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Trust of Information about Tobacco and E-Cigarettes from Health Professionals versus Tobacco or Electronic Cigarette Companies: Differences by Subgroups and Implications for Tobacco Messaging

Rhyan N. Vereen^a, J. Lee Westmaas^a, Jeuneviette Bontemps-Jones^a, Kelsi Jackson^b, and Kassandra I. Alcaraz^a

^aBehavioral and Epidemiology Research Group, American Cancer Society; ^bCommunity Strategies Division, Health Management Associates

ABSTRACT

Smoking behavior may be influenced by perceived trust of information from tobacco and e-cigarette companies about their products. The purpose of this study was to identify sociodemographic subgroups with more trust in tobacco product (tobacco and e-cigarette) companies than health professionals and explore associations between this relative trust and tobacco product use.

Health Information National Trends Survey (HINTS 4, FDA Cycle) data were analyzed ($N = 3,738$). Two relative trust measures were developed identifying respondents who trust tobacco companies or e-cigarette companies as much as or more than health professionals for information about the health effects of tobacco products or e-cigarettes versus those who place more trust in health professionals. Dependent variables were smoking status (current, former, never) and e-cigarette use (ever, never). Bivariate analyses and multivariable logistic regressions were conducted in SAS 9.4 using jackknife replicate weights.

Respondents who trusted tobacco or e-cigarette companies as much as or more than health professionals were disproportionately from racial/ethnic minority groups or had low levels of income or education (all $p < 0.05$). Relative trust was not associated with smoking status. After controlling for demographics, respondents who trusted e-cigarette companies as much as or more than health professionals had 87% greater odds (95% CI: 1.16, 3.00) of e-cigarette use, compared to respondents who placed higher trust in health professionals.

Findings suggest that population subgroups with greater trust in e-cigarette companies relative to health professionals are more prone to e-cigarette use. Targeted communication strategies may be needed for underserved populations and to counter messaging from e-cigarette companies.

Introduction

Smoking-related disparities

Tobacco use remains the leading cause of preventable death in the United States (American Cancer Society, 2017). It is responsible for one in five deaths and is accountable for a disproportionate number of tobacco-related cancers in racial/ethnic minority populations, those with low education or income, and rural residents (Henley, Thomas, & Sharapova, 2016). Despite an overall decrease in cigarette use from 21% in 2005 to 15% in 2015 (Jamal et al., 2016), use remains disproportionately high among American Indians/Alaska Natives, males, individuals from sexual minority groups as well as socioeconomically disadvantaged populations, such as those with low levels of education and income (American Cancer Society, 2017). A better understanding of receptivity to information about tobacco products may be useful for informing tobacco control messaging efforts among groups with increased risk of use.

While the decrease in cigarette use is promising, use of new products, such as electronic cigarettes (e-cigarettes), has increased. The National Center for Health Statistics reported that in 2014, an estimated 13% of adults had tried e-cigarettes (Schoenborn & Gindi, 2015). This was about four times higher than the estimated

3% who had ever used e-cigarettes in 2010 (King, Patel, Nguyen, & Dube, 2015). Similar to traditional cigarettes, e-cigarette use differs by sociodemographic characteristics, with use being highest among men, young adults, non-Hispanic (NH) American Indian/Alaska Natives, and NH Whites (Schoenborn & Gindi, 2015).

Tobacco messaging

Tobacco product messages are communicated through a variety of sources that advocate both for (e.g., MarkTen, Blu) and against (e.g., CDC's Tips from Former Smokers, Truth Campaign) tobacco product use. Communication theories like the Elaboration Likelihood Model (O'Keefe, 1990; Petty & Cacioppo, 1986) and the Heuristic Systematic Model (Chaiken & Maheswaran, 1994) recognize multiple factors that influence the persuasiveness of messages (such as how a message is processed), and thus, the impact of messages on behaviors. While it is, to our knowledge, unknown how tobacco messages are processed, whether certain populations inherently differ in styles of processing, and the factors that influence which processing route is used, evidence suggests that the source of the message and the trustworthiness of the source differ across some populations and may be important factors associated with tobacco and e-cigarette use.

For example, studies of trust in health professionals have shown that individuals from racial/ethnic minority groups, those with low income, and those with low education have less trust in health professionals than Whites or those with high income and/or education (Armstrong et al., 2013; Boulware, Cooper, Ratner, LaVeist, & Powe, 2003; Richardson, Allen, Xiao, & Vallone, 2012). Moreover, trust in tobacco companies is reported to be higher in individuals from racial/ethnic minority and socioeconomically disadvantaged groups. For example, a recent study found that Blacks were more likely than Whites to trust information about the health effects of tobacco products and e-cigarettes from tobacco and e-cigarette companies (Alcala, Sharif, & Morey, 2017). While studies have identified demographic differences in trust of various information sources, few have accounted for trust of a specific source in relation to other sources.

In addition, while health communication theories note the importance of source trust, no theories explicitly encourage further understanding of trust of a specific source *in relation to* another source. Identifying the context of trusted sources of tobacco product information can help researchers create innovative strategies to disseminate future messages as research on emerging tobacco products evolves. In an era when health information is available from various sources, with often conflicting messages, a better understanding of source trust can inform the development and dissemination of messages to guide tobacco use behaviors.

Rather than examining trust of information sources independently, we propose exploring a measure of *relative trust*. We view relative trust as potentially important because trust in one source for information can depend on the trust of its competitors (Hoogendoorn, Jaffry, Maanen, & Treur, 2014). The concept of *relative trust* has been used by health (Brosseau-Liard, Cassels, & Birch, 2014; Gidman, Ward, & McGregor, 2012) and non-health researchers (e.g., information technology) (Hoogendoorn et al., 2014). However, this study will be the first, to our knowledge, to assess relative trust in relation to smoking behaviors. In the current study, we were interested in trust of sources that usually promote pro-tobacco messaging, such as tobacco and e-cigarette companies, relative to trust of traditional sources of information, such as health professionals (who generally promote anti-tobacco messaging).

The purpose of this study was to (1) assess trust of tobacco and e-cigarette companies relative to trust of health professionals by sociodemographic variables and (2) examine associations between relative trust with smoking status and e-cigarette use. We hypothesized that a higher proportion of respondents from socioeconomically disadvantaged groups would trust tobacco/e-cigarette companies as much as or more than health professionals and that this pattern of trust would be associated with smoking behavior. Understanding trusted sources for information about tobacco products and e-cigarettes will further researchers' understanding of the relationship between health information and smoking behavior.

Methods

Data source and sample

This study used data from the National Cancer Institute's 2015 Health Information National Trends Survey (HINTS-FDA Cycle,

$N = 3,738$), a cross-sectional survey administered to civilian non-institutionalized individuals aged 18 years and older with an oversampling of current and former smokers. Survey data were collected via mail between May and September 2015. Additional details regarding data collection and methodology have been published elsewhere (Blake et al., 2016).

Measures

Tobacco-related relative trust

Trust of information sources was assessed using two survey questions. The first question asked, "In general, how much would you trust information about the health effects of using tobacco from each of the following?" Participants responded by indicating their level of trust for each source listed —(i) a doctor/pharmacist/health-care provider (hereafter, "doctors"), (ii) family or friends, (iii) government health agencies (e.g., the Food and Drug Administration (FDA), National Institutes of Health (NIH), or Centers for Disease Control and Prevention (CDC)), (iv) health organizations or groups (such as the American Cancer Society, American Lung Association, or others), (v) religious organizations and leaders, and (vi) tobacco companies—on a four-point Likert scale. Response options were 1 (a lot), 2 (some), 3 (a little), and 4 (not at all). Responses were reverse coded so that higher values represented a higher level of trust in that source.

A dichotomous measure of relative trust of information on the health effects of using tobacco products from tobacco companies relative to health professionals was created by first computing a variable representing *trust in health professionals*. Trust in health professionals was defined as the mean level of respondents' trust in doctors, government health agencies, and health organizations or groups (which together formed a good reliable subscale; Cronbach's $\alpha = 0.85$). Respondents' level of trust in information from health professionals was compared to their reported trust in information from tobacco companies by categorizing respondents as trusting tobacco companies more than, as much as, or less than health professionals. Due to the low number of respondents who trusted information from tobacco companies more than health professionals ($n = 66$), this category was combined with the category indicating those who trusted information from tobacco companies an equal amount as health professionals ($n = 315$). The final dichotomous tobacco-related relative trust measure used in analysis specified respondents reporting equal or greater trust in information from tobacco companies compared to health professionals ($n = 381$) (coded as "1") versus those reporting a lower level of trust in information from tobacco companies than health professionals ($n = 3,138$) (coded as "0"). This latter group is described hereon as reporting greater trust in information from health professionals relative to tobacco companies.

E-cigarette-related relative trust

A separate question asked, "In general, how much would you trust information about the health effects of electronic cigarettes from each of the following?" Levels of trust were reported for the same list of sources described above, with the addition of "E-cigarette companies", using the same four-point scale. A similar relative trust measure was computed by first computing a variable representing *trust in information from health professionals*, defined as the mean level of respondents' trust in doctors, government health

agencies, and health organizations or groups (which together formed a good reliable subscale; Cronbach's $\alpha = 0.86$). Using a process identical to the one used to create the tobacco-related relative trust measure above, a dichotomous measure was created to indicate respondents with equal or greater trust in information from e-cigarette companies relative to health professionals (coded "1") versus respondents with less trust in information from e-cigarette companies relative to health professionals (coded "0") (i.e., greater trust in information from health professionals than e-cigarette companies).

Tobacco-related behavior

A smoking status measure was created using two survey items: "Have you smoked at least 100 cigarettes in your entire life?" (yes/no) and "Do you now smoke cigarettes every day, some days, or not at all?" (every day/some days/not at all). Respondents who smoked 100 cigarettes and currently smoke cigarettes every day or some days were categorized as current smokers, those who smoked 100 cigarettes but did not currently smoke were categorized as former smokers, and those who had not smoked 100 cigarettes in their life were categorized as never smokers.

Respondents were also asked about e-cigarette use using the survey item, "Which of the following tobacco products have you ever tried even once?" The list of products included, but was not limited to, "e-cigarettes, also known as vape-pens, hookah pens, e-hookahs, or e-vaporizers." Respondents indicating they had tried e-cigarettes were coded as ever users, and those who did not indicate use were coded as never users.

Demographic variables

Demographics of interest were self-reported measures (dichotomized for analyses) of race/ethnicity [Non-Hispanic (NH) White versus from a racial/ethnic minority group], annual household income (<\$20,000 versus \geq \$20,000), education (\leq high school versus >high school), gender (male versus female), and self-reported age (continuous years). Based on literature citing associations between geographic location and cigarette use (Roberts et al., 2017), we also included a measure indicating each respondent's geographic area. HINTS categorized respondent addresses into one of nine metropolitan codes using the USDA Rural–Urban Continuum Codes (National Cancer Institute, 2016). Following the cut points provided by the USDA (U.S. Department of Agriculture, 2013) and used in other HINTS studies (Befort, Nazir, Engelman, & Choi, 2013; Heffner & Mull, 2017), the codes were dichotomized into metropolitan (codes 1–3) versus non-metropolitan (codes 4–9) areas.

Statistical analyses

The first set of analyses examined bivariate associations between demographic variables and relative trust measures using Chi-squared tests for categorical variables and t-tests for continuous variables. The second set of analyses explored bivariate associations of relative trust and demographic measures with smoking status and e-cigarette use. For smoking status, Chi-squared tests and one-way Analysis of Variance (ANOVA) were conducted. For e-cigarette use (dichotomous), Chi-squared and t-tests were conducted. The final set of analyses assessed associations between

relative trust measures and smoking status and e-cigarette use, controlling for demographic variables. Tobacco-related relative trust was entered as an independent variable in a multinomial logistic regression model with smoking status as the outcome and demographic variables as covariates. Similarly, a binary logistic regression model was conducted with e-cigarette-related relative trust as the independent variable and e-cigarette use as the dependent variable, with demographic variables as covariates.

Analyses were conducted in SAS version 9.4. Jackknife replicate weights were used to account for the complex survey design of the HINTS. Weighted percentages and adjusted odds ratios with 95% confidence intervals are presented, with alpha set at $p < 0.05$. Respondents missing data on any of the measures described were excluded from final analyses, resulting in a final sample of 2,966 for the smoking status outcome and 2,691 for the e-cigarette use outcome.

Results

Forty percent of survey respondents belonged to a racial/ethnic minority group, 32% reported a high school education or less, 20% had an income of less than \$20,000, 49% were male, 85% lived in a metropolitan area, and the average age was 47 years old (Table 1). Fifteen percent were current smokers, 25% former smokers, and 60% never smokers. Approximately 21% of the sample had used e-cigarettes. Overall, 13% of respondents trusted information about the health effects of using tobacco from tobacco companies as much as or more than health professionals, and 17% of respondents trusted information about the health effects of e-cigarettes from e-cigarette companies as much as or more than health professionals.

Relative trust by demographic variables

Respondents who placed as much or more trust in tobacco companies than health professionals were more likely to be from a racial/ethnic minority group (20% of racial/ethnic minority group versus 9% of NH Whites), have less education (22% with high school education or less versus 7% with more than high school education), or lower income (26% with income less than \$20,000 versus 10% with income of \$20,000 or more) (all $p < 0.0001$) (Table 1). Respondents with as much or more trust in e-cigarette companies relative to health professionals were more likely to be from a racial/ethnic minority group (24% of racial/ethnic minority group versus 13% of NH Whites, $p < 0.0001$), have less education (24% with high school education or less versus 14% with more than high school education, $p = 0.0018$) or lower income (31% with income less than \$20,000 versus 14% with income \$20,000 or more, $p < 0.0001$), and live in metropolitan areas (18% in metropolitan areas versus 13% in non-metropolitan areas, $p = 0.0411$).

Smoking behavior by relative trust and demographic variables

Smoking status did not significantly differ by tobacco-related relative trust, but there were differences in smoking status by race/ethnicity, education, income, gender, geographic area, and age (Table 2). For example, 26% of respondents with an annual

Table 1. Differences in tobacco-related and E-cigarette-related relative trust by demographics.

Characteristics	Tobacco-related relative trust, <i>n</i> = 3,519				E-cigarette-related relative trust, <i>n</i> = 3,507		
	Total, <i>N</i> = 3,738, <i>n</i> (%) or <i>M</i> (SE)	Trust information from:		<i>p</i> -Value	Trust information from:		<i>p</i> -Value
		Health professionals more than tobacco companies, <i>n</i> (%) or <i>M</i> (SE)	Tobacco companies as much or more than health professionals, <i>n</i> (%) or <i>M</i> (SE)		Health professionals more than e-cigarette companies, <i>n</i> (%) or <i>M</i> (SE)	E-cigarette companies as much or more than health professionals, <i>n</i> (%) or <i>M</i> (SE)	
<i>Demographics</i>							
Race/ethnicity							
Racial/ethnic minority	1,105 (40.4)	830 (80.5)	172 (19.5)	< 0.0001	782 (76.4)	209 (23.6)	<0.0001
Non-Hispanic White	2,633 (59.6)	2,308 (90.7)	209 (9.3)		2,204 (87.4)	312 (12.6)	
Education							
≤High School	964 (31.9)	690 (78.5)	174 (21.5)	< 0.0001	663 (76.3)	202 (23.7)	<0.0001
>High School	2,710 (68.1)	2,397 (90.4)	197 (6.6)		2,273 (85.9)	312 (14.1)	
Income							
<\$20,000	664 (20.3)	469 (74.3)	138 (25.7)	< 0.0001	441 (69.0)	162 (31.0)	<0.0001
≥\$20,000	2,638 (79.7)	2,331 (89.6)	198 (10.4)		2,229 (86.5)	296 (13.5)	
Gender							
Male	1,497 (49.1)	1,272 (87.1)	143 (12.9)	0.8412	1,203 (83.8)	209 (16.2)	0.9305
Female	2,018 (50.9)	1,700 (86.5)	207 (13.5)		1,623 (83.5)	269 (16.5)	
Geographic area							
Non-metropolitan	901 (14.9)	724 (86.0)	113 (14.0)	0.6719	714 (86.9)	127 (13.1)	0.0411
Metropolitan	2,837 (85.1)	2,414 (86.7)	268 (13.3)		2,272 (82.4)	394 (17.6)	
Age (years)	47.2 (0.13)	46.9 (0.27)	45.0 (1.62)	0.3164	46.6 (0.31)	46.1 (1.36)	0.7669

Note: Weighted percentages, means, and standard errors are presented. Data from the Health Information National Trends Survey-FDA Cycle.

Table 2. Differences in smoking status and E-cigarette use by relative trust and demographics.

Characteristics	Smoking Status, <i>n</i> = 3,668				E-cigarette use, <i>n</i> = 3243		
	Current, <i>n</i> (%) or <i>M</i> (SE)	Former, <i>n</i> (%) or <i>M</i> (SE)	Never, <i>n</i> (%) or <i>M</i> (SE)	<i>p</i> -Value	Ever, <i>n</i> (%) or <i>M</i> (SE)	Never, <i>n</i> (%) or <i>M</i> (SE)	<i>p</i> -value
<i>Relative trust</i>							
Tobacco-related relative trust							
Trust health professionals more than tobacco companies	388 (15.0)	966 (25.3)	1,726 (59.8)	0.2511	N/A	N/A	
Trust tobacco companies as much or more than health professionals	80 (14.7)	96 (19.7)	196 (65.7)		N/A	N/A	
E-cigarette-related relative trust							
Trust health professionals more than e-cigarette companies	N/A	N/A	N/A		382 (20.3)	2,321 (79.7)	0.0050
Trust e-cigarette companies as much or more than health professionals	N/A	N/A	N/A		104 (31.3)	295 (68.7)	
<i>Demographics</i>							
<i>Race/Ethnicity</i>							
Racial/ethnic minority	157 (12.5)	267 (16.1)	648 (71.4)	<0.0001	131 (16.9)	734 (83.1)	0.0340
Non-Hispanic White	338 (16.4)	865 (30.7)	1,393 (52.8)		366 (24.0)	2,012 (76.0)	
<i>Education</i>							
≤ High School	212 (23.1)	289 (24.5)	441 (52.4)	<0.0001	155 (24.5)	604 (75.5)	0.2440
> High School	276 (11.2)	822 (24.7)	1,570 (64.2)		337 (20.3)	2,108 (79.7)	
<i>Income</i>							
<\$20,000	173 (26.2)	179 (18.5)	298 (55.3)	<0.0001	137 (27.1)	383 (72.9)	0.1232
\$20,000 or more	280 (12.6)	820 (26.1)	1,496 (61.4)		326 (21.2)	2,054 (78.8)	
<i>Gender</i>							
Male	208 (16.1)	545 (28.0)	717 (55.8)	0.0005	196 (23.2)	1124 (76.8)	0.1526
Female	265 (14.3)	520 (21.0)	1,200 (64.7)		275 (19.5)	1,482 (80.5)	
<i>Geographic Area</i>							
Non-metropolitan	151 (22.6)	284 (27.6)	452 (49.8)	0.0003	139 (24.7)	650 (75.3)	0.1940
Metropolitan	344 (13.5)	848 (24.4)	1,589 (62.1)		358 (20.7)	2,096 (79.3)	
Age (years)	44.9 (1.22)	54.8 (0.85)	44.4 (0.38)	<0.0001	37.6 (0.84)	48.8 (0.53)	< 0.0001

Note: Weighted percentages, means, and standard errors are presented. Data from the Health Information National Trends Survey-FDA Cycle.

household income <\$20,000 were current smokers, compared to 13% of respondents with an income at or above \$20,000. ($p < 0.0001$). E-cigarette use significantly differed by e-cigarette-related relative trust, where a higher proportion of respondents trusting information from e-cigarette companies as much as or more than health professionals had used e-cigarettes (31% versus 20%, $p = 0.0050$). E-cigarette use also significantly differed by race/ethnicity and age (both $p < 0.05$).

A logistic regression model with e-cigarette use as the dependent variable and e-cigarette related relative trust as the independent variable (controlling for demographic variables) found that respondents who trusted information about the health effects of e-cigarettes from e-cigarette companies as

much as or more than health professionals had 87% (95% CI: 1.16, 3.00) greater odds of having used e-cigarettes than those who had higher trust in health professionals (Table 3).

Discussion

This study identified population subgroups that placed more or equal trust in tobacco and e-cigarette companies relative to health professionals for information about the health effects of smoking products. Additionally, while tobacco-related relative trust was not associated with smoking status, e-cigarette-related relative trust was associated with e-cigarette use. These findings may improve targeted messaging for populations that

Table 3. Multivariable binary logistic regression for the association between E-cigarette-related relative trust and E-cigarette use.

Characteristics	E-cigarette use ^a
	aOR (95% CI)
E-cigarette-related relative trust	
Trust e-cigarette companies as much or more than health professionals	1.87 (1.16, 3.00)
Trust health professionals more than e-cigarette companies	REF
Race/ethnicity	
Non-Hispanic White	2.28 (1.33, 3.89)
Racial/ethnic minority	REF
Education	
≤High School	1.41 (0.86, 2.33)
>High School	REF
Income	
<\$20,000	1.18 (0.68, 2.04)
≥\$20,000	REF
Gender	
Male	1.22 (0.84, 1.78)
Female	REF
Geographic Area	
Non-metropolitan	1.34 (0.88, 2.05)
Metropolitan	REF
Age (years)	0.96 (0.94, 0.97)

Note: Weighted analyses are presented. Data from the Health Information National Trends Survey-FDA Cycle.

^aReference group = never smokers, aOR = adjusted odds ratios, CI = confidence interval.

may be more receptive to messaging from tobacco and e-cigarette companies and increase our understanding of the association between health information and smoking behavior.

More specifically, the current study found that respondents trusting tobacco and e-cigarette companies as much as or more than health professionals were more likely to be from medically vulnerable groups (i.e., from a racial/ethnic minority, low income, or low education group). This may be the effect of years of advertisement from tobacco companies that targeted these groups. For example, previous studies have shown disproportionate tobacco product marketing that targets disadvantaged neighborhoods and neighborhoods with a high number of Black residents (Lee, Henriksen, Rose, Moreland-Russell, & Ribisl, 2015).

Higher trust of tobacco and e-cigarette companies among some medically vulnerable groups also could have resulted from differing levels of trust in health professionals in these populations. Previous literature indicates that individuals from racial/ethnic minority groups have lower levels of trust in physicians (Boulware et al., 2003), the health-care system (Armstrong et al., 2013), and the government (Corbie-Smith, Thomas, Williams, & Moody-Ayers, 1999; Weaver et al., 2017). Evidence suggests that trust of health professionals also differs by education, income, and smoking status. A study using 2007 HINTS data found that respondents with a high school education or less were less likely than college graduates to trust government health agencies, and those with low income were less likely to trust doctors or other health-care professionals (Richardson et al., 2012). A separate study using 2005 HINTS data found that current smokers were also less likely to trust health-care professionals compared to never smokers (Rutten, Blake, Hesse, & Ackerson, 2011). Our study is one of few (Alcala et al., 2017) to identify sociodemographic differences in the level of trust of information sources for information specific to tobacco products and e-cigarettes.

In the current study, tobacco-related relative trust was not associated with smoking status, possibly reflecting generally high public awareness about the health effects of tobacco products. Recent studies assessing knowledge of health effects

of using tobacco products in a population-based sample are lacking. However, a 2008 HINTS brief acknowledged that 84% of the US population was aware that smoking is associated with cancer (National Cancer Institute, 2008). With generally high levels of knowledge about the health effects of smoking, the source of additional information about their health effects may not be an essential factor in the decision to use cigarettes.

While most of the general population understands tobacco health effects, some groups are less knowledgeable about the impact of tobacco products. For example, only 51% of people with less than a high school education, 54% of people with an income less than \$25,000, 54% of African Americans, and 49% of Hispanics believed quitting smoking can reduce chances of getting cancer, compared to 70% of college graduates, 70% of people with an income higher than \$75,000, and 63% of Whites (National Cancer Institute, 2008). These groups overlap with the subgroups identified in our study that have more or equal trust in tobacco and e-cigarette companies relative to health professionals and may benefit from additional tobacco control messaging. Tobacco control messaging must continue to improve to ensure equitable distribution of evidence-based information to groups identified as being more susceptible to information from tobacco and e-cigarette companies.

In addition, although most people know about the detrimental health effects of tobacco products (National Cancer Institute, 2008), inconclusive findings and lack of consensus in the medical community on the effects of e-cigarette use (Kaisar, Prasad, Liles, & Cucullo, 2016) may be leading to misinformed use of the product. For example, a study of an online patient-provider health service observed inconsistent feedback given by health professionals in which about 47% of providers responded to patient questions and comments about e-cigarettes with a “negative attitude” (i.e., noting the risk of addiction and use by youth), 33% responded with a “neutral attitude” (i.e., providing a non-committal or general response), and 20% provided a “positive attitude” (i.e., noting the use of e-cigarettes for harm reduction or cessation) (Brown-Johnson et al., 2016). In addition, a recent report published by the National Academies of

Sciences, Engineering, and Medicine concluded that scientists were unable to generally classify e-cigarettes as beneficial or harmful due to their many different uses (e.g., cessation tool versus a gateway product to conventional cigarette use) (National Academies of Sciences, Engineering, and Medicine, 2018). Health communication literature states the need for consistent messaging when promoting a desired behavior (Crawford & Okigbo, 2013). Therefore, inconsistent and inconclusive information can confuse tobacco consumers and patients who would normally turn to health-care providers for health-related advice and may also decrease their trust in providers' ability to provide accurate information about the health effects of this product. In contrast to health professionals' mixed arguments about e-cigarettes, e-cigarette companies continue to present the same message: e-cigarettes are a healthier alternative to traditional cigarettes and can be used as a cessation tool (Grana & Ling, 2014; Richardson, Ganz, Stalgaitis, Abrams, & Vallone, 2014). Health professionals may need to make a collective effort to present a consistent message to increase trust in their information about the product and educate the public if continued research reveals negative health effects of e-cigarettes.

Limitations

The cross-sectional nature of HINTS data did not allow us to explore a temporal relationship between relative trust of information sources and smoking behavior. However, we identified a measure (relative trust) that can be considered in longitudinal research exploring causal associations. Furthermore, our relative trust measure combined trust of information from doctors, government health agencies, and health organizations into one group of health professionals, limiting our ability to gauge nuanced trust in the individual sources relative to trust in tobacco and e-cigarette companies. While there are multiple ways to construct a relative trust measure, the creation of a summary measure was supported by the reliability of a measure that included these sources. We also acknowledge the potential for information lost by categorizing the two continuous levels of trust into one categorical measure. However, the categorization of the relative trust measure allowed us to more clearly focus on a single aspect of information trust (i.e., determining whether respondents trusted information from tobacco/e-cigarette companies more than, the same as, or less than health professionals).

Despite these limitations, this study is the first, to our knowledge, to examine relative trust of e-cigarette companies and to assess the relationship between relative trust of sources for information about tobacco products and e-cigarettes with smoking (and vaping) behavior in a national sample. We present a novel approach to better understanding the complex association between health messaging via different sources with tobacco and e-cigarette use.

Conclusions and implications

The association between relative trust and e-cigarette use suggests a need for educational material specific to e-cigarettes among specific populations. Providing consistent and accurate messaging may inform public decision-making about whether to

use the product. Continued research should enhance knowledge about anti-tobacco and e-cigarette educational messaging and identify targeted outreach strategies such as seeking to ensure that trust in information about the health effects of tobacco products, particularly e-cigarettes, from health professionals is higher than that of e-cigarette companies. This will be especially important among identified populations that may be more susceptible to messages from tobacco and e-cigarette companies.

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