in cigarettes (from 37.3 to 40 pence per cigarette) and 11% (95% CI: 10 to 11%) in HRT (from 32 to 35.4 pence per gram) from May 2015 till plain packaging policy was 75% implemented. However, HRT was still considerably cheaper than manufactured cigarettes. **Conclusions:** Implementation of the new legislation was associated with significant price increases in tobacco products though considering price differences between cigarettes and HRT might encourage switching to cheaper products instead of quitting.

FUNDING: Nonprofit grant funding entity

POS4-157

ASSOCIATIONS BETWEEN CHILDHOOD TRAUMA AND RETROSPECTIVE REPORTS OF INITIAL REACTIONS TO SMOKING

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Significance: Exposure to childhood trauma has been linked to a wide range of negative health outcomes, including tobacco use. However, the mechanisms underlying these associations are unclear. Both animal and human models have shown that early life stress alters reward-related neural circuitry, which may sensitize response to psychostimulants, such as nicotine. Given that initial reactions to smoking are an important predictor of subsequent use and dependence, we examined whether exposure to childhood trauma was associated with increased reports of positive, negative, or dizzy reactions to initial smoking in a large, nationally representative sample. **Methods:** Data were drawn from Wave III (collected at ages 18-26) of the National Longitudinal Study of Adolescent to Adult Health. Participants who had ever tried smoking (n=11,012) provided retrospective reports of initial reactions to smoking and history of sexual abuse, physical abuse, or neglect occurring before 6th grade. Linear regression models were used to examine associations between childhood trauma variables and initial reactions to nicotine based on a 9-item scale, with responses grouped into positive, negative, and dizzy factors based on prior literature. **Results:** Controlling for covariates, childhood physical abuse and neglect were both associated with greater negative reactions ($B = .45$ and $.37$, $p < .0001$) and dizziness ($B = .18$ and $.13$, $p < .0001$). Childhood physical abuse was also associated with greater positive reactions ($B = .27$, $p < .0001$), but the effect of neglect was minimal ($B = .16$, $p < .05$). Childhood sexual abuse—which occurred in less than 5% of the sample—was not associated with any initial reactions factor. **Conclusions:** These results suggest a nonspecific increase in sensitivity to nicotine among individuals exposed to childhood physical abuse or neglect, which could represent an important mechanism of risk. Risk for smoking among those exposed to childhood sexual abuse may operate via a different pathway, but results are potentially limited by retrospective recall and infrequent occurrence of sexual abuse in this sample. Prospective analyses are needed to further examine the specific contributions of different types and timing of childhood trauma and initial reactions to smoking, at time of first exposure.

FUNDING: Federal



SRNT

POS4-158

INSPECTING CORPORATE DETERMINANTS OF HEALTH: SALES-TO-MINOR VIOLATIONS BY CORPORATE BRAND AND ASSURANCES OF VOLUNTARY COMPLIANCE, 2012-2017, USA

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SIGNIFICANCE: Corporate decisions and priorities are an important determinant of public health. Yet, little research has examined compliance with tobacco control laws by store brand. In addition, some corporations are subject to a legal intervention to reduce sales to minors called an Assurance of Voluntary Compliance (AVC). These agreements between some state attorneys general and one or more of 16 corporations require specialized employee training and retail signage about ID checks. AVC efficacy has received limited attention. Thus, we used public data from the Food & Drug Administration (FDA) inspections of retail locations over six years (2012-2017) to (1) compare retail violation rates (RVR) by corporate brand and (2) examine whether AVCs were associated with reduced likelihood of failing a sales-to-minor inspection. **METHODS:** We developed syntax to identify sales-to-minors inspections (n=101,356) at retail locations for 16 corporate brands, taking into account 66 subsidiaries and more than 100 spelling variations. Using three-level generalized linear mixed models to account for dependence at the state and ZIP-code levels and adjusting for known state- and neighborhood-level predictors of sales to minors, we assessed the independent associations of store brand (compared to Wal-Mart) and AVC with violations (within-brand comparison between inspection in states with/without AVCs). **RESULTS:** Brands averaged a 13.5% RVR (min=4.2% at Rite Aid, max=24.0% at ConocoPhillips). Compared to Wal-Mart (RVR=7.7%), 7-Eleven, BP/Amoco, Chevron, Conoco, Exxon, Kroger, Shell, and Valero were significantly more likely to fail a sales-to-minor inspection. AVC-covered locations for six corporate brands were associated with significantly reduced likelihood of a violation. However, the opposite was found for Walgreens and Wal-Mart. **DISCUSSION:** Corporate branding is associated with the likelihood of a sale to a minor, and compliance with regulations should be considered a corporate determinant of health. Inspections programs should consider the role of corporate brand in targeting inspections and retailer interventions. Stronger longitudinal, panel evaluations of AVCs are warranted.

FUNDING: State

POS4-159

A CROSS SECTIONAL SURVEY OF INTERNET USE AMONG A HIGHLY DISADVANTAGED POPULATION OF TOBACCO SMOKERS

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Background: Tobacco smoking is highest among population groups which are the most socioeconomically disadvantaged. Internet-based smoking cessation programs have been found to be effective, though rates of internet access are not well known in disadvantaged populations. This study describes the rates of internet use and types of technology used to access the internet by a population of socially disadvantaged smokers. The study also examined relationships between sociodemographic and smoking behaviours with amount of internet use and type of device used. **Methods:** A cross-sectional survey of 369 clients (response rate 77%) from two non-government community service organisations in Australia was conducted. Descriptive statistics were calculated, and logistic regressions were used to examine sociodemographic and smoking factors related to at least weekly internet usage and devices used to access the internet. **Findings:** Over half (58%) of the participants reported weekly or more frequent use of the internet with less than a third (28%) not having any access. The odds of using the internet at least weekly decreased with age and as heaviness of smoking increased (OR = 0.94, p<0.001; OR = 0.81, p = 0.022, respectively). Odds of internet use were higher as income increased (OR = 2.74, p < 0.001 for individuals earning \$201-\$400 per week; OR = 2.83, p= 0.006 for individuals earning >\$400 per week). The odds of using a smartphone (OR = 0.92, p<0.001), tablet (OR = 0.96, p = 0.008), or other person's device (OR = 0.97, p= 0.021) to access the internet in the last 12 months decreased as age increased. The relationship between internet use and interested in using the internet to support health was significant (OR = 1.68, p = 0.048). **Conclusion:** Results suggest younger individuals, who are on the higher end of the low income scale, and who have a lower level of nicotine addiction may therefore benefit

most from an internet-based intervention aimed at socially disadvantaged individuals. It may be that internet use is more prominent in this population than believed with a lower proportion than expected not having access.

