Published in final edited form as:

Health Commun. 2018 September ; 33(9): 1059–1067. doi:10.1080/10410236.2017.1331190.

Source Credibility and E-Cigarette Attitudes: Implications for Tobacco Communication

Kathleen R. Case^a, Allison J. Lazard^b, Michael S. Mackert^{a,c,d}, and Cheryl L. Perry^a

^aSchool of Public Health in Austin, The University of Texas Health Science Center at Houston (UTHealth)

^bSchool of Media and Journalism, University of North Carolina at Chapel Hill

^cStan Richards School of Advertising and Public Relations, University of Texas at Austin

^dUniversity of Texas at Austin, University of Texas at Austin Center for Health Communication

Abstract

As there are many conflicting sources of e-cigarette information, research is needed to determine the impact of these sources on e-cigarette attitudes to inform future communication campaigns. Source credibility is important in shaping attitudes toward other health topics; however, no study has examined its role in influencing e-cigarette attitudes. Data from the 2015 Health Information National Trends Survey-FDA (HINTS-FDA) were utilized to assess differences in trust in different sources by e-cigarette user status and to investigate the associations between trust in sources and e-cigarette attitudes ($n = 3,738$). Differences in trust in sources were examined using weighted linear regression. Associations between trust in sources of e-cigarette health effects and attitudes toward e-cigarettes were assessed using weighted logistic regression. Overall, e-cigarette ever users reported significantly lower trust in governmental agencies as compared to never users. Trust in e-cigarette companies was negatively associated with perceived addictiveness of e-cigarettes (AOR = 0.76, 95% CI = 0.58, 1.00), while trust in doctors/pharmacists/healthcare providers was negatively associated with harm perceptions of e-cigarettes relative to conventional cigarettes (AOR = 0.72, 95% CI = 0.55, 0.95). Trust in tobacco companies and trust in e-cigarette companies were negatively associated with absolute perceived harm of e-cigarettes (AOR = 0.70, 95% CI = 0.51, 0.95; AOR = 0.60, 95% CI = 0.46, 0.79, respectively). Results from this study indicate that the associations between trust in sources of e-cigarette health effects and e-cigarette attitudes differ both by source and specific attitude assessed. Ultimately, future campaigns should incorporate messaging to discredit industry sources of information and utilize non-governmental sources to effectively influence e-cigarette attitudes.

Electronic cigarette (“e-cigarette”) use continues to increase among adult populations, with recent research finding that the prevalence of current e-cigarette use is second only to conventional cigarettes (Hu et al., 2016; King, Patel, Nguyen, & Dube, 2014). While the

CONTACT: Kathleen R. Case, kathleen.r.case@uth.tmc.edu, The University of Texas Health Science Center at Houston (UTHealth), School of Public Health in Austin, 400 W. 15th Street, Suite 1050, Austin, TX 78701.

ORCID

Allison J. Lazard: <http://orcid.org/0000-0002-2502-2850>

long-term health effects of e-cigarette use are still being examined, numerous governmental agencies and health organizations have released statements warning about the dangers of e-cigarette use (American Cancer Society, 2015; American Lung Association, 2015; U.S. Food and Drug Administration, 2009). These statements stand in stark contrast to e-cigarette ads which claim that e-cigarettes are safer alternatives to conventional cigarettes (Grana & Ling, 2014; Kim, Arnold, & Makarenko, 2014; Kornfield, Huang, Vera, & Emery, 2015; Zhu et al., 2014). Due to the conflicting information about e-cigarettes, research is needed not only to determine perceptions and attitudes of these products, but also to examine factors that contribute to these attitudes. One such factor that may influence adoption of pro- or anti-e-cigarette beliefs is source credibility.

Source credibility is conceptualized as both the “expertise” and “trustworthiness” of a person or organization presenting a message and is an important factor in information processing and attitude development (Pornpitakpan, 2004; Schmidt, Ranney, Pepper, & Goldstein, 2016). High source credibility often functions as a cue for information processing that influences attitudes to align with message content, especially when little attention is given to the message or the message content is novel to the viewer (Hovland & Weiss, 1951; Petty, Cacioppo, & Goldman, 1981; Pornpitakpan, 2004). To date, no study has investigated perceptions of source credibility of e-cigarette health information, which include those of varying positions, such as healthcare providers, government health agencies, health organizations, and tobacco or electronic cigarette companies. Research is needed to examine perceptions of different sources to determine which source or sources may be most effective in delivering health messages about e-cigarettes.

Background

Effective health communication regarding electronic cigarette use among adults presents a unique challenge to the public health community. E-cigarette use remains a contentious issue in public health, with harm reductionists arguing that e-cigarettes will reduce the public health burden of traditional tobacco use, and others arguing that e-cigarettes are attracting a new group of consumers who would otherwise have not started smoking (Cahn & Siegel, 2011; Fairchild, Bayer, & Colgrove, 2014). Furthermore, even governmental agencies are in disagreement about e-cigarettes. The United States’ Food and Drug Administration (FDA) warns against use, while Public Health England has routinely stated that e-cigarettes are a healthier alternative to tobacco cigarettes (McNeill et al., 2015; U.S. Food and Drug Administration, 2009). Despite these opposing views, several consistent themes have emerged from the literature that warrant concern about e-cigarettes, for example, 1) many e-cigarettes contain nicotine, a highly addictive chemical (Grana, Benowitz, & Glantz, 2014), 2) e-cigarettes are not approved as effective cessation devices and their efficacy as quit aids is dubious (Kalkhoran & Glantz, 2016; Pearson et al., 2015), and 3) e-cigarettes contain harmful constituents such as formaldehyde and diacetyl, which are associated with respiratory illnesses (Allen et al., 2015; Kosmider et al., 2014).

Sources of E-Cigarette Health Information

There are numerous sources of e-cigarette information (e.g., federal agencies, healthcare providers, and e-cigarette companies) that provide differing and often conflicting points of view. First, the FDA has issued warnings that e-cigarettes contain many toxic chemicals found in conventional cigarettes (U.S. Food and Drug Administration, 2009). In addition, health organizations have issued statements warning about the potential harms of e-cigarettes (American Cancer Society, 2015; American Lung Association, 2015). Furthermore, recent research indicates that healthcare providers, namely physicians, are important sources of e-cigarette health information (Kandra, Ranney, Lee, & Goldstein, 2014; Steinberg, Giovenco, & Delnevo, 2015). A substantial percentage of physicians (30 to 35%) report recommending e-cigarettes as cessation aids, in spite of findings from the U.S. Preventive Task Force that there is not enough evidence to support the use of e-cigarettes in cessation (Kandra et al., 2014; Siu, 2015; Steinberg et al., 2015). Finally, e-cigarette companies themselves are important sources of e-cigarette information, with a recent study finding that 40% of adult conventional cigarette smokers reported frequent exposure to e-cigarette advertising (Blake et al., 2015). Currently, e-cigarette advertising is permitted on a wide variety of media including television, websites, social media, and print advertisements, among others (Duke et al., 2014; Emery, Vera, Huang, & Szczypka, 2014). The high levels of exposure to advertising are particularly alarming given that misleading health claims, such as that e-cigarettes produce harmless water vapor, are commonly perpetuated by e-cigarette companies (Grana & Ling, 2014).

Given the multitude of sources providing conflicting information about e-cigarettes, research is needed to determine the impact of these sources on perceptions and attitudes about e-cigarettes. While there has been considerable research on the association between e-cigarette messaging and harm perceptions, to date, no study has examined the role of source credibility on perceptions of e-cigarettes (Blake et al., 2015; Latimer, Batanova, & Loukas, 2014; Pearson, Richardson, Niaura, Vallone, & Abrams, 2012; Pokhrel, Fagan, Kehl, & Herzog, 2015).

Source Credibility as Defined by the Elaboration Likelihood Model

The elaboration likelihood model (ELM) is a useful framework for understanding how messages influence attitudes toward e-cigarettes via one of two processing pathways: the central or the peripheral route (Petty & Cacioppo, 1986; Petty, Priester, & Brinol, 2009). Persuasive communication is processed through the different routes depending on factors such as motivation; when motivation to process the information is high (central route), individuals actively evaluate the messages using previous knowledge of the topic and assessment of argument quality, often resulting in persistent attitudes. Conversely, when motivation is low (peripheral route), individuals often rely on cues to inform and shape attitudes (Petty & Cacioppo, 1986; Petty et al., 2009). Importantly, source credibility can impact the formation of attitudes in both the central and peripheral routes—functioning as a cue or indicator of argument quality.

Source credibility is most widely agreed to be a combination of two essential qualities: expertise and trustworthiness (Pornpitakpan, 2004). Expertise or the degree that one believes

that the source has knowledge, skills, and thus accurate information directly influences whether audiences think that the source is *worth* listening to. Trustworthiness is more closely linked to opinions of whether one *should* listen to the advice, information, or argument given by the source. Higher source credibility has been shown to increase positive reception of message content and in turn influence attitudes (Hovland & Weiss, 1951). This is especially true when message are processed through the peripheral route (Chaiken, 1980; Petty & Cacioppo, 1986; Petty et al., 2009).

Source credibility has been studied as an important factor in shaping attitudes toward controversial health topics, such as genetically modified foods and vaccines (Dean & Shepherd, 2007; Freed, Clark, Butchart, Singer, & Davis, 2011; Roe & Teisl, 2007). Less research has examined the role of source credibility and attitudes toward tobacco products, although there are some insights for differences in perceptions of source credibility by smoking status (Guttman & Peleg, 2003; Rutten, Augustson, Doran, Moser, & Hesse, 2009; Zagona & Harter, 1966). For example, Guttman and Peleg (2003) found rankings of credible sources of cigarette health warnings differed by smoking status (light versus heavy smokers). Light smokers rated the Ministry of Health as most credible, while heavy smokers rated medical research as most credible. Similarly, in another study, moderate to heavy daily smokers have reported less trust in cancer information from a doctor than light daily smokers and intermittent smokers (Rutten et al., 2009). Zagona and Harter (1966) found that participants assigned to a high credibility condition (message was attributed to the Surgeon General's Report) had more positive attitudes toward a message regarding health consequences of smoking than those in the low credibility group (message was attributed to a tobacco company). While research indicates that source credibility may be an important factor in shaping attitudes and perceptions of conventional cigarettes (Guttman & Peleg, 2003; Rutten et al., 2009; Schmidt et al., 2016; Zagona & Harter, 1966), to date, no research has yet examined the role of source credibility and attitudes or beliefs regarding e-cigarette use.

Study Purpose

Following the recommendations by Schmidt et al. (2016), the present study investigated one aspect of source credibility, trustworthiness, with respect to general health information and health information about e-cigarettes specifically across a variety of sources. Furthermore, differences in trustworthiness of sources of information across sociodemographic characteristics and e-cigarette use behaviors were also explored. Finally, associations between trust in specific sources of e-cigarette information and beliefs about the addictiveness and harmfulness of e-cigarettes were examined. Results from this study will be used to inform one of the FDA's Center for Tobacco Products research priorities, specifically, "effective communication strategies regarding harmful and potentially harmful constituents and risks of tobacco products" (U.S. Food and Drug Administration, 2014).

Methods

Study Design and Participants

The present study examined data from the 2015 Health Information National Trends Survey-FDA Survey (HINTS-FDA). The HINTS survey is a nationally representative survey of U.S. adults over the age of 18 which includes questions related to health communication, health behaviors, and cancer beliefs. In the HINTS-FDA survey, the National Cancer Institute partnered with the Food and Drug Administration (FDA) to examine additional items specific to tobacco product use and beliefs about tobacco products, including harm and risk perceptions (Westat, 2015). Both current and former smokers were oversampled to ensure a sufficient sample size for analyses. A description of sampling design and oversampling of current and former smokers is provided elsewhere (Westat, 2015). Data collection began on May 29, 2015 and concluded on September 9, 2015. All analyses included sampling weights to generalize the findings to the overall U.S. population. The final sample included 3,738 adults ($N = 245,279,633$).

Measures

Perceptions of E-Cigarettes—Perceptions of e-cigarettes served as the outcome variables. Three different perceptions of e-cigarettes were assessed: perceived addictiveness, perceived harm relative to conventional cigarettes, and absolute perceived harm (National Institutes of Health, & U. S. Department of Health and Human Services, 2016). For addictiveness, a variable was created corresponding to those participants who answered “not at all addictive” versus those who selected “moderately addictive” or “very addictive.” For harm relative to conventional cigarettes, a variable was created corresponding to participants who indicated “much less harmful,” or “less harmful” versus those who selected “just as harmful,” “more harmful,” or “much more harmful.” For absolute perceived harm, a variable was created corresponding to participants who indicated “not at all harmful” versus those who selected “moderately harmful,” or “very harmful.” Participants who indicated “I’ve never heard of these products,” or “I don’t know enough about these products” were excluded from the analyses.

Trust in Sources—Trust in sources served as the exposure variables of interest. Trust in sources was assessed for two different types of health information: general health information and e-cigarette health effects (National Institutes of Health, & U. S. Department of Health and Human Services, 2016). Trust in sources of general health information was assessed for doctors, government health agencies, and health organizations or groups. Trust in sources of e-cigarette health effects was assessed for doctors/pharmacists/healthcare providers (“healthcare providers”), government health agencies, health organization or groups, tobacco companies, and electronic cigarette companies. A variable was created for each source with responses ranging from 1 (“not at all”) to 4 (“a lot”).

Statistical Analyses

First, differences between never e-cigarette users and ever e-cigarette users by demographic and conventional cigarette use were examined using weighted chi-square analyses. Next, mean differences in *trust in sources* for general health information and e-cigarette health

effects were examined by demographic characteristics and e-cigarette/tobacco product use. Separate models were conducted for each different source, and significant differences were examined using weighted linear regression models. For variables with more than two categories, each mean was tested to determine if it was significantly different from the mean across all groups using Bonferroni corrections for multiple comparisons. For variables with two categories, the means were compared to determine if there were significant differences. Weighted logistic regression analyses were conducted to determine the associations between trust in sources of e-cigarette health effects and the three different perception variables. Given the large number of covariates, bivariate analyses were conducted between each of the covariates and the outcome variables to determine which covariates to include in the adjusted models; covariates that were significant at $p < .10$ were included in the final adjusted models. All analyses were conducted using Stata 14.0 (College Station, TX).

Results

As the primary aim of the study was to examine differences in trust in health information by e-cigarette user status, analyses were thus restricted to individuals who had complete data for e-cigarette use ($n = 3,243$). As shown in Table 1, there were significant differences between never and ever e-cigarette users with respect to age, education level, and cigarette use. Specifically, a higher proportion of ever e-cigarette users was younger, had completed some college, and had ever used cigarettes as compared to never e-cigarette users.

Results for differences in mean scores for *trust in sources for general health information* by demographic and e-cigarette/tobacco product use behaviors are presented in Table 2. Overall, participants reported the highest level of trust in doctors ($m = 3.65$), followed by government health agencies ($m = 3.24$), and health organizations ($m = 3.17$). For differences in trust in sources by e-cigarette user status, ever users reported significantly lower trust in government health agencies as compared to never users. There were no significant differences in trust in doctors or health organizations by e-cigarette user status. There were also no significant differences in trust in sources by conventional cigarette user status.

Results for differences in mean scores for *trust in sources for e-cigarette health effects* are presented in Table 3. Similar to the results for general health information, participants reported the highest level of trust in doctors, pharmacists, or healthcare providers ($m = 3.37$). For differences in trust by e-cigarette user status, ever users reported significantly lower trust in government health agencies and health organizations compared to never users. Conversely, ever users reported significantly higher trust in e-cigarette companies as compared to never users. Ever users of conventional cigarettes reported significantly lower trust in doctors, governmental health agencies, and health organizations as compared to never users.

Results for the unadjusted and adjusted associations between *trust in sources of e-cigarette health effects* and perceptions of e-cigarettes are presented in Table 4. Trust in e-cigarette companies was negatively associated with perceived addictiveness (AOR = 0.76, 95% CI = 0.58, 1.00) after controlling for covariates. Next, trust in doctors/pharmacists/healthcare providers was negatively associated with perceptions of harm relative to conventional

cigarettes (AOR = 0.72, 95% CI = 0.55, 0.95) after controlling for covariates. Finally, after controlling for covariates, both trust in tobacco companies and trust in e-cigarette companies were negatively associated with absolute perceived harm of e-cigarettes (AOR = 0.70, 95% CI = 0.51, 0.95; AOR = 0.60, 95% CI = 0.46, 0.79, respectively).

Discussion

The present study provides important insight into factors associated with both *trust in sources of general health information* and *trust in sources of e-cigarette health effects*. In addition, we also explored the associations between trust in sources of e-cigarette health effects and perceived addictiveness of e-cigarettes, perceived harm of e-cigarettes relative to cigarettes, and absolute perceived harm of e-cigarettes. Results from the study have important implications for the development of future health education campaigns.

Overall, individuals are *less likely* to trust the *same* sources (doctors, governmental health agencies, health organizations) when receiving information about e-cigarette health effects compared to general health information. We also found individuals trust some sources differently based on their e-cigarette/tobacco product user status. Both e-cigarette and conventional cigarette users are less trusting of governmental health agencies and health organizations for e-cigarette health effect information than never users. Previous knowledge and experiences could explain e-cigarette users' differential trust in sources of e-cigarette health effects (Slater & Rouner, 1996). Specifically, e-cigarette ever users had lower trust in governmental health agencies for all information, which mirrors other findings that tobacco product users trust federal governments less than non-users (Boynton et al., 2016). Conversely, while trust in e-cigarette companies as source of general health information was not assessed, ever e-cigarette users reported significantly higher trust in e-cigarette companies as sources of e-cigarette health effects as compared to nonusers. Previous research on perceptions of e-cigarette companies is lacking; however, recent research has found that e-cigarette users hold positive views of e-cigarettes especially in comparison with conventional cigarettes (Berg, Barr, Stratton, Escoffery, & Kegler, 2014; Coleman et al., 2016). These positive views of e-cigarettes may also influence trust in e-cigarette companies, as a result of positive experiences.

Consistent with the ELM, trust in sources of e-cigarette health effects was associated with attitudes toward e-cigarettes; however, the associations differed both by the source of the information and the specific attitudes assessed. Notably, as trust in e-cigarette companies increased, individuals perceived e-cigarettes to be less addictive and less harmful. These results are consistent with the ELM framework which suggests that source credibility is an important factor in influencing attitudes towards a message (Petty & Cacioppo, 1986; Petty et al., 2009). Potential explanations for these findings include the high amount of exposure to e-cigarette advertising and the content of such advertising. Given that adults are exposed to e-cigarette advertising from a variety of media (point of sale, online, television, etc.) and that much of that advertising includes health claims (Blake et al., 2015; Duke et al., 2014; Emery et al., 2014; Grana & Ling, 2014), it is not surprising that trust in e-cigarette companies as sources of e-cigarette health effects was associated with lower harm perceptions.

Contrary to expectations, higher trust in doctors/pharmacists/healthcare providers as sources of e-cigarette health effects was associated with lower harm perceptions of e-cigarettes as compared to conventional cigarettes. One potential explanation for this finding is in the type of information provided by physicians. Namely, previous research indicates that doctors are an important source of health information about e-cigarettes and many doctors report recommending e-cigarettes to patients trying to reduce conventional cigarette use (Kandra et al., 2014; Smith, 2011; Steinberg et al., 2015). Thus, the negative association between trust in doctors and harm perceptions could be due to the fact that doctors are counseling patients to use e-cigarettes as cessation devices due to beliefs that they are less harmful than conventional cigarettes.

Implications for Health Communication Strategies

This paper addresses one of the research priorities established by the FDA's Center for Tobacco Products, specifically, "Effective communication strategies regarding harmful and potentially harmful constituents and risks of tobacco products" (U.S. Food and Drug Administration, 2014). Namely, results from the study suggest that messages that decrease the trust people have in the e-cigarette industry should be incorporated into e-cigarette health education campaigns, and that such campaigns should incorporate non-governmental sources. In addition, the results regarding trust in healthcare providers and harm perceptions indicate that additional training and education are needed to inform healthcare providers, particularly physicians about the current state of the research regarding the questionable effectiveness of e-cigarettes in tobacco use cessation.

In order to counter the health claims made by e-cigarette advertising and to reduce perceptions of e-cigarette companies as trustworthy sources of health information, future health education campaigns should incorporate messages that focus on the e-cigarette industry as unreliable sources of health information. For example, such messages could include statements regarding e-cigarette companies' ties to the tobacco industry, as the largest advertisers of e-cigarettes are owned by big tobacco (Cantrell, Emelle, Ganz, Hair, & Vallone, 2015). Additionally, facts that debunk specific e-cigarette company claims such as "e-cigarettes produce water vapor" should be utilized to further discredit the industry as reliable sources of health information. Counter industry tactics have been successfully employed by national campaigns such as the truth campaign, which aims to reduce the use of cigarettes among youth (Evans, Wasserman, Bertolotti, & Martino, 2002). In addition, while branding is an important strategy for anti-tobacco campaigns, future e-cigarette health communication campaigns should avoid branding that relies solely on federal agencies as message sources (Evans et al., 2002). E-cigarette users are wary of federal agencies as sources of health information, and thus, health education campaigns may be more effective if they incorporate more trusted sources such as healthcare providers. In campaigns like the FDA's Real Cost produced by the federal government, designers should consider branding the campaign from the government, as well as from more trusted sources; this might be a better approach than simply "hiding" the role of the government in producing such campaigns, which could be perceived as disingenuous and only increase that sense of distrust in the government. Previous research on sources of information about genetically modified foods (GMOs) found that consensus messages coupling a lower trusted source

(federal agency) with a higher trusted source (consumer organization or expert committee) resulted in more positive attitudes toward GMOs as compared to messages that used the federal agency as the sole source of the message (Dean & Shepherd, 2007). Ultimately, our results suggest that e-cigarette ever users may be more receptive to health education campaigns that incorporate trusted sources such as healthcare providers into messages sponsored by the federal government.

Finally, the negative association between trust in healthcare providers and perceptions of e-cigarettes as harmful as compared to conventional cigarettes highlights the need for increased educational efforts targeted at healthcare professionals. Physicians in particular are highly trusted sources of health information (Smith, 2011; Wackowski, Manderski, & Delnevo, 2015) and, thus, should be informed about the potential risks of e-cigarette use and the lack of information about the efficacy as cessation devices. Some medical organizations have already incorporated e-cigarette messaging into continuing medication education courses. For example, the Mayo Clinic College of Medicine published an online continuing medical education course for physicians detailing the current state of the literature on e-cigarettes, namely the lack of knowledge of harms associated with e-cigarette use, as well as advocating against recommending e-cigarettes to patients as cessation devices (Ebbert, Agunwamba, & Rutten, 2015). While this is an excellent first step, lessons on communicating with patients about e-cigarettes should be incorporated into continuing education courses for a wide-variety of healthcare providers (primary care physicians, family physicians, pediatricians, pharmacists, among others) to ensure that they are providing patients with accurate information about e-cigarettes.

Limitations and Future Directions

There are several limitations to the present study that warrant consideration. First, the HINTS-FDA survey did not include items related to general attitudes toward e-cigarettes apart from perceptions regarding harm and addictiveness. Such attitudes, for example, whether individuals had positive views toward e-cigarettes overall would be helpful in further understanding the association between source credibility and perceptions of e-cigarettes. Another limitation of the present data set is that the majority of participants were older adults (over the age of 55) who may be less likely than their younger counterparts to use e-cigarettes (McMillen, Gottlieb, Shaefer, Winickoff, & Klein, 2015; Regan, Promoff, Dube, & Arrazola, 2013; Schoenborn & Gindi, 2015). Future research should be conducted to determine the association between source credibility and perceptions of e-cigarettes among youth and young adults who are at an increased risk of using such products. Furthermore, given the cross-sectional nature of the study, we are unable to determine if source credibility caused the perceptions of e-cigarettes or if perceptions of e-cigarettes influenced the rating of sources of e-cigarette health effects as trustworthy. In addition, since e-cigarette user status was differentially associated with trust for the varied sources of e-cigarette health effects, trust should be explored as a potential mediator of the association between e-cigarette user status and perceptions of e-cigarettes. Ultimately, longitudinal research is needed to tease apart these effects and determine the nature of the association.

Acknowledgments

Funding

Research reported in this publication was supported by grant number [1 P50 CA180906] from the National Cancer Institute and the FDA Center for Tobacco Products (CTP). 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. NIH/FDA had no role in the study design, collection, analysis or interpretation of the data, writing the article, or the decision to submit the article for publication.

References

- Allen JG, Flanigan SS, LeBlanc M, Vallarino J, MacNaughton P, Stewart JH, Christiani DC. Flavoring chemicals in e-cigarettes: Diacetyl, 2, 3-pentanedione, and acetoin in a sample of 51 products, including fruit-, candy-, and cocktail-flavored e-cigarettes. *Environmental Health Perspectives*. 2015; 124:733–739. DOI: 10.1289/ehp.1510185 [PubMed: 26642857]
- American Cancer Society. Is any type of smoking safe?. 2015. Retrieved from <http://www.cancer.org/cancer/cancercauses/tobaccocancer/is-any-type-of-smoking-safe>
- American Lung Association. Statement on e-cigarettes. 2015. Retrieved from <http://www.lung.org/our-initiatives/tobacco/oversight-and-regulation/statement-on-e-cigarettes.html>
- Berg CJ, Barr DB, Stratton E, Escoffery C, Kegler M. Attitudes toward e-cigarettes, reasons for initiating e-cigarette use, and changes in smoking behavior after initiation: A pilot longitudinal study of regular cigarette smokers. *Open Journal of Preventive Medicine*. 2014; 4:789–800. DOI: 10.4236/ojpm.2014.410089 [PubMed: 25621193]
- Blake KD, Rutten LFJ, Grana RA, Kaufman AR, Agunwamba AA, Wilson PM, Leischow SJ. Information exposure about e-cigarettes predicts reduced harm perceptions and e-cigarette use among adult smokers in the US. *Tobacco Regulatory Science*. 2015; 1:265–275. DOI: 10.18001/TRS.1.3.8
- Boynton MH, Agans RP, Bowling JM, Brewer NT, Sutfin EL, Goldstein AO, Ribisl KM. Understanding how perceptions of tobacco constituents and the FDA relate to effective and credible tobacco risk messaging: A national phone survey of US adults, 2014–2015. *BMC Public Health*. 2016; 16doi: 10.1186/s12889-016-3151-5
- Cahn Z, Siegel M. Electronic cigarettes as a harm reduction strategy for tobacco control: A step forward or a repeat of past mistakes? *Journal of Public Health Policy*. 2011; 32:16–31. DOI: 10.1057/jphp.2010.41 [PubMed: 21150942]
- Cantrell J, Emelle B, Ganz O, Hair EC, Vallone D. Rapid increase in e-cigarette advertising spending as Altria's MarkTen enters the marketplace. *Tobacco Control*. 2015; 25:e16–e18. DOI: 10.1136/tobacco-control-2015-052532 [PubMed: 26530219]
- Chaiken S. Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology*. 1980; 39:752–766. DOI: 10.1037/0022-3514.39.5.752
- Coleman BN, Johnson SE, Tessman GK, Tworek C, Alexander J, Dickinson DM, Green KM. “It’s not smoke. It’s not tar. It’s not 4000 chemicals. Case closed”: Exploring attitudes, beliefs, and perceived social norms of e-cigarette use among adult users. *Drug and Alcohol Dependence*. 2016; 159:80–85. DOI: 10.1016/j.drugalcdep.2015.11.028 [PubMed: 26708706]
- Dean M, Shepherd R. Effects of information from sources in conflict and in consensus on perceptions of genetically modified food. *Food Quality and Preference*. 2007; 18:460–469. DOI: 10.1016/j.foodqual.2006.05.004
- Duke JC, Lee YO, Kim AE, Watson KA, Arnold KY, Nonnemaker JM, Porter L. Exposure to electronic cigarette television advertisements among youth and young adults. *Pediatrics*. 2014; 134:e29–e36. DOI: 10.1542/peds.2014-0269 [PubMed: 24918224]
- Ebbert JO, Agunwamba AA, Rutten LJ. Counseling patients on the use of electronic cigarettes. *Mayo Clinic Proceedings*. 2015; 90:1–3. DOI: 10.1016/j.mayocp.2014.11.004 [PubMed: 25572189]

- Emery SL, Vera L, Huang J, Szczypka G. Wanna know about vaping? Patterns of message exposure, seeking and sharing information about e-cigarettes across media platforms. *Tobacco Control*. 2014; 23(suppl 3):iii17–iii25. DOI: 10.1136/tobaccocontrol-2014-051648 [PubMed: 24935893]
- Evans WD, Wasserman J, Bertolotti E, Martino S. Branding behavior: The strategy behind the truthSM campaign. *Social Marketing Quarterly*. 2002; 8:17–29. DOI: 10.1080/15245000214134
- Fairchild AL, Bayer R, Colgrove J. The renormalization of smoking? E-cigarettes and the tobacco “endgame”. *New England Journal of Medicine*. 2014; 370:293–295. DOI: 10.1056/NEJMp1313940 [PubMed: 24350902]
- Freed GL, Clark SJ, Butchart AT, Singer DC, Davis MM. Sources and perceived credibility of vaccine-safety information for parents. *Pediatrics*. 2011; 127(suppl 1):S107–S112. DOI: 10.1542/peds.2010-1722P [PubMed: 21502236]
- Grana R, Benowitz N, Glantz SA. E-cigarettes a scientific review. *Circulation*. 2014; 129:1972–1986. DOI: 10.1161/CIRCULATIONAHA.114.007667 [PubMed: 24821826]
- Grana RA, Ling PM. “Smoking revolution”: A content analysis of electronic cigarette retail websites. *American Journal of Preventive Medicine*. 2014; 46:395–403. DOI: 10.1016/j.amepre.2013.12.010 [PubMed: 24650842]
- Guttman N, Peleg H. Public preferences for an attribution to government or to medical research versus unattributed messages in cigarette warning labels in Israel. *Health Communication*. 2003; 15:1–25. DOI: 10.1207/S15327027HC1501_1 [PubMed: 12553775]
- Hovland CI, Weiss W. The influence of source credibility on communication effectiveness. *Public Opinion Quarterly*. 1951; 15:635–650. DOI: 10.1086/266350
- Hu SS, Neff L, Agaku IT, Cox S, Day HR, Holder-Hayes E, King BA. Tobacco product use among adults—United States, 2013–2014. *Morbidity and Mortality Weekly Report*. 2016; 65:685–691. DOI: 10.15585/mmwr.mm6527a1 [PubMed: 27416365]
- Kalkhoran S, Glantz SA. E-cigarettes and smoking cessation in real-world and clinical settings: A systematic review and meta-analysis. *The Lancet Respiratory Medicine*. 2016; 4:116–128. DOI: 10.1016/S2213-2600(15)00521-4 [PubMed: 26776875]
- Kandra KL, Ranney LM, Lee JG, Goldstein AO. Physicians’ attitudes and use of e-cigarettes as cessation devices, North Carolina, 2013. *Plos One*. 2014; 9doi: 10.1371/journal.pone.0103462
- Kim AE, Arnold KY, Makarenko O. E-cigarette advertising expenditures in the US, 2011–2012. *American Journal of Preventive Medicine*. 2014; 46:409–412. DOI: 10.1016/j.amepre.2013.11.003 [PubMed: 24650844]
- King BA, Patel R, Nguyen K, Dube SR. Trends in awareness and use of electronic cigarettes among US adults, 2010–2013. *Nicotine & Tobacco Research*. 2014; 17:219–227. DOI: 10.1093/ntr/ntu191 [PubMed: 25239961]
- Kornfield R, Huang J, Vera L, Emery SL. Rapidly increasing promotional expenditures for e-cigarettes. *Tobacco Control*. 2015; 24:110–111. DOI: 10.1136/tobaccocontrol-2014-051580 [PubMed: 24789603]
- Kosmider L, Sobczak A, Fik M, Knysak J, Zaciera M, Kurek J, Goniewicz ML. Carbonyl compounds in electronic cigarette vapors—Effects of nicotine solvent and battery output voltage. *Nicotine & Tobacco Research*. 2014; 16:1319–1326. DOI: 10.1093/ntr/ntu078 [PubMed: 24832759]
- Latimer LA, Batanova M, Loukas A. Prevalence and harm perceptions of various tobacco products among college students. *Nicotine & Tobacco Research*. 2014; 16:519–526. DOI: 10.1093/ntr/ntt174 [PubMed: 24212764]
- McMillen RC, Gottlieb MA, Shaefer RMW, Winickoff JP, Klein JD. Trends in electronic cigarette use among US adults: Use is increasing in both smokers and nonsmokers. *Nicotine & Tobacco Research*. 2015; 17:1195–1202. DOI: 10.1093/ntr/ntu213 [PubMed: 25381306]
- McNeill, A., Brose, L., Calder, R., Hichman, S., Hajek, P., McRobbie, H. E-cigarettes: An evidence update. A report commissioned by Public Health England. 2015. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/457102/E-cigarettes_an_evidence_update_A_report_commissioned_by_Public_Health_England_FINAL.pdf

- National Institutes of Health, & U. S. Department of Health and Human Services. Heathey: FDA. 2016. Retrieved from http://hints.cancer.gov/docs/Instruments/HINTS_FDA_English_Annotated_Survey.pdf
- Pearson JL, Richardson A, Niaura RS, Vallone DM, Abrams DB. E-cigarette awareness, use, and harm perceptions in US adults. *American Journal of Public Health*. 2012; 102:1758–1766. DOI: 10.2105/AJPH.2011.300526 [PubMed: 22813087]
- Pearson JL, Stanton CA, Cha S, Niaura RS, Luta G, Graham AL. E-cigarettes and smoking cessation: Insights and cautions from a secondary analysis of data from a study of online treatment-seeking smokers. *Nicotine & Tobacco Research*. 2015; 17:1219–1227. DOI: 10.1093/ntr/ntu269 [PubMed: 25542911]
- Petty, RE., Cacioppo, JT. The elaboration likelihood model of persuasion. In: Berkowitz, L., editor. *Advances in experimental social psychology*. Vol. 19. New York, NY: Academic Press; 1986. p. 123-205.
- Petty RE, Cacioppo JT, Goldman R. Personal involvement as a determinant of argument-based persuasion. *Journal of Personality and Social Psychology*. 1981; 41:847–855. <http://dx.doi.org.utsph.idm.oclc.org/10.1037/0022-3514.41.5.847>.
- Petty, RE., Priester, JR., Brinol, P. Mass media attitude change: Implications of the elaboration likelihood model of persuasion. In: Bryant, J., Oliver, M., editors. *Media effects: Advances in theory and research*. Vol. 7. Hoboken, NJ: Routledge; 2009. p. 155-198.
- Pokhrel P, Fagan P, Kehl L, Herzog TA. Receptivity to e-cigarette marketing, harm perceptions, and e-cigarette use. *American Journal of Health Behavior*. 2015; 39:121–131. <http://dx.doi.org.utsph.idm.oclc.org/10.5993/AJHB.39.1.13>. [PubMed: 25290604]
- Pornpitakpan C. The persuasiveness of source credibility: A critical review of five decades' evidence. *Journal of Applied Social Psychology*. 2004; 34:243–281. DOI: 10.1111/j.1559-1816.2004.tb02547
- Regan AK, Promoff G, Dube SR, Arrazola R. Electronic nicotine delivery systems: Adult use and awareness of the 'e-cigarette' in the USA. *Tobacco Control*. 2013; 22:19–23. DOI: 10.1136/tobaccocontrol-2011-050044 [PubMed: 22034071]
- Roe B, Teisl MF. Genetically modified food labeling: The impacts of message and messenger on consumer perceptions of labels and products. *Food Policy*. 2007; 32:49–66. DOI: 10.1016/j.foodpol.2005.12.006
- Rutten LJF, Augustson EM, Doran KA, Moser RP, Hesse BW. Health information seeking and media exposure among smokers: A comparison of light and intermittent tobacco users with heavy users. *Nicotine & Tobacco Research*. 2009; 11:190–196. DOI: 10.1093/ntr/ntn019 [PubMed: 19264865]
- Schmidt AM, Ranney LM, Pepper JK, Goldstein AO. Source credibility in tobacco control messaging. *Tobacco Regulatory Science*. 2016; 2:31–37. DOI: 10.18001/TRS.2.1.333 [PubMed: 27525298]
- Schoenborn CA, Gindi RM. Electronic cigarette use among adults: United States, 2014. *NCHS Data Brief*. 2015; 217:1–8.
- Siu AL. Behavioral and pharmacotherapy interventions for tobacco smoking cessation in adults, including pregnant women: U.S. Preventive Services Task Force recommendation statement. *Annals of Internal Medicine*. 2015; 163:622–634. DOI: 10.7326/M15-2023 [PubMed: 26389730]
- Slater MD, Rouner D. How message evaluation and source attributes may influence credibility assessment and belief change. *Journalism & Mass Communication Quarterly*. 1996; 73:974–991. DOI: 10.1177/107769909607300415
- Smith D. Health care consumer's use and trust of health information sources. *Journal of Communication in Healthcare*. 2011; 4:200–210. DOI: 10.1179/1753807611Y.0000000010
- Steinberg MB, Giovenco DP, Delnevo CD. Patient–physician communication regarding electronic cigarettes. *Preventive Medicine Reports*. 2015; 2:96–98. DOI: 10.1016/j.pmedr.2015.01.006 [PubMed: 26844056]
- U.S. Food and Drug Administration. FDA Consumer Health Information: FDA warns of health risks posed by e-cigarettes. 2009. Retrieved from <http://www.fda.gov/downloads/ForConsumers/ConsumerUpdates/UCM173430.pdf>
- U.S. Food and Drug Administration. FDA Center for Tobacco Products research interest areas. 2014. Retrieved from <https://prevention.nih.gov/tobacco-regulatory-science-program/research-priorities>

- Wackowski OA, Manderski MTB, Delnevo CD. Smokers' sources of e-cigarette awareness and risk information. *Preventive Medicine Reports*. 2015; 2:906–910. DOI: 10.1016/j.pmedr.2015.10.006 [PubMed: 26576338]
- Westat. Health Information National Trends Survey 4 (HINTS 4): HINTS-FDA methodology report. 2015. Retrieved from http://hints.cancer.gov/docs/Instruments/HINTS-FDA_Methodology_Report.pdf
- Zagona SV, Harter MR. Credibