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Using Marketing Frameworks to Predict the Effects of E-Cigarette Commercials on Youth

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Abstract

Purpose—This investigation applied the Product Life Cycle (PLC) and Product Evolutionary Cycle (PEC) frameworks to the nicotine and tobacco market to predict the impact of television commercials for electronic cigarettes (e-cigarettes) on youth.

Design/methodology/approach—Surveys were administered over a three-year period to 417 alternative high school students from southern California who had never used e-cigarettes, cigarettes, or cigars at the baseline. Covariate-adjusted logistic regression causal mediation models were employed to test competing hypotheses from the PLC and PEC frameworks.

Findings—Results support a refined version of the PEC framework where e-cigarette commercials increase the odds of e-cigarette use, which leads to subsequent use of competing products including cigarettes and cigars.

Originality—Regulations in the United States that permit television commercials for e-cigarettes but restrict the promotion of cigarettes and cigars have created an opportunity to study product adoption among youth consumers when one product has a strategic marketing advantage.

Practical implications—This investigation demonstrates the utility of frameworks that conceptualize youth-oriented marketing as a two-part process in which potential customers are first convinced to adopt a behavior and then enticed to use a specific product to enact the behavior.

Social implications—Rising rates of nicotine and tobacco product use among youth may be partially attributable to e-cigarette commercials.

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Keywords

Electronic Cigarettes; Advertising; Television Commercials; Product Life Cycle; Product Evolutionary Cycle

INTRODUCTION

The Effect of Marketing on Youth

The effect of marketing on consumer behavior has been debated for decades. Critics have accused marketers of manipulating public perceptions and behaviors (Packard, 1957). Defenders have questioned the persuasive power ascribed to marketing (Achenbaum, 1972). Within this debate, one of the most contentious topics is the effect of advertising on the use of nicotine and tobacco products among youth. In the 1960s, the tobacco industry claimed that advertising for cigarettes had no effect on youth and only encouraged adult smokers to switch brands (Tobacco Institute, 1964). Research conducted by the federal government suggested otherwise (U.S. Department of Health, Education, and Welfare, 1964; U.S. Department of Health and Human Services, 2012). As a consequence, numerous advertising restrictions have been put into place over the past few decades ranging from a ban on television commercials in 1971 to the elimination of billboards promoting cigarettes in 1998 (Hodge *et al.*, 2013).

A new point of contention arose in 2012 when companies began advertising electronic cigarettes (e-cigarettes) on television and exposing an estimated 24 million youth to imagery that glamourized nicotine use (Duke *et al.*, 2014). A central question that emerged was how youth who had never used nicotine or tobacco products would respond to a multi-million dollar investment in a new advertising channel (Ali *et al.*, 2020). Past research has shown a dose-response relationship between exposure to pro-tobacco advertising and youth experimentation with e-cigarettes (Dai and Hao, 2016; Hammig *et al.*, 2017; Singh *et al.*, 2016). Meta-analyses indicate that youth who smoke e-cigarettes are more likely to transition to cigarettes (Khouja *et al.*, 2020; O'Brien *et al.*, 2021; Soneji *et al.*, 2017) and emerging evidence suggests a comparable association with cigars (Hair *et al.*, 2021). Based on these findings, many public health advocates fear that commercials for e-cigarettes may encourage youth to adopt a behavior that acts as a gateway (Chan *et al.*, 2021) to the lifelong use of products known to cause cancer (U.S. Department of Health and Human Services, 2014).

From a marketing perspective, the anticipated effects of television commercials on youth product use vary depending on how one conceptualizes markets and the role of advertising in attracting new customers. Classical frameworks such as Product Life Cycle (PLC; Vernon, 1966) argue that markets are restricted to a single product. Advertising can be used to generate interest in a novel product like e-cigarettes but is unlikely to influence other products. Ecologically inspired frameworks such as Product Evolutionary Cycle (PEC; Tellis and Crawford, 1981) offer a different narrative. Markets can be conceived of as ecosystems in which interrelated products compete for customers. Under the PEC framework, advertising might directly increase the number of youth who use e-cigarettes

while indirectly decreasing the number who use cigarettes and cigars. Empirical tests of the PEC framework (Holak and Tang, 1990) suggest a third possibility—advertising for one product might encourage use of comparable products. In other words, advertising for e-cigarettes might directly increase the number of youth who use e-cigarettes and indirectly increase the number who use cigarettes and cigars. To evaluate the predictive utility of these marketing frameworks, hypotheses were formulated and tested by monitoring product use within a longitudinal cohort of adolescents who had initially never used e-cigarettes, cigarettes, or cigars (nonconsumers).

The Product Life Cycle Hypothesis

Though originally intended for investors (Vernon, 1966), the PLC framework was adopted by marketers in the 1970s as a tool for designing advertising strategy (Mackenzie, 1971; Smallwood, 1973). The core tenet of the framework is that products pass through four phases—introduction, growth, maturity, and decline. During the introductory phase, advertising builds consumer interest. In the growth phase, advertising attracts new customers. When a product reaches maturity, advertising is refocused on brand differentiation and capturing market share. As sales decline, advertising stops since there is little value in promoting a product whose demise is predestined.

Applying this framework to the nicotine and tobacco market, e-cigarettes would be classified as a novel product in a growth phase as evidenced by the annual rise in sales that has occurred since 2011 (Huang *et al.*, 2019; Marynak *et al.*, 2017). In contrast, cigarettes would be considered an established product with declining use among youth (East *et al.*, 2021; El-Toukhy *et al.*, 2017). Based on this assessment, one might hypothesize that e-cigarette commercials will cause an increase in e-cigarette use among youth without influencing the use of traditional tobacco products. Formally, this hypothesis would be stated as follows:

H1. E-cigarette commercials will *directly increase* the odds of e-cigarette use among adolescent nonconsumers without affecting the odds of using cigarettes or cigars (Figure 1, Hypothesis 1).

The Product Evolutionary Cycle Hypothesis

Although the basic premise of the PLC framework appears reasonable, the model lacks empirical support (Gardner, 1987; Polli and Cook, 1969). Perhaps the most compelling rebuke came from Dhalla and Yuspeh (1976) who demonstrated that the model could not be validated for cigarettes at the product class, segment, or brand level. The authors speculated that product managers were engaged in a self-fulfilling prophecy. If the market seemed like it was growing, product managers increased their advertising. As a result, sales increased and their viewpoint was vindicated. If product managers suspected the market was in decline, they decreased their advertising. When sales decreased, they congratulated themselves on correctly anticipating the latest trends. The fallacy at the heart of this self-reinforcing loop was the view that products represent distinct markets. In reality, consumers can typically choose from a variety of options. A drop in sales that occurs after a manager reduces his or her investment in advertising may simply be consumers switching to a competitor’s product.

The PEC framework (Tellis and Crawford, 1981) corrects this oversight by incorporating the concept of competition. This framework posits that product sales are influenced by the activities of all product managers that operate in the same ecosystem. To illustrate this concept, Holak and Tang (1990) used the analogy of finches (cigarettes) competing for food (customers). They argued that if one species acquired more food, then the remaining species would have less. Extending the metaphor to the current investigation, one could envision the introduction of a new species of finch (e-cigarettes) that steals food (customers) from older species (cigarettes and cigars). Logically, one might use this line of reasoning to hypothesize that e-cigarette commercials will cause an increase in youth e-cigarette use which will decrease use of cigarettes and cigars. This hypothesis would be expressed in the following manner:

H2. E-cigarette use acts as a mediator that *indirectly decreases* the odds that adolescent nonconsumers who view e-cigarette commercials will use cigarettes or cigars (Figure 1, Hypothesis 2).

An Alternative Product Evolutionary Cycle Hypothesis

While the traditional PEC framework integrates the concept of competition, it ignores the possibility of 'coopetition' (Bengtsson and Kock, 2000). Prior research (Bass *et al.*, 2005) has shown that product managers can simultaneously increase their share of the market (competition) while also expanding the market (cooperation). For example, advertising for Coca-Cola has been shown to increase the demand for both Coca-Cola and Pepsi (Fosfuri and Giarratana, 2009). This concept can be better understood by reversing the direction of the metaphorical food chain. Imagine nicotine and tobacco products as flowers and consumers as bees. As new flowers (e-cigarettes) are introduced into the ecosystem, they lure active bees (current customers) while simultaneously attracting new bees (new customers) who eventually try other flowers (cigarettes and cigars).

This phenomenon was detected by Holak and Tang (1990) when they attempted to empirically validate the PEC framework by examining the effect of advertising on the sale of cigarettes. Contrary to their original hypothesis, advertising for some brands (Winston, Salem, etc.) had a positive association with the sales of other brands (Marlboro, Pall Mall, L&M, etc.). A similar pattern was detected at the segment level (filter, nonfilter, etc.) with advertising for emerging segments boosting the sales of existing segments. Extending this pattern to the current investigation, one might hypothesize that e-cigarette commercials will cause an increase in youth e-cigarette use that will lead to the subsequent use of cigarettes and cigars. This refined hypothesis would be stated as follows:

H3. E-cigarette use acts as a mediator that *indirectly increases* the odds that adolescent nonconsumers who view e-cigarette commercials will use cigarettes or cigars (Figure 1, Hypothesis 3).

Converting Youth Nonconsumers Into Consumers

Each of the three hypotheses were evaluated by monitoring product use within a cohort of alternative high school (AHS) students who had never used e-cigarettes, cigarettes, or cigars (nonconsumers) at the baseline of a two-year longitudinal study. Previous investigations of

past month product use among AHS students (Pike *et al.*, 2019) reported consistently higher rates than the national average (Gentzke *et al.*, 2020) for e-cigarettes (19.8% vs 13.1%), cigarettes (15.9% vs 3.3%), and cigars (11.9% vs 3.5%). This population was therefore selected as a group that was likely to be susceptible to e-cigarette commercials and to transition from being nonconsumers to consumers of nicotine and tobacco products.

The PLC hypothesis (H1) was tested by examining whether exposure to e-cigarette commercials or positive reactions to these commercials predicted e-cigarette use. The PEC hypotheses (H2 and H3) were tested by determining whether the effect of e-cigarette commercials on cigarette and cigar use was mediated by e-cigarette use. Collectively, these analyses functioned as an empirical test of the predictive utility of the PLC and PEC frameworks.

METHODS

Sampling

Using data provided by the California Department of Education, research staff identified 183 alternative high schools that had at least 100 students and were within 100 miles of the program offices in Claremont, California. On February 6th, 2014 research staff began contacting schools in a random order. All schools were invited to participate in accordance with a protocol approved by the Claremont Graduate University Institutional Review Board. Schools were enrolled on a first-come, first-served basis until 29 sites agreed to participate. By June 5th, 2014 each participating school provided a letter confirming their involvement.

Between October 14th, 2014 and May 18th, 2015, research staff visited each school and invited all students to enroll in the study. Interest forms were distributed to 6,870 students who attended the schools. Completed forms were returned by 2,726 students. Each student that returned a form was assigned to a specific staff member. The staff member obtained written consent. Parental consent and youth assent were obtained for students under the age of 18. After acquiring consent, staff members scheduled a date and time for each student to receive a link for a web-based survey. Students who completed the survey received a $45 gift card. Baseline data collection concluded on September 1st, 2015 by which time 1,060 participants had been assessed.

Research staff maintained contact with participants using evidence-based procedures documented in prior publications (Pike *et al.*, 2019). One-year follow-up assessments were administered between September 21st, 2015 and September 1st, 2016. The average length of time between the baseline assessment and the one-year follow-up assessment was 330 days (SD = 26.6). The retention rate was 87.1% (923/1060). The majority of the participants (96.6%) completed a web-based survey. Those without access to a web-enabled device (3.4%) completed a computer-assisted telephone interview. Each participant that completed an assessment received a $50 gift card. Among the 137 youth who did not complete a follow-up assessment, 93.5% failed to respond to repeated contact attempts, 5.8% withdrew from the study, and 0.7% were incarcerated.

Two-year follow-up assessments were administered between September 26th, 2016 and September 1st, 2017. The average length of time between the baseline assessment and the two-year follow-up assessment was 695 days (SD = 33.7) and the retention rate was 81.0% (859/1060). Most participants (96.9%) completed a web-based survey while some (3.1%) completed a computer-assisted telephone interview. Each participant that completed an assessment received a $100 gift card. Among the 201 youth who did not complete an assessment, 93.0% failed to respond to repeated contact attempts, 4.5% withdrew from the study, 1.5% had died, 0.5% were incarcerated, and 0.5% were deployed overseas after enlisting in the military.

Measures

Exposure to e-cigarette commercials.—A single item employed in previous research (Schooler *et al.*, 1996; Stacy *et al.*, 2004) was administered at the baseline to quantify how frequently each participant had seen commercials for e-cigarettes either on television or on ad-supported streaming television services such as Hulu. Response options included '*Never*', '*Less than once a month*', '*Once a month*', '*2–3 times a month*', '*Once a week*', '*2–6 times a week*', and '*Every day.*'

Reaction to e-cigarette commercials (α = .77).—A five-item scale utilized in prior studies (Unger *et al.*, 2003; Pokhrel *et al.*, 2015) measured participants' reaction to e-cigarette commercials. The first three questions were '*When you see electronic cigarette commercials on TV or online…*', '*Do you think they are funny?*', '*Do you think they are sexy?*', '*Do you wish you were like the people in the commercials?'* Response options for all three items were '*No, never*', '*No, usually not*', '*Yes, usually*', and '*Yes, always*'. The next question asked '*When you see electronic cigarette commercials, how often do you pay attention to them?*' Response options included '*Never*', '*Some of the time*', '*Most of the time*', and '*Always*'. The final question was '*Of all the commercials you see, how much do you like electronic cigarette commercials?*' Participants responded on a 4-point scale ranging from '*I like electronic cigarette commercials the least*' to '*I like electronic cigarette commercials the most.*'

Age of nicotine and tobacco product use.—A scale from the National Youth Tobacco Survey (NYTS; Centers for Disease Control and Prevention, 2012) was used to detect the age at which each participant first tried (1) cigarettes, (2) e-cigarettes, vaporizers, or vape pens, and (3) cigars, cigarillos, or little cigars. Responses were dichotomized to reflect whether a participant had ever used each product at each annual assessment.

Demographics.—Participants reported their gender and ethnicity. Participants also provided their birthdate, which was used to calculate their age at the baseline.

Exposure to other forms of product advertising (α = .81).—To account for the influence of other forms of advertising for nicotine and tobacco products, a four-item scale from the NYTS (Centers for Disease Control and Prevention, 2012) was used to assess the extent to which participants had been exposed to (1) newspaper and magazine ads, (2) posters and signs, (3) radio spots, and (4) web banners for these products. Response options

included '*None*', '*1–3 times in the past 30 days*', '*1–3 times per week*', '*Daily or almost daily*', and '*More than once a day*'.

Family use of one or more products.—Numerous studies have documented the effect of familial use of nicotine and tobacco products on youth (Leonardi-Bee *et al.*, 2011; Wang *et al.*, 2018). To adjust for this confounder, three items were adapted from the NYTS (Centers for Disease Control and Prevention, 2012) to determine whether participants had at least one family member who currently used (1) cigarettes, (2) e-cigarettes, vaporizers, or vape pens, or (3) cigars, cigarillos, or little cigars.

Peer use of one or more products.—Peer use of nicotine and tobacco products is another well-documented confounder (Tyas and Pederson, 1998; Wang *et al.*, 2018). To account for this effect, three items were adapted from the California Student Tobacco Survey (California Department of Public Health, 2014) to measure whether participants had at least one friend who currently used (1) cigarettes, (2) e-cigarettes, vaporizers, or vape pens, or (3) cigars, cigarillos, or little cigars.

Analyses

The analytic dataset was restricted to 417 adolescents from 29 schools who had never used e-cigarettes, cigarettes, or cigars at the baseline (nonconsumers). Descriptive statistics stratified by exposure to e-cigarette commercials were examined utilizing $\chi 2$ tests, t tests, and Cochran-Armitage trend tests. Calculating the intra-class correlation revealed that up to 12.0% of the variation in product use could be attributed to random effects at the school level. To account for similarities among adolescents attending the same school, a clustering variable was created and included in all statistical models. Standard errors robust to non-normality and non-independence of observations were estimated for each model. Age in years, exposure to e-cigarette commercials, reaction to e-cigarette commercials, and exposure to other forms of product advertising were group-mean centered. Exposure and reaction to e-cigarette commercials were standardized to facilitate effect size comparisons since the original validated measures utilized different numbers of response options.

Logistic regression models tested the PLC hypothesis (H1) that commercials for e-cigarettes would increase the odds of e-cigarette use but not the use of cigarettes or cigars. Youth reactions to e-cigarette commercials and the frequency with which they had seen these commercials at the baseline were included in the models as predictors of product use at the one-year or two-year follow-up assessment. Four variations of each model were fit to the data. The first model provided unadjusted, crude parameter estimates. The second model adjusted for baseline age, gender, and ethnicity. The third model additionally adjusted for baseline exposure to other forms of advertising for nicotine and tobacco products. The fourth, fully-adjusted model incorporated family and peer use of nicotine and tobacco products at the baseline as covariates. The progression of models documented the strength and persistence of statistically significant associations as additional confounders were accounted for. The fully-adjusted model may be conceptualized as an over-adjustment given prior studies suggesting that nicotine and tobacco use by family and friends act as mediators

of the relationship between advertising exposure and subsequent product use (Fulmer *et al.*, 2015).

Logistic regression mediation models that generated causal estimands by utilizing a potential outcomes framework (Holland, 1986; Rubin, 2005) tested hypotheses (H2 and H3) from the PEC framework. The first model examined whether e-cigarette commercials had a natural direct effect on cigarette use at the two-year follow-up assessment as well as an indirect effect via e-cigarette use during the interim one-year follow-up assessment. The second model replicated this analysis but changed the outcome to cigar use. The same four variations of covariate adjustments utilized in the logistic regression models were applied to the mediation models. A 10,000 iteration bias-corrected bootstrap resampling method was utilized to test for mediation (MacKinnon *et al.*, 2004).

To minimize the effect of attrition, all analyses were conducted using a hundred imputed datasets generated from multivariate imputation by chained equations (Van Buuren, 2007). This process included imputing a value representing reactions to e-cigarettes among the subsample (N=143) of youth who had never seen an e-cigarette commercial. To evaluate the robustness of the results, a sensitivity analysis was conducted in which the same models were fit to the subsample (N=274) who had seen commercials for e-cigarettes. Parameter estimates were computed in Mplus version 8.5 (Muthén and Muthén, 1998–2017) while descriptive statistics and imputed datasets were generated in SAS 9.4 (SAS Institute, Cary, NC).

RESULTS

Among the 417 adolescents in the analytic sample, the mean (SD) age at the baseline was 17.4 (0.9), 48.8% (203/416) were male, and 75.1% (308/410) were Hispanic (Table I). Nearly two-thirds (65.7%, 274/417) had been exposed to e-cigarette commercials. These youth were more likely to have peers who used nicotine and tobacco products (52.0% vs 34.8%, $p = .003$). At the two-year follow-up assessment, product use had risen from 0.0% at the baseline to 34.3% for e-cigarettes, 29.3% for cigarettes, and 20.2% for cigars. Use of two or more products (24.6%) was more common than use of only one product (17.9%).

Parameter estimates from logistic regression models appeared to provide support for the PLC hypothesis (H1). While the frequency of exposure to e-cigarette commercials did not have a statistically significant association with product use (Table II), the relationship between youth reactions to e-cigarette commercials at the baseline and subsequent e-cigarette use was statistically significant. For each one standard deviation increase, the unadjusted odds that an adolescent would use e-cigarettes were 1.44 times greater (95% Confidence Intervals [95% CI] = 1.09, 1.90) at the one-year follow-up assessment and 1.41 times greater (95% CI = 1.09, 1.83) at the two-year follow-up assessment. This association attenuated but remained statistically significant when covariates were added to the model and when the sample was restricted to youth (N=274) who had seen commercials for e-cigarettes. In contrast, neither exposure to e-cigarette commercials nor reactions to e-cigarette commercials were statistically significant predictors of future use of cigarettes or cigars.

The mediation models from the PEC framework (H2 and H3) offered a more complete picture of the effect of e-cigarette commercials on youth nonconsumers. Youth reactions to e-cigarette commercials predicted e-cigarette use at the one-year follow-up assessment, which was positively associated (H3) with cigarette and cigar use at the two-year follow-up assessment. The natural direct effect was not statistically significant (Table III), but the unadjusted indirect effect via e-cigarette use was statistically significant for cigarettes (Odds Ratio [OR] = 1.20, 95% CI = 1.02, 1.39) and cigars (OR = 1.26, 95% CI = 1.02, 1.50). This effect persisted but decreased in magnitude as covariates were added to the model. The association ceased to be statistically significant in the fourth and potentially over-adjusted model (Fulmer *et al.*, 2015). Although point estimates were comparable, associations from sensitivity analyses were not statistically significant.

DISCUSSION

Strategic Insights from Ecologically Inspired Marketing Frameworks

Evidence from the current investigation did not support the original PEC framework (H2) and at first glance appeared to provide support for the PLC framework (H1). However, in considering the totality of evidence the refined PEC framework (H3) had the greatest empirical support. These findings demonstrate the predictive utility of envisioning markets as ecosystems in which both competition and cooperation are possible (Iansiti and Levien, 2004). To illustrate, picture a product manager who applies the PLC framework. This manager might observe a competitor making a substantial investment in television commercials for a new product as a sign to decrease their marketing budget, which may trigger a premature decline in sales. Using the PEC framework however, the same product manager might recognize the opportunity to piggyback on rising consumer awareness for the product class (Sahni, 2016) and decide to pivot their marketing dollars (Kushwaha and Shankar, 2013; Sridhar *et al.*, 2021) to point-of-purchase promotions (Beleva *et al.*, 2018; Hultén and Vanyushyn, 2014). If successful, this tactic may help the product manager acquire new customers and increase sales. Indeed, this type of advertising spillover has been observed in studies that utilize Nielsen ScanTrack data to examine the effects of e-cigarette commercials on the demand for multiple nicotine and tobacco products (Zheng *et al.*, 2017; Zheng *et al.*, 2016).

The current evidence also indicates that youth-oriented customer acquisition can be conceptualized as a two-part process. First, nonconsumers must become interested in enacting a general behavior. Once they are convinced, they must be enticed to use a specific product to perform the behavior. Ecological frameworks like the PEC are effective in part because they make this two-part process salient in the minds of marketing practitioners. For example, recent findings on the ability of online reviews (Shaheen *et al.*, 2020), gamification (Wut *et al.*, 2021), and celebrity endorsements (Chan *et al.*, 2013; Fan, 2021) to attract young consumers is entirely understandable once it is recognized that these marketing tactics first introduce the adoption of a new behavior and then offer a specific recommendation for enacting the behavior.

An additional contribution of the current study is the discovery that youth reactions to commercials were predictive of product adoption but repeated exposure was not. For product

managers, this implies that quality may be more important than quantity. Previous studies have demonstrated that positive reactions to commercials predict future behavior among youth (Grenard *et al.*, 2013; Stacy *et al.*, 2004). If the goal is to attract the next generation of customers, then it may be advantageous to strategically place a few well-liked ads rather than bombard consumers with mediocre marketing campaigns.

Limitations

Although efforts were made to strengthen the validity of this longitudinal investigation, several limitations are worth noting. The sample was predominantly Hispanic and restricted to high-risk youth from southern California. In addition, the investigation was limited to a set of products that have unique properties including the presence of addictive, carcinogenic substances. Before generalizing the current findings to other products and populations, researchers and practitioners should attempt to replicate the analyses using nationally representative datasets that include information specific to the market of interest.

The use of an observational rather than experimental design curtails attributions of causality. Still, prior randomized controlled trials (Villanti *et al.*, 2015) depicting a causal relationship between exposure to e-cigarette advertising and subsequent product use among youth nonconsumers buttresses the current findings. The reliance on self-reported exposure to e-cigarette commercials is another potential source of bias—although these concerns are mitigated by prior research suggesting a strong relationship between objective and subjective measures of advertising exposure (Cowling *et al.*, 2015; Dunlop *et al.*, 2012; Romberg *et al.*, 2020).

Regulations in the United States restricted the focus of the investigation to one advertising channel. It may be the case that television is particularly effective at generating consumer interest while other channels, such as point-of-sale promotions, are more adept at capturing market share. Future studies may benefit from a thorough investigation of the how the competitive and cooperative effects of advertising vary across different channels. Marketing practitioners should also note that the current study applied select elements of the PEC framework. The full framework accounts for numerous other factors including market dynamics, managerial creativity, and government mediation. Additional strategic insights may be generated by applying the complete model (Tellis and Crawford, 1981).

Advertising Ethics and the Creation of New Customers

A study examining the effects of e-cigarette commercials on product adoption among youth nonconsumers would be incomplete without a discussion of the moral obligations of marketers. Frequently, the implicit assumption among practitioners is that marketing is about identifying nonconsumers who have an unmet, preexisting need (Nairn and Berthon, 2003). The current findings suggest that advertising may in fact be creating youth consumers of nicotine and tobacco products. Although representatives of the industry may deny that this is their intent, they would be wise to recall the words of Peter Drucker (1954) who commented that ‘There is only one valid definition of business purpose: to create a customer. Markets are not created by God, nature or economic forces but by businessmen.’

The industry has a long history of customer creation. A 1981 internal document from Phillip Morris proclaimed that 'today's teenager is tomorrow's potential regular customer' (Perry, 1999). In the 1960s, this strategy was enacted by running television commercials during times that correlated with teenage viewership (Pollay, 1994a; Pollay, 1994b). In the past decades, the same philosophy was enacted for e-cigarettes by running commercials next to television programs with substantial youth audiences (McCarthy, 2014). These commercials reached more than one-third of adolescents in the United States every year between 2014 and 2016 (Marynak *et al.*, 2018) and may have subsequently reached even more as investments in television advertising escalated beginning in 2019 (Duan *et al.*, 2021). Such extensive advertising is likely to encourage young nonconsumers to use addictive products that contain toxicants and carcinogens (Ghosh *et al.*, 2017; Goniewicz *et al.*, 2014; U.S. Department of Health and Human Services, 2014). The ethical choice for the industry would be to voluntarily cease this practice. Given substantial public support in the United States for additional restrictions on e-cigarette marketing (*Czaplicki et al.*, 2020), continued attempts to circumvent the spirit of prior legislation designed for cigarettes (Hodge *et al.*, 2013) will simply prompt local, state, and national government entities to achieve the same outcome through regulation (*Kennedy et al.*, 2017).

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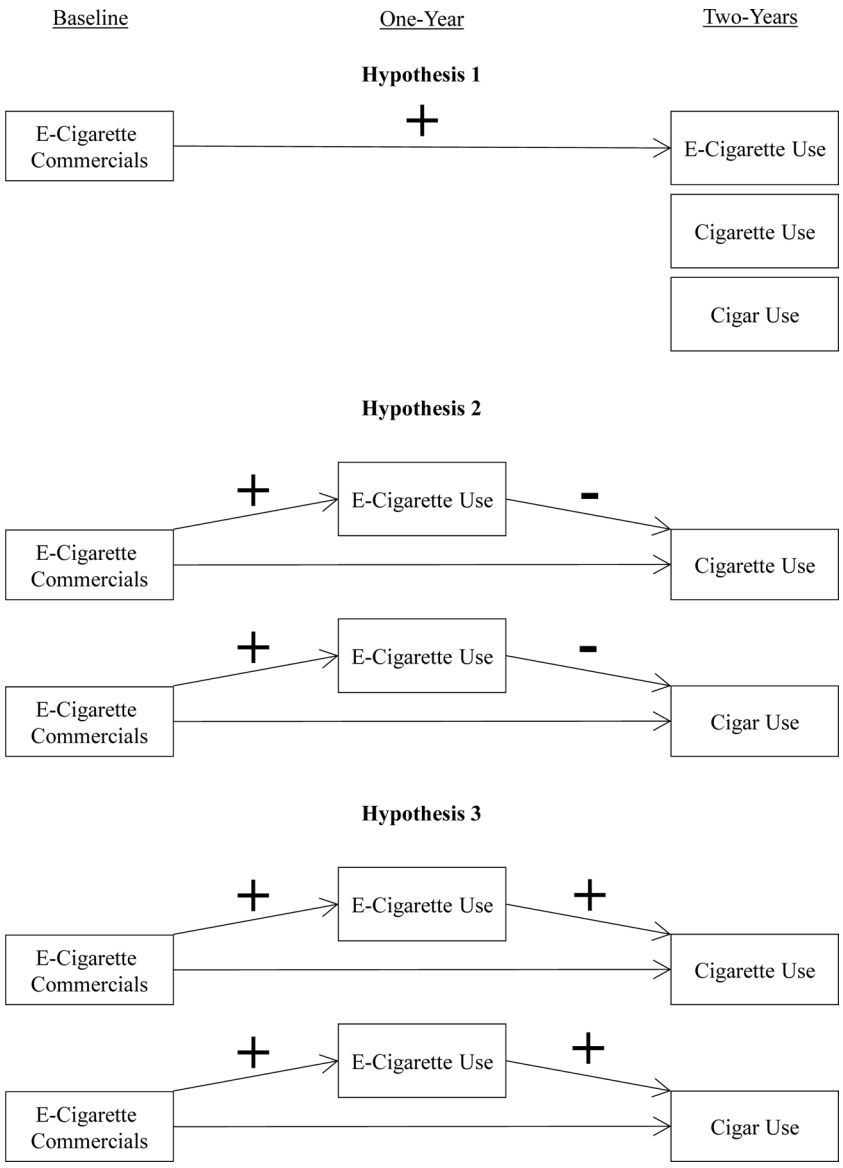

Figure 1.
Visual depiction of proposed hypotheses

Table I.

Descriptive statistics for 417 youth who never used e-cigarettes, cigarettes, or cigars at the baseline assessment

	N	All (N=417)	Exposed to E-Cigarette Commercials (N=274)	Not Exposed to E-Cigarette Commercials (N=143)	*p*
Baseline					
Age, mean (SD), y	416	17.4 (0.9)	17.4 (0.9)	17.4 (0.9)	.74
Male gender, No. (%)	416	203 (48.8)	140 (51.1)	63 (44.4)	.19
Hispanic ethnicity, No. (%)	410	308 (75.1)	200 (74.1)	108 (77.1)	.50
Family use of one or more products, No. (%)	417	119 (28.5)	79 (28.8)	40 (28.0)	.85
Peer use of one or more products, No. (%)	319	146 (45.8)	106 (52.0)	40 (34.8)	.003
Exposure to e-cigarette commercials, mean (SD)	381	1.5 (1.9)	2.5 (1.9)	0.0 (0.0)	<.001
Reaction to e-cigarette commercials, mean (SD)	251	0.4 (0.5)	0.4 (0.5)		
Exposure to other forms of product advertising, mean (SD)	383	1.0 (1.0)	1.2 (1.0)	0.7 (0.9)	<.001
One-year follow-up assessment					
E-cigarette use, No. (%)	370	84 (22.7)	56 (23.2)	28 (21.7)	.74
Cigarette use, No. (%)	370	65 (17.6)	43 (17.8)	22 (17.1)	.85
Cigar use, No. (%)	370	49 (13.2)	34 (14.1)	15 (11.6)	.50
Use of one product, No. (%)		50 (13.5)	31 (12.9)	19 (14.7)	
Use of two products, No. (%)		26 (7.0)	18 (7.5)	8 (6.2)	
Use of all three products, No. (%)		32 (8.6)	22 (9.1)	10 (7.8)	
Two-year follow-up assessment					
E-cigarette use, No. (%)	350	120 (34.3)	81 (35.1)	39 (32.8)	.67
Cigarette use, No. (%)	352	103 (29.3)	65 (28.0)	38 (31.7)	.48
Cigar use, No. (%)	347	70 (20.2)	46 (20.2)	24 (20.2)	.99
Use of one product, No. (%)		62 (17.9)	41 (18.0)	21 (17.8)	
Use of two products, No. (%)		35 (10.1)	24 (10.5)	11 (9.3)	
Use of all three products, No. (%)		50 (14.5)	32 (14.0)	18 (15.3)	

Youth were permitted to skip survey questions they did not want to answer. Consequently, the number of complete cases varied for each measure. Differences between youth exposed and youth not exposed to e-cigarette commercials were assessed using χ^2 tests, t tests, and Cochran-Armitage trend tests as appropriate.

Table II.

Logistic regression models depicting the effect of e-cigarette commercials on product use among 417 youth

	One-Year Follow-Up Assessment			Two-Year Follow-Up Assessment		
	E-Cigarette Use OR (95% CI)	**Cigarette Use OR (95% CI)**	**Cigar Use OR (95% CI)**	**E-Cigarette Use OR (95% CI)**	**Cigarette Use OR (95% CI)**	**Cigar Use OR (95% CI)**
Never used e-cigarettes, cigarettes, or cigars at baseline (N=417)						
Model 1						
Exposure to e-cigarette commercials	1.00 (0.73, 1.37)	1.07 (0.79, 1.45)	1.03 (0.75, 1.42)	1.16 (0.91, 1.47)	0.99 (0.76, 1.30)	1.00 (0.76, 1.33)
Reaction to e-cigarette commercials	1.44 (1.09, 1.90)	1.19 (0.87, 1.64)	1.32 (0.94, 1.87)	1.41 (1.09, 1.83)	1.16 (0.89, 1.51)	1.28 (0.95, 1.71)
Model 2						
Exposure to e-cigarette commercials	1.00 (0.72, 1.39)	1.08 (0.80, 1.47)	1.03 (0.75, 1.42)	1.16 (0.91, 1.49)	0.99 (0.76, 1.30)	1.00 (0.75, 1.33)
Reaction to e-cigarette commercials	1.44 (1.09, 1.90)	1.19 (0.86, 1.64)	1.33 (0.93, 1.89)	1.42 (1.09, 1.86)	1.16 (0.89, 1.51)	1.28 (0.96, 1.72)
Model 3						
Exposure to e-cigarette commercials	0.96 (0.68, 1.36)	1.06 (0.77, 1.46)	0.96 (0.68, 1.36)	1.12 (0.86, 1.45)	0.92 (0.69, 1.23)	0.92 (0.66, 1.27)
Reaction to e-cigarette commercials	1.43 (1.08, 1.89)	1.18 (0.86, 1.62)	1.29 (0.91, 1.84)	1.41 (1.08, 1.85)	1.13 (0.87, 1.47)	1.24 (0.93, 1.67)
Model 4						
Exposure to e-cigarette commercials	0.93 (0.65, 1.32)	1.04 (0.75, 1.44)	0.97 (0.68, 1.40)	1.08 (0.82, 1.43)	0.91 (0.67, 1.23)	0.92 (0.66, 1.29)
Reaction to e-cigarette commercials	1.37 (1.03, 1.83)	1.15 (0.82, 1.60)	1.31 (0.92, 1.88)	1.34 (1.02, 1.76)	1.10 (0.84, 1.44)	1.25 (0.93, 1.67)
Never used e-cigarettes, cigarettes, or cigars at baseline and exposed to e-cigarette commercials (N=274)						
Model 1						
Exposure to e-cigarette commercials	0.95 (0.65, 1.40)	1.07 (0.69, 1.66)	0.98 (0.67, 1.43)	1.15 (0.84, 1.58)	1.04 (0.73, 1.48)	0.99 (0.70, 1.41)
Reaction to e-cigarette commercials	1.37 (1.02, 1.82)	1.21 (0.89, 1.64)	1.31 (0.93, 1.84)	1.35 (1.04, 1.76)	1.14 (0.88, 1.49)	1.27 (0.95, 1.69)
Model 2						
Exposure to e-cigarette commercials	0.95 (0.64, 1.40)	1.08 (0.70, 1.66)	0.97 (0.67, 1.40)	1.15 (0.83, 1.59)	1.04 (0.73, 1.48)	0.98 (0.69, 1.39)
Reaction to e-cigarette commercials	1.37 (1.03, 1.82)	1.19 (0.87, 1.63)	1.32 (0.94, 1.86)	1.36 (1.05, 1.77)	1.15 (0.87, 1.50)	1.28 (0.95, 1.72)
Model 3						
Exposure to e-cigarette commercials	0.94 (0.62, 1.43)	1.10 (0.71, 1.70)	0.96 (0.66, 1.39)	1.13 (0.81, 1.58)	1.00 (0.70, 1.45)	0.94 (0.64, 1.37)
Reaction to e-cigarette commercials	1.37 (1.02, 1.84)	1.21 (0.88, 1.65)	1.31 (0.93, 1.86)	1.35 (1.03, 1.76)	1.13 (0.87, 1.46)	1.25 (0.93, 1.67)
Model 4						
Exposure to e-cigarette commercials	0.92 (0.60, 1.40)	1.09 (0.70, 1.71)	0.98 (0.67, 1.43)	1.10 (0.77, 1.57)	1.00 (0.68, 1.45)	0.95 (0.64, 1.40)
Reaction to e-cigarette commercials	1.30 (0.96, 1.78)	1.18 (0.86, 1.62)	1.36 (0.96, 1.92)	1.27 (0.96, 1.66)	1.10 (0.84, 1.44)	1.29 (0.96, 1.72)

Abbreviations: CI, confidence intervals; OR, Odds Ratio.

Odds ratios (OR) and 95% confidence intervals (CI) were estimated utilizing logistic regression models with robust standard errors that accounted for similarities among youth attending the same school. Multivariate imputation by chained equations was employed to impute missing values. Exposure to e-cigarette commercials and reaction to e-cigarette commercials were standardized to facilitate comparisons. Model 1 depicts unadjusted, crude estimates. Model 2 incorporated baseline age, gender, and ethnicity as covariates. Model 3 additionally adjusted for baseline exposure to other forms of advertising for nicotine and tobacco products. Model 4 integrated family and peer use of nicotine and tobacco products as covariates.

Table III.

Logistic regression causal mediation models depicting the effect of e-cigarette commercials on product use at the two-year follow-up assessment among 417 youth

	Outcome Cigarette Use OR (95% CI)	Outcome Cigar Use OR(95% CI)
Never used e-cigarettes, cigarettes, or cigars at baseline (N=417)		
Model 1		
Indirect effect of exposure to e-cigarette commercials	1.00 (0.85, 1.15)	1.00 (0.80, 1.19)
Direct effect of exposure to e-cigarette commercials	1.00 (0.81, 1.18)	1.01 (0.76, 1.25)
Indirect effect of reaction to e-cigarette commercials	1.20 (1.02, 1.39)	1.26 (1.02, 1.50)
Direct effect of reaction to e-cigarette commercials	0.97 (0.75, 1.18)	1.03 (0.79, 1.26)
Model 2		
Indirect effect of exposure to e-cigarette commercials	1.00 (0.84, 1.16)	1.00 (0.80, 1.20)
Direct effect of exposure to e-cigarette commercials	0.99 (0.80, 1.18)	1.00 (0.74, 1.25)
Indirect effect of reaction to e-cigarette commercials	1.20 (1.02, 1.39)	1.25 (1.02, 1.49)
Direct effect of reaction to e-cigarette commercials	0.97 (0.75, 1.19)	1.02 (0.79, 1.26)
Model 3		
Indirect effect of exposure to e-cigarette commercials	0.98 (0.82, 1.15)	0.98 (0.76, 1.20)
Direct effect of exposure to e-cigarette commercials	0.94 (0.75, 1.13)	0.95 (0.66, 1.24)
Indirect effect of reaction to e-cigarette commercials	1.20 (1.01, 1.39)	1.25 (1.00, 1.50)
Direct effect of reaction to e-cigarette commercials	0.95 (0.73, 1.16)	1.00 (0.77, 1.24)
Model 4		
Indirect effect of exposure to e-cigarette commercials	0.97 (0.82, 1.12)	0.96 (0.76, 1.16)
Direct effect of exposure to e-cigarette commercials	0.93 (0.72, 1.15)	0.96 (0.67, 1.26)
Indirect effect of reaction to e-cigarette commercials	1.16 (0.98, 1.33)	1.20 (0.97, 1.43)
Direct effect of reaction to e-cigarette commercials	0.94 (0.70, 1.17)	1.02 (0.77, 1.27)
Never used e-cigarettes, cigarettes, or cigars at baseline and exposed to e-cigarette commercials (N=274)		
Model 1		
Indirect effect of exposure to e-cigarette commercials	0.98 (0.78, 1.17)	0.97 (0.73, 1.21)
Direct effect of exposure to e-cigarette commercials	1.07 (0.80, 1.33)	1.02 (0.73, 1.31)
Indirect effect of reaction to e-cigarette commercials	1.18 (0.97, 1.39)	1.22 (0.97, 1.47)
Direct effect of reaction to e-cigarette commercials	0.97 (0.74, 1.20)	1.05 (0.79, 1.31)
Model 2		
Indirect effect of exposure to e-cigarette commercials	0.98 (0.78, 1.17)	0.97 (0.73, 1.21)
Direct effect of exposure to e-cigarette commercials	1.07 (0.79, 1.35)	1.01 (0.72, 1.31)
Indirect effect of reaction to e-cigarette commercials	1.19 (0.98, 1.39)	1.22 (0.97, 1.47)
Direct effect of reaction to e-cigarette commercials	0.97 (0.73, 1.21)	1.05 (0.77, 1.33)
Model 3		
Indirect effect of exposure to e-cigarette commercials	0.97 (0.76, 1.19)	0.97 (0.70, 1.24)
Direct effect of exposure to e-cigarette commercials	1.03 (0.76, 1.31)	0.98 (0.66, 1.29)
Indirect effect of reaction to e-cigarette commercials	1.19 (0.97, 1.41)	1.22 (0.96, 1.49)
Direct effect of reaction to e-cigarette commercials	0.96 (0.73, 1.18)	1.03 (0.76, 1.30)

	Outcome Cigarette Use OR (95% CI)	Outcome Cigar Use OR(95% CI)
Model 4		
Indirect effect of exposure to e-cigarette commercials	0.97 (0.77, 1.16)	0.96 (0.72, 1.20)
Direct effect of exposure to e-cigarette commercials	1.04 (0.73, 1.34)	0.99 (0.66, 1.32)
Indirect effect of reaction to e-cigarette commercials	1.14 (0.92, 1.35)	1.16 (0.91, 1.40)
Direct effect of reaction to e-cigarette commercials	0.96 (0.69, 1.23)	1.09 (0.74, 1.44)

Abbreviations: CI, confidence intervals; OR, Odds Ratio.

Odds ratios (OR) and 95% confidence intervals (CI) were estimated utilizing causal mediation logistic regression models with robust standard errors that accounted for similarities among youth attending the same school. A 10,000 iteration bias-corrected bootstrap resampling method was used to calculate the indirect effect. Multivariate imputation by chained equations was employed to impute missing values. Exposure to e-cigarette commercials and reaction to e-cigarette commercials were standardized to facilitate comparisons. Model 1 depicts unadjusted, crude estimates. Model 2 incorporated baseline age, gender, and ethnicity as covariates. Model 3 additionally adjusted for baseline exposure to other forms of advertising for nicotine and tobacco products. Model 4 integrated family and peer use of nicotine and tobacco products as covariates.