FUNDING: Federal

POS4-160

NATIONAL ESTIMATES OF POISONING EVENTS RELATED TO LIQUID NICOTINE IN YOUNG CHILDREN TREATED IN US HOSPITAL EMERGENCY DEPARTMENTS, 2013-2017

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Significance: An estimated 2 million youth (in 2017) and 7.9 million adults (in 2015) reported currently using electronic nicotine delivery systems (ENDS). Reports of poisoning events related to liquid nicotine (e-liquids) in ENDS have been on the rise, but current, nationally-representative estimates of hospital-treated poisoning cases related to e-liquid nicotine exposure in the United States (US) are lacking. **Methods:** We used National Electronic Injury Surveillance System (NEISS) data from 2013 to 2017 to calculate national estimates with 95% confidence intervals (CIs) of poisoning incidents related to e-liquid nicotine exposure. We conducted a text search of the narratives including ENDS and e-liquid related keywords and used diagnosis code (68- "Poisoning") to obtain e-liquid poisoning events. Since product codes were not specific to ENDS, we reviewed these events related to ENDS and poisoning, and excluded events not related to e-liquid poisoning. Weighted distributions of characteristics (age groups, sex, route of exposure, and disposition) were examined. All analyses were conducted in SAS program. **Results:** From 2013 to 2017, 4,745 poisoning cases related to e-liquids among children under age 5 were treated in US hospital emergency departments; the number of cases increased from 181 (95% CI: 0-369) in 2013 to 1,736 (95% CI: 871-2602) in 2015 and then decreased to 411 (95% CI: 84-738) in 2017. Most of the cases were treated and released from the hospitals, but about 4.1% were admitted. The most common route of exposure was through ingestion (99.1%), and in 2014, 5.4% of the cases were through dermal exposure. **Conclusions:** This study provides national estimates of poisoning cases related to nicotine exposure from e-liquids among children under age 5. Since NEISS data do not include product codes specific to ENDS nor provide information on severity of poisoning, we had to use general keywords to capture these events, which might underestimate the burden. Information from this study may inform tobacco regulation and public education efforts to prevent unintended nicotine exposure to e-liquids in ENDS among children.

FUNDING: Federal

POS4-161

TOBACCO USE ASSESSMENT AMONG ADOLESCENT PRIMARY CARE PATIENTS

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Significance: Tobacco use is the leading cause of preventable death in the United States. Identifying adolescents who are using tobacco is critical for targeting those who need cessation assistance to prevent continued use into adulthood. We know that adults are often assessed for tobacco use but little is known about the percent of adolescent patients in safety-net settings who are assessed and whether this differs by patient demographics. This study examines the prevalence of adolescent patients assessed for tobacco use and the patient and clinic variables associated with increased odds of assessment. **Methods:** Electronic health records data were extracted from the OCHIN network of clinics across the US from patients 10-19 years of age seen at ≥ 1 primary care or school-based health center visit between 1/1/2015-12/31/2016. Tobacco use assessment was dichotomized (coded 'yes' if assessment of tobacco use was documented at ≥ 1 visit in study period). Patient covariates included sex, age, race/ethnicity, household income as percent of federal poverty level (FPL), diabetes diagnosis, asthma diagnosis, substance use disorder, psychiatric disorder, number of visits, insurance type, and urban/rural primary clinic. Logistic regression was used to model adjusted odds of tobacco use assessment. **Results:** Among the 94,664 adolescents with ≥ 1 visit in the study period, 61.6% (n=58,267) had tobacco use assessed at least once during the study period. Adjusted odds of having tobacco use assessed were higher among older adolescents, those with more visits, those seen in rural clinics,



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those in households with incomes >138% of the FPL, and those with a diagnosis of asthma, psychiatric disorder, and substance use disorder. Hispanic adolescents had lower odds of being assessed for tobacco use than non-Hispanic white adolescents (aOR: 0.94; 95% CI: 0.90,0.98). Compared with commercially insured patients, those with Medicaid insurance had higher odds (aOR: 1.65, 95% CI:1.58,1.72) of being asked about tobacco use and those that were uninsured had lower odds (aOR: 0.91; 95% CI: 0.86,0.96). There were no significant differences in tobacco use assessment by sex or diabetes diagnosis. **Conclusions:** Disparities exist in the assessment of tobacco use among adolescent patients seeking care in safety-net settings, in particular by patient socioeconomic status and race/ethnicity. Future research is needed to determine the etiology of these differences to ensure all adolescents are screened for tobacco use and provided assistance, if needed.

FUNDING: Federal

POS4-162

AN INVESTIGATION OF THE EFFECTS OF MULTIPLE DIMENSIONS OF SOCIAL CAPITAL ON SMOKING IN AUSTRALIAN ADULTS

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Significance: The concept of social capital has been studied with regard to its impact on health behaviours including smoking. Recent research focused on different aspects of social capital such as structural and cognitive elements and their impact on health and well-being. However, there are few studies examining the effects of multiple dimensions of social capital on smoking. The primary aim of the study was to investigate the associations between structural and cognitive aspects of social capital and smoking among Australian adults aged 18 and above. **Methods:** This study used a cross-sectional data (N=16,644) from the wave 14 of the Household, Income and Labour Dynamics in Australia (HILDA) Survey, collected from July 2014 to February 2015. Multivariate logistic regression analyses were performed to assess relationships between multi-dimensions of social capital and smoking status, controlling for socio-demographic characteristics and health status. To estimate population characteristics of the Australian adults, the complex survey design components (i.e., sample weights, strata and clusters) were incorporated into the analyses. **Results:** The analyses indicated that two subscales of structural social capital - informal social connectedness and civic engagement - were significantly related to smoking status. Participants who had a greater level of informal social connectedness were more likely to be a smoker ($OR=1.120, p=.017$). In contrast, those who exhibited a greater level of civic engagement were less likely to be a smoker ($OR=.647, p<.0001$). Additionally, two subscales of cognitive social capital - tangible support and social trust - were inversely associated with smoking. **Conclusion:** There were significant relationships between structural and cognitive components of social capital and smoking status, but these relationships varied across different components depending upon factors, such as long-term health conditions. Findings suggest that future tobacco control interventions and policies should consider fostering multiple dimensions of social capital at individual, community and societal levels, relating to smoking cessation and other health outcomes.

FUNDING: Unfunded

POS4-163

BEING DIAGNOSED WITH SMOKING RELATED HEALTH PROBLEMS AND REPORTING OF QUITTING AND VAPING

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Significance This paper relates self-reported health conditions to quitting and vaping. We expected to find greater quitting where smoking had affected smokers' health; but were less certain as to what to expect for vaping. **Methods** Data came from the 2016 wave of the International Tobacco Control Four Country Smoking and Vaping Survey conducted in Australia, Canada, England and the US. We asked current smokers and recent quitters (n=11, 344) whether they were being treated for or diagnosed with heart disease, cancer, chronic lung disease and diabetes, and if they were worried that smoking had damaged their health (all respondents), and were worried that smoking might affect their health in future (current smokers), along with questions on sociode-

mographics, quitting and vaping. **Results** All disease related variables were associated with increased likelihood of making quit attempts in the last 12 months; and those with cancer (adjusted OR=1.5, p<0.05), lung disease (AOR=1.3, p<0.05) and those worried about past (AOR=1.8, p<0.001) and future health effects (AOR=3.6, p<0.001) were more likely to be planning future attempts. Smokers who worried that smoking might affect their health in future (AOR=1.3, p<0.05) were more likely to be current users of vaping devices, compared to those that did not worry. Among respondents who made quit attempts in the last year (n=6,293) there were no differences in vaping to quit by any health variable. Those worried about future health effects were more likely to report using NRT (AOR=1.6, p<0.05), and those with diabetes (AOR=1.8, p<0.01) and worries that smoking had damaged their health (AOR=1.6, p<0.05) were more likely to use varenicline or bupropion, in their last quit attempt. **Conclusions** Smoking related health problems help to motivate smokers to make quit attempts. However, people with these health problems are not more likely to use vaping on quit attempts. Smokers who worry about future health effects of smoking are more likely to use NRT on their last quit attempt and be current vapers. More could be done to motivate those already affected to try to quit more and to use effective methods to do so.

FUNDING: Federal; Academic Institution; Other

POS4-164

WHAT IS THE BEST WAY TO ASSESS CURRENT E-CIGARETTE USE AMONG YOUNG ADULTS?

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Significance: Epidemiologic studies of tobacco product use behavior rely on survey methods. Such studies commonly use past-30-day use as a proxy for current use. E-cigarettes are unique among tobacco products because of lower perceived harm, which may encourage prolonged casual or occasional use, especially among youth and young adults. We do not know whether past-30-day use underestimates or overestimates current e-cigarette use. In addition, we do not know whether frequency of past-30-day use is a better predictor of e-cigarette dependence when assessed in terms of number of days used or number of times used. **Methods:** Cross-sectional data were collected from N = 2622 young adult college students (18-25 years old; 54% women). Participants were asked Q1) whether they currently used e-cigarettes (daily, less than daily but weekly, less than weekly but monthly, less than monthly, and not at all); Q2) how many days in the past 30 days they used e-cigarettes (0 days, 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29 days, daily); and Q3) how many times in the past 30 days they used e-cigarettes (0 times, 1-10 times, 11-20 times,...., over 100 times). E-cigarette dependence was assessed among self-identified current e-cigarette users. **Results:** Thirty-one percent of the sample (i.e., n = 812) could be classified as current users based on Q1, 25% (n = 656) based on Q2, and 29% (n = 768) based on Q3. According to Q1, 41% self-identified current e-cigarette users reported being "less than monthly" users. Among current e-cigarette users (as identified by Q1), Q3 ($\beta = .66, p < .0001$) was a stronger predictor of e-cigarette dependence than Q2 ($\beta = .56, p < .0001$), adjusting for age, gender, ethnicity, and parental income. **Conclusions:** Among young adult college students, assessing current e-cigarette use based on past-30-day use, particularly number of days used in the past month, may underestimate the proportion of current users. Additionally, past month frequency of use based on number of times used rather number of days used may be a better predictor of e-cigarette use dependence. Surveys may benefit from employing multiple measures to ascertain current e-cigarette use among young adults.

FUNDING: Nonprofit grant funding entity

POS4-165

STATEWIDE TRENDS AND VARIATION IN OTP USE AMONG MIDDLE SCHOOL YOUTH

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Significance. While current use of a tobacco product has declined over time among middle school students, use of other tobacco products (OTPs) than cigarettes has increased. However, it is unclear which demographic sub-groups of middle school students are using OTPs, which OTPs are being used most, and the frequency with



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which middle school students are using OTPs (e.g., in the past 30 days, ever). **Methods.** We used cross-sectional data of 3,195 adolescents in middle school (response rate, 65.4%) from the 2017 North Carolina Youth Tobacco Survey. Adolescents were asked whether they used OTPs in the past 30 days including e-cigarettes, cigars, little cigars, cigarillos, smokeless tobacco, hookah, roll-your-own cigarettes, and other (i.e., pipe tobacco, snus, dissolvable tobacco, and bidis). Logistic regressions examined correlates associated with current and ever OTP use including e-cigarettes (compared to never OTP use). Because of the especially high rates of youth e-cigarette use, separate additional models looked at correlates associated with current and ever e-cigarette use (compared to never e-cigarette use). **Results.** E-cigarettes (5.3%) were the most commonly used OTP among middle school students and OTP use increased with age. Ever and current cigarette smokers had higher odds of being an ever OTP user (AOR: 13.45; 95% CI: 7.87, 22.97; AOR: 8.99; 95% CI: 2.45, 33.01, respectively) and ever e-cigarette user (AOR: 7.73; 95% CI: 4.75, 12.58; AOR: 7.69; 95% CI: 3.53, 16.72, respectively) compared to never cigarette smokers. Hispanic students had higher odds of being a current OTP user compared to white students (AOR: 2.26; 95% CI: 1.12, 4.57). African American students had higher odds of being an ever OTP user compared to white students (AOR: 1.57; 95% CI: 1.03, 2.41) but lower odds of being a current e-cigarette user (AOR: 0.29; 95% CI: 0.13, 0.64). **Conclusions.** Findings indicate high experimentation with tobacco products other than cigarettes among middle school students. Patterns of OTP and e-cigarette use differ across race and ethnicity. Early tobacco prevention tailored to minorities and focused on the harms associated with OTPs is essential to reduce tobacco use rates among adolescents.

FUNDING: Federal

POS4-166

A LONGITUDINAL QUALITATIVE ANALYSIS OF SMOKING TO VAPING TRANSITIONS

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SIGNIFICANCE: Although many smokers begin using electronic nicotine delivery systems (ENDS) to quit smoking, smoking to vaping transitions follow varying trajectories and may result in cessation, dual use, or relapse to smoking. Few longitudinal qualitative studies have probed smokers' experiences as they attempt to replace smoking with vaping and little is known about the factors that shape the trajectory they follow. **METHODS:** Using a mixed methods approach involving a smart e-cigarette, a daily diary survey, and an intake and four fortnightly in-depth interviews, we probed whether and how 15 smokers transitioned from smoking to vaping over an eight-week period. We recruited smokers of varying ages and nicotine dependence who all wished to make a smoking cessation attempt. This abstract reports data from the longitudinal in-depth interviews, which we analysed using an interpretive phenomenological analysis approach. **RESULTS:** We identified three key themes in participants' experiences. First, all described how smoking was embedded in their social interactions, and many began their transition concerned with how they would re-create physical smoking attributes such as the hand- and mouth-feel of a cigarette, nicotine hit and inhalation experience, and visual components, such as smoke. Second, those who fully or partly transitioned to vaping developed a taste aversion to smoking and had strong vaping flavour preferences. Third, those who transitioned fully to vaping found their affiliation with other vapers increased; they noticed vaping more, felt cued to vape when they saw others vape, and became more assertive in how and where they vaped. However, some also reported feeling outsiders, particularly if smoking remained normative in their social group. **CONCLUSION:** Smokers beginning to vape may need guidance about how to use vaping to recreate attributes of smoking they value. Some may also need to manage the stigma of vaping, which implicitly threatens normative smoking practices and may prompt dual use patterns or even reversion to smoking.

FUNDING: Nonprofit grant funding entity

POS4-167

DO REASONS FOR THE REGULAR USE OF VAPORIZED NICOTINE PRODUCTS AND FOR STOPPING THEIR USE VARY BY SMOKING STATUS, AGE, COUNTRY AND DEVICE TYPE? FINDINGS FROM THE 2016 ITC FOUR COUNTRY SMOKING AND VAPING SURVEY

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Background: Use of vaporized nicotine products (VNPs) globally has increased rapidly in recent years. Understanding factors influencing reasons for vaping and stopping use may help inform strategies to encourage or discourage VNP use.

Aim: To examine differences in reasons for regular VNP use and its discontinuation by smoking status, age, country and device type.

Methods: Adult current (n=2381) and former (n=1109) daily/weekly VNP users from the 2016 ITC survey conducted in Australia, Canada, England, and the United States were analysed based on their reported reasons to use and stop using VNPs.

Results: *Reasons to vape daily/weekly:* ex-smokers were more likely than current smokers to cite reduced harm to others (adjusted odds ratio [AOR]=1.68, p<.05) and enjoyment (AOR=2.25, p<.001); vapers aged 40+ were more likely to cite affordability (p<.05) and help with cutting down smoking (p<.01) but less likely to cite enjoyment (p<.05) and reduced harm to others (p<.05) than 18-24 group; Australian vapers were more likely to cite helpfulness for smoking cessation, enjoyment and affordability than vapers from other countries (all p<.05); tank users were more likely to cite enjoyment (p<.01), affordability (p<.001), cutting down (p<.001) and smoking cessation (p<.001) than disposable users. *Reasons to stop daily/weekly vaping:* ex-smokers were more likely to cite addiction concerns (AOR=2.86, p<.001) but less likely to cite product dissatisfaction (AOR=0.28, p<.001) than current smokers; ex-vapers aged 18-24 were more likely to cite addiction concerns, affordability, and public discomfort than 25+ group (all p<.05); Australian ex-vapers were more likely to cite public discomfort than US (p<.01) and England ex-vapers (p<.05) but less likely to cite product dissatisfaction (p<.05); non-disposable users were more likely to cite inconvenience but disposable users were more likely to cite cost (p<.05). **Conclusions:** Motivations to vape regularly and to discontinue use are both dependent on smoking status, age, country of residence and choice of device used, underscoring the need to consider these factors when designing interventions to either encourage or discourage VNP use.

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POS4-168

INDUSTRY INTERFERENCE - A PROPOSED CONCEPTUAL FRAMEWORK

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Background: A growing proportion of global burden of disease can be attributed to commercialization of products like tobacco, alcohol, and sugar-sweetened beverages that are backed by industry giants. These industries, often politically and economically influential, frequently utilize an array of tactics to promote their products to the detriment of public health. Studies, for example, have shown that evidence-based public health policies have been opposed or watered down in the battle between health and profit. Despite the recognition that industry interference has been hampering policy adoption and implementation efforts, few attempts have been made to conceptualize industry tactics and to compare them across public health issues. This study proposes a conceptual framework that illustrates the domains of industry interference by drawing on literature pertaining to tobacco, alcohol, and sugar-sweetened beverages. **Method:** A scoping review was undertaken in March 2018 via PubMed, Scopus, EconLit, Business Source Complete, Global Health Observatory, Grey, Literature Report, Communication Initiative Network as well as watchdog websites to identify studies pertaining to industry tactics published in English. Subsequently, a grounded theory approach was undertaken to analyze published papers and to construct the conceptual framework. **Results:** Six domains of industry interference were identified across the three industries and illustrated in the framework: 1) challenging science, 2) creating a positive public image, 3) manipulating economics, 4) influencing government policy making and implementation, 5) mounting legal challenges, and 6) anticipating future scenarios. **Conclusions:** Advocates can use this framework to devise strategies to counter industry interference.



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Studies can also be undertaken to explore the applicability of this framework with other industrial epidemics. Such evidence will contribute to actionable knowledge as well as theory development.

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POS4-169

PATTERNS OF CIGARETTE SMOKING AMONG US ADOLESCENTS, NATIONAL YOUTH TOBACCO SURVEY 2017

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Significance. Although cigarette smoking is at a historic low, over 1.3 million US middle (2.1%) and high school (7.6%) students reported past-30-day cigarette smoking in 2017. To better understand youth quitting intentions and behaviors, this study assessed associations between cigarette smoking patterns and quitting behaviors among US youth. **Methods.** Data from the 2017 National Youth Tobacco Survey were used to assess intention to quit and past year quit attempts among US students in grades 6-12 who reported past-30-day cigarette use (N=973). Independent variables included the number of cigarettes smoked per day (CPD, 1-10 versus ≥ 11), time since first trying cigarette smoking, and thoughts about smoking cigarettes in the coming year (intention to smoke). Assessed covariates included: sex, age, race/ethnicity, current (past-30-day) non-cigarette tobacco product use, time to first tobacco use in the morning, exposure to tobacco product advertisements, harm perceptions of someday versus daily cigarette smoking, beliefs about all tobacco products being dangerous, and whether the respondent lived with a cigarette smoker. Data were assessed using multivariable adjusted logistic regression. **Results.** Among cigarette smokers, 62.6% intended to quit smoking, and 62.1% made one or more quit attempts in the past year. In adjusted models, the odds of intending to quit was significantly ($p<0.05$) higher among those with lower CPD (AOR=2.52) and who were current e-cigarette users (AOR=1.79), agreed that all tobacco products are dangerous (AOR=2.98), and had no intention to smoke in the next year (AOR=4.18). The odds of making a quit attempt were significantly higher among those with lower CPD (AOR=3.58), and who were current e-cigarette users (AOR=1.64), had no intention to smoke in the next year (AOR=5.02), and had longer time since first trying smoking (AOR=1.12). **Conclusion.** Among US youth, intending to quit and making a quit attempt are greater among those with lower CPD, who do not intend to smoke in the coming year, and who currently use e-cigarettes. These data can inform strategies, including public education campaigns, to prevent youth smoking initiation.

FUNDING: Federal

POS4-170

EXPOSURE TO PRO- AND ANTI-TOBACCO MESSAGES ON THE INTERNET AMONG HOMELESS ADULTS

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Significance: Homeless adults have among the highest rates of tobacco use, yet little is known about exposure to pro- and anti-tobacco messages via the internet and online streaming services among this population. **Methods:** Using time-location sampling, we recruited a sample of unduplicated homeless adults who were current cigarette smokers from emergency homeless shelters, homeless referral programs, and community centers in San Francisco. We administered a survey to explore tobacco use behaviors, use of internet and online streaming services, and exposure to anti-tobacco industry warnings and advertisements for tobacco products. We examined self-reported use of the internet and online streaming services; exposure to advertisements for tobacco products on- and offline; and exposure to anti-industry messages on- and offline. We examined whether demographics or tobacco use status (i.e. cigarette only versus concurrent tobacco product use) were associated with exposure to advertisements for tobacco products or anti-tobacco industry messages via the internet and online streaming services. **Results:** 470 homeless adults completed the survey. The median age was 49.8 (IQR 41-59), 30.7% were female, 44.6% were African American, and 28.6% were White. Most respondents (64.9%) reported using the internet for two hours or more each week and 54.9% reported using online streaming video for more than two hours each week. Nearly half of respondents had seen online advertisements for tobacco products (41.7%) or anti-tobacco industry messages (45.6%). Neither demographic nor tobacco use status

were associated with self-reported exposure to advertisements for tobacco products or anti-tobacco industry messages. The vast majority of respondents had seen advertisements for tobacco products (95.1%) or anti-tobacco industry messages offline (89.6%).

Conclusions: Results suggest that the internet may be an increasingly viable means of communicating with homeless adults, thereby presenting an opportunity to saturate internet and online streaming services with anti-tobacco industry messages before advertisements for tobacco products become as ubiquitous online as they are elsewhere.

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POS4-171

ASSESSING THE STATUS OF STATE TOBACCO CONTROL PROGRAM INFRASTRUCTURE

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Significance. In 2015, the Centers for Disease Control and Prevention (CDC) released the National State-Based Tobacco Control Programs Initiative Funding Opportunity to support state and territorial efforts to implement evidence-based practices for tobacco use prevention and control. Tobacco control programs (TCPs) funded through this mechanism are required to develop and maintain their program infrastructure, as defined by the Component Model of Infrastructure (CMI). CMI considers five factors: multi-level leadership; managed resources; engaged data; responsive plans/planning; and networked partnerships. Monitoring infrastructure is important given that many TCPs struggle to sustain capacity and intervention effectiveness, especially during funding cuts and in the face of an ever changing landscape that includes emerging tobacco products, such as e-cigarettes. **Methods.** During June-September, 2015, structured telephone interviews were conducted with TCP managers in all 50 U.S. states and DC using a 58-item measurement tool to assess status on the five core CMI factors. Descriptive and cross-classification statistical analyses were conducted on CMI items and scales, and qualitative analysis of open-ended questions was performed. **Results.** The CMI measurement tool yielded internally consistent scales, analysis of which revealed wide variation in infrastructure component levels across TCPs. Common infrastructure strengths reported by most TCPs included strong partner support, and strategic plans built with diverse stakeholders. Common infrastructure barriers included insufficient program funding, and limited TCP expertise in policy analysis, surveillance and evaluation, and tobacco-related disparities. **Discussion.** This is the most comprehensive empirical assessment of TCP infrastructure to date, with results suggesting actionable options for developing guidance documents and implementing technical assistance to strengthen TCP infrastructure. The assessment could also serve as a baseline for future efforts to obtain a deeper understanding of modifiable infrastructure factors that might explain variation in program outcomes and help inform future TCP efforts.

FUNDING: Federal

POS4-172

TOBACCO SMOKING AND SOCIODEMOGRAPHIC FACTORS, HEALTH BEHAVIOURS, AND HEALTH STATUS AMONG OLDER INDIGENOUS AND NON-INDIGENOUS ADULTS IN NEW SOUTH WALES, AUSTRALIA

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Significance: Tobacco smoking is the leading contributor to the burden of disease among Indigenous Australians. Smoking prevalence is decreasing among Indigenous Australian adults, but at 41.4% is still high compared to 14.5% in the total Australian population. To inform policy to support continued smoking reduction, we investigated factors associated with smoking prevalence among Indigenous adults, and in comparison with non-Indigenous adults. **Methods:** This cross-sectional study used baseline data collected in 2006-2009 from the 45 and Up Study, a cohort study of adults 45 years and older living in New South Wales, Australia. Data from 1,934 Indigenous participants and 259,401 non-Indigenous participants were used to calculate age-sex-adjusted prevalence ratios (PRs) for current versus never smoking by sociodemographic factors, health behaviours, and health status. **Results:** Smoking prevalence was 21.6% among Indigenous participants and 7.2% among non-Indigenous participants (PR=2.63,



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95%CI:2.44,2.83). Smoking prevalence was significantly lower among Indigenous adults who were older, had higher socioeconomic position (education, employment, income), healthy behaviours (fruit consumption, lower alcohol consumption), and good physical and mental health. Smoking prevalence was not significantly associated with sex, remoteness, physical activity, screen time, vegetable consumption or diabetes status. Associations were generally similar for Indigenous and non-Indigenous participants. **Conclusions:** Smoking prevalence was up to 50% lower among Indigenous adults with higher socioeconomic position, and good physical and mental health. Increased smoking prevalence among Indigenous versus non-Indigenous participants may be partially explained by the lower prevalence of factors associated with being a non-smoker. Socioeconomic and health status factors are potential targets for smoking prevention; these findings suggest there are missed opportunities for smoking cessation support for those already in contact with healthcare providers. Efforts to promote cessation must consider the historical, social, and cultural context and be developed in partnership with Indigenous Australians.

FUNDING: Academic Institution

POS4-173

USER CHARACTERISTICS, RISK FACTORS, AND PRODUCT TYPES - A SYSTEMATIC REVIEW OF MULTIPLE TOBACCO PRODUCT USE AMONG YOUTH IN THE UNITED STATES

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Background. Multiple tobacco product use among youth has increased in recent years. Concurrent use of multiple tobacco and nicotine containing products is particularly harmful to adolescents' health. With changing tobacco use patterns and an increasingly diversified tobacco market, rigorous strategies are needed to prevent young people from engaging in multiple tobacco product use behavior. To inform such strategies, we systematically reviewed the literature for studies on multiple tobacco product use in youth in the United States (U.S.). **Methods Data sources.** We systematically searched 11 computerized databases (e.g., PubMed, CINAHL, Web of Science, PsycINFO, Cochrane Database, Embase) for studies on multiple tobacco product use. **Study selection.** The search yielded 7,249 research papers. Two independent coders first screened the title and abstract of each paper revealing 500 potentially relevant papers for which they conducted a full text screening. The final review included 47 youth studies. Studies were eligible for inclusion if they were original studies conducted in the U.S., published in peer-reviewed journal, reported on user characteristics, risk factors, or product types associated with multiple tobacco product use in youth populations. **Data extraction.** Data were extracted from all 47 included studies. The QATSDD tool was used to assess study quality. **Data synthesis.** Extracted data were synthesized according to topic areas (e.g., demographic, psychosocial, or environmental risk factors, and product types associated with use). **Results.** The vast majority of studies were cross sectional in design. Studies show that youth multiple product users tend to be older, male, non-Hispanic White or Hispanic, are more nicotine dependent and are less interested in quitting, have weaker harm perceptions of tobacco use, have stronger beliefs about the social benefits of smoking, have more friends and family who use tobacco, are more receptive to tobacco promotions, are more exposed to tobacco advertising, report more perceived stress and are more likely to engage in other risk behaviors such as alcohol and drug use than their counterparts. **Conclusions.** The findings from this study may inform tobacco-use prevention efforts targeting youth and assist with developing communications campaigns and other health promotion strategies that address multiple tobacco product use.

FUNDING: Federal

POS4-174

CORRELATES OF CIGARETTE, WATERPIPE, AND DUAL USE AMONG MEN IN RURAL VIETNAM

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Significance: Waterpipe and dual use of cigarettes and waterpipe is prevalent in low and middle income countries (LMICs), particularly among men. Few studies

have examined this population; this study fills gaps in our understanding of correlates of these different smoking patterns among male smokers in rural Vietnam.

Methods: A cross-sectional survey was conducted with 1005 adult male smokers enrolled in a large cluster-randomized controlled trial conducted in a rural province in Vietnam. We used multinomial logistic regression analyses to analyze correlates of three prevailing smoking patterns in that setting (exclusive cigarette, exclusive waterpipe or dual use). While controlling for age, education and marital status; we examined associations of reporting depression, binge drinking, perceived health status, and perception of harm from smoking waterpipe in comparison to cigarettes.

Results: Forty seven percent used cigarettes only, 34% were dual users and 19% used waterpipes only. Dual users smoked fewer cigarettes than cigarette only users (mean cigarettes/d 15 vs 12.7 respectively). However dual users also used a waterpipe an average of 14 times per day. Dual smokers were more likely to report history of binge drinking (OR= 1.64, 95% CI= 1.06, 2.53, p= 0.03) and less likely to report good versus poor health status (OR= 0.47, 95% CI= 0.27, 0.81, p<0.01) in comparison to exclusive cigarette smokers. Exclusive waterpipe smokers were less likely to report good versus poor health status (OR= 0.30, 95% CI= 0.15, 0.58, p<0.001) in comparison to exclusive cigarette smokers. No other significant associations were detected.

Conclusions: Dual and waterpipe use only were prevalent in this population of tobacco users. Few differences in factors explaining type of tobacco use is contrary to findings in previous research and suggests a unique pattern of waterpipe use in rural Vietnam but one that may be prevalent in other rural areas in LMICs. Given the prevalence and potential for association with other high risk behaviors (e.g. binge drinking) further research is warranted to better characterize this group and inform interventions addressing dual use.

FUNDING: Federal

POS4-175

BEHAVIORAL PATTERNS AND PROFILES OF KOREAN VAPERS

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Objective: There has been a rapid increase in the number of vapers worldwide. While Korea lacks strict regulatory actions on e-cigarettes, the market soared in 2015, following a significant tax hike for cigarettes. This study aimed to identify behavioral patterns and risk factors of e-cigarettes among Korean young population to better understand and help promote tobacco prevention and cessation. **Methods:** In a cross-sectional study, anonymous written survey was completed between April-July, 2015 among 1) 2,744 (1,496 males) adolescents aged 13-18 from Seoul, Incheon, Gyeonggi, and Cheongju and 2) 2,167 (1,166 males) university students aged 19-29 from fourteen nationwide universities in Korea. Clusters were identified using latent class analysis (LCA). **Results:** A total of 345 (12.6%) adolescents and 459 (21.2%) university students ever used e-cigarette. Current smokers who were formerly e-cigarette users were more likely to have used e-cigarettes to help quit smoking (adolescents: OR 2.54, 95% CI 1.59-4.05), to promote smoking taste (adolescents: 2.49, 1.62-3.85), or to use them in smoking prohibited places (university students: 1.41, 1.04-1.90). In LCA, we identified four different classes which differed significantly by demographics and inconsistently by other tobacco-related factors. **Conclusion:** E-cigarette use in adolescents may not be effective for smoking cessation. Distinct patterns of tobacco use were identified in classes among Korean young population. Consideration of the underlying patterns and correlates of tobacco use is important in designing control programs for a target group. A prospective study examining how the patterns change over time is needed to examine the evolution of vaping.

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POS4-176

LONG TERM QUITTING BEHAVIORS AMONG DUAL CIGARETTE/E-CIGARETTE AND EXCLUSIVE CIGARETTE USERS ENROLLED IN THE TOBACCO USER ADULT COHORT (TUAC)

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Purpose: We examined long term quitting behaviors among dual users of cigarettes/e-cigarettes and exclusive cigarette smokers with regard to: 1) reduction in daily number of cigarettes smoked; 2) quit attempts; 3) abstinence from cigarettes; 4) abstinence from all tobacco products, over a 30 month period. These analyses expand upon previous analyses completed after 18 months of data collection. **Methods:** Members of the Tobacco User Adult Cohort (TUAC) were interviewed



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face-to-face every six months, for 30 months, and self-reported current product(s) used, daily number of cigarettes smoked, quit attempts, and seven day point prevalence abstinence from cigarettes and from all products. Participants included in these analyses reported daily use of cigarettes and at least some days/week use of e-cigarettes (n=88) or daily use of cigarettes only (n=617) at the baseline interview. **Results:** Exclusive cigarette smokers smoked a greater number of daily cigarettes compared to dual cigarette/e-cigarette users at baseline ($p=0.008$) and at 30 month follow-up ($p=0.020$), but there was no difference in the reduction in number of daily cigarettes smoked by user group over time. There was also no significant differences by user groups in quit attempts, abstinence from cigarettes, or abstinence from all tobacco products from baseline to 30 month follow-up. **Conclusions:** Previous analyses with the same cohort showed a significant difference in abstinence from cigarettes from baseline to 6 month follow-up, with dual users having a higher likelihood of quitting cigarettes. This suggested that e-cigarettes may serve as a potential tool to help smokers transition to a less harmful product. However, this short term association was not seen when analyses were expanded over 30 months. Funding: NIH P50 CA108908 and NIH UL1TR001070

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POS4-177

INVESTIGATING THE ORIGINS OF PRODUCTS IN THE AEROSOL OF ELECTRONIC CIGARETTES

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Significance: Electronic cigarette use continues to increase among youth and young adults. The variety of flavors is a major contributing factor in their appeal. Our investigation focuses on how aerosol profiles change with the addition of flavor chemicals. In addition, we examine how device designs can lead to enhanced levels of aldehyde production.

Methods: The molecular composition of aerosols generated from vaping flavored and unflavored e-liquids were studied as a function of various device design and power levels. Measurements were taken of each device, including the coil and wick. Isotopically-labeled solvents and flavorings were used to enable precise determination of the composition of the aerosol products and concentrations by NMR as well as by CORESTA standard methods.

Results: The main findings are: (i) Certain flavor chemicals are a catalytic source for significantly enhanced aerosol levels of aldehydes such as acrolein and acetaldehyde. (ii) The design of the atomizer enhances degradation of propylene glycol and glycerol. (iii) Reported levels of some products in e-cigarette aerosols have been underrepresented due to the analysis methods, promoting inter-laboratory differences.

Conclusions: The origin of toxic aldehydes found in e-cigarette aerosols generated from flavored e-liquid involves catalysis in the case of one major flavor additive. Identifying the effect of individual flavor chemicals and device design are steps towards understanding associated health risks.

FUNDING: Federal

POS4-178

CHARACTERISTICS OF YOUNG ADULT DUAL USERS WHO REPORT USING E-CIGARETTES TO QUIT SMOKING CIGARETTES

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Significance: Little is known as to what proportion of dual users are actually using e-cigarettes to quit smoking, especially among young adults (18-25 years old) who tend to be less preoccupied with cessation and represent a higher proportion of occasional smokers. In addition, we do not know how dual users trying to quit smoking using e-cigarettes differ from other dual users in terms of demographic, e-cigarette-related, and smoking cessation-related characteristics. **Methods:** Data are from N = 360 young adults (M age = 21.7; SD = 2.24; 51% women; multiethnic), current dual users of cigarettes and e-cigarettes from a larger sample of young adult college students. Participants were asked: "Are you currently using e-cigarettes to quit cigarette smoking?" Those who reported "Yes" to this question were compared with those who responded "No" on demographic, e-cigarette-related, and smoking cessation-related variables. **Results:** Only 31% young adult dual users reported that they were currently using e-cigarettes to quit smoking. These dual users reported significantly higher motivation to quit and scored lower on e-cigarette harm perceptions, on both explicit and implicit measures. Also, they tended to be older, represented more men than women, were more likely to use e-cigarettes daily, used mods more regularly, and showed higher e-cigarette dependence. However,

they did not differ from the other group on number of cigarettes smoked per day, cigarette dependence, number and length of past cigarette quit attempts and self-efficacy to quit cigarette smoking. **Conclusions:** It appears that young adult dual users using e-cigarettes to quit smoking are using e-cigarettes more intensely compared with those who are using e-cigarettes for other reasons and have higher positive attitudes towards e-cigarettes and show higher motivation to quit smoking. However, they appear to be unable to reduce cigarette smoking or cigarette dependence. Research is needed to understand the barriers being faced by these smokers and whether this phenomenon is limited to young adult smokers.

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POS4-179

ASSOCIATION OF QUITTING, REDUCING CIGARETTE CONSUMPTION WITH THE INCREASE USE IN ELECTRONIC CIGARETTES, CIGARS, SMOKELESS TOBACCO

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Background Cigarette smokers who quit or reduce their smoking may use alternative tobacco products to compensate their nicotine intake. This study analyze the bidirectional associations between cigarette quitting/reduction and the increase use in e-cigarettes, cigars and smokeless tobacco (ST) use. **Methods** Using Population Assessment of Tobacco and Health wave 1 (T1) and wave 2 (T2) data, we constructed a study sample of 6,219 adults who were daily heavy/moderate smokers (≥ 10 cigarette per day (CPD)) 12 months before T1 (T0). The CPD change in period 1 (T0-T1) and period 2 (T1-T2) was classified as: 100% decrease (quitting), 50-99% (substantial) decrease, 5%-49% (moderate) decrease, <5% decrease/increase (no change), and $\geq 5\%$ increase. The increase of E-cigarettes, cigars and ST use in period 1 and 2 were defined as the increase in per day use or use status changed from never/former use to current use or from nondaily to daily use. To investigate the association between period 1 CPD change and period 2 e-cigarette/cigars/ST use changes or reciprocal associations, multivariate multinomial logistic regressions adjusted period 1 CPD changes, period 1 e-cigarettes/cigars/ST use increase and period 2 CPD changes or period 2 e-cigarettes/cigars/ST increase use were estimated, accounted for time-invariant socio-demographics and the current use of other tobacco products (excluding cigarettes and the tobacco product at interest) at T0, T1 and T2. **Results** Among daily moderate/heavy smokers, in period 1, 8.3% quit, 12.2% reduced smoking substantially, 10.6% reduced moderately, and 60% did not change consumption, while in period 2, the corresponding rates were 6.7%, 13.3%, 19.6% and 36.5%. From period 1 to 2, the increase use rate increased from 6.7% to 14.5% for e-cigarette, but decreased from 5.8% to 3.2% for cigar and from 6.2% to 2.3% for ST. Cigarette cessation or reduction at period 2 was associated with the increase of e-cigarette, cigars and ST at period 2. Quitting cigarette in period 1 predicted e-cigarettes use increase in period 2, and increasing e-cigarette use in period 1 also predicted cigarette quitting at period 2. Increasing ST use in period 1 predicted cigarette reduction by 5-49% in period 2, but no reciprocal association was found. And no bidirectional associations were found in the CPD change and the increase in cigar use. **Conclusion** Our results suggest that the increase of e-cigarettes and cigarette quitting have bidirectional impacts on each other and ST use increase predicted subsequent cigarette consumption reduction.

FUNDING: Federal; Academic Institution

POS4-180

SOCIODEMOGRAPHIC DISPARITIES IN THE TOBACCO RETAIL ENVIRONMENT IN WASHINGTON, DC: A SPATIAL PERSPECTIVE

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Neighborhoods with a higher prevalence of minority and low-income residents tend to have a higher density of tobacco retailers. However, most studies disregard the necessary spatial methods when examining geographic data. This study used a spatial analytical framework to evaluate neighborhood sociodemographic disparities in the tobacco retail environment in Washington, DC (DC) and the DC metropolitan statistical area (DC MSA). The availability of retail tobacco for each DC (n=177) and DC MSA (n=1,428) census tract was assessed using adaptive-bandwidth kernel density esti-



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mation. Density surfaces were constructed from DC (n=743) and DC MSA (n=4,539) geocoded tobacco retailers. Census tract sociodemographics were obtained from the 2011-2015 American Community Survey. Spearman's correlations between sociodemographics and retail density were computed to account for spatial autocorrelation. Bivariate and multivariate spatial lag models were fit to predict retail density. DC and DC MSA neighborhoods with a higher percentage of Hispanics were positively correlated with retail density ($\rho = 0.3392, p = 0.0001$ and $\rho = 0.1191, p = 0.0000$, respectively). DC neighborhoods with a higher percentage of African Americans and families living in poverty were negatively correlated with retail density ($\rho = -0.3774, p = 0.0000$ and $\rho = -.1543, p = 0.0155$, respectively). However, this pattern was reversed for families living in poverty ($\rho = 0.1148, p = 0.0001$) and not significant for African Americans ($\rho = 0.1042, p = 0.1228$) in DC MSA. DC bivariate and multivariate spatial lag models found a significant inverse relationship between the percentage of African Americans and retail density ($\text{Beta} = -0.0133, p = 0.0181$ and $\text{Beta} = -0.0165, p = 0.0307$, respectively). However, this relationship was not observed in DC MSA. While associations between neighborhood sociodemographics and retail density were significant, the direction of the associations, specifically among African Americans, contradicts previous findings. Future studies must account for spatial autocorrelation within their analytic framework when examining geographic data to avoid potentially misleading conclusions.

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POS4-181

EXPLORING THE POPULATION CHARACTERISTICS OF TOBACCO USE IN THE UNITED STATES

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Esri's Population Segmentation Tapestry data has tied US consumer behaviors to location to create 67 geodemographic market segments and 14 summary groups. This study used these data to investigate population characteristics of tobacco use. Data from a cross-sectional survey of a nationally representative cohort of youth/young adults aged 15-24 years were collected in January 2017 (n=11,263). Geodemographic data were compiled into a database of quantitative measures and qualitative themes and were merged with survey data. Independent t-tests and chi-square tests examined differences between non-users and past 30-day users of cigarettes; cigars, little cigars, and cigarillos (CLCC); hookah; smokeless tobacco; ENDS; and single; dual; and poly product use. Across participants, 11.1% were cigarette users, 5.9% CLCC users, 4.5% hookah users, 2.9% smokeless tobacco users, and 9.2% ENDS users. On average, cigarette, CLCC, and single, dual, and poly product users lived in less financially well-off areas than non-users across various metrics (median household income, median net worth, household budget indices, and socioeconomic indices, each $p < 0.000$). While not always significant, similar trends were present for hookah and smokeless tobacco users across these metrics ($p = 0.000-0.78$). Cigarette, smokeless tobacco, and dual product users lived in areas with greater housing affordability ($p = 0.036, p = 0.000, p = 0.044$, respectively). Hookah users lived in more racially/ethnically diverse ($p = 0.008$) areas and areas with less housing affordability ($p = 0.005$) than non-users. Smokeless tobacco users lived in less diverse areas ($p = 0.000$). Cigarette users also lived in areas with higher newspaper consumption and lower smart device use than non-users ($p = 0.021, p = 0.013$, respectively). CLCC users though lived in areas with lower newspaper consumption than non-users ($p = 0.032$). Few differences were observed between ENDS and non-users. This study reinforces observations that tobacco users live in low income disadvantaged areas. These novel geodemographic data can help identify and target areas burdened by tobacco for public health media campaigns and policy initiatives.

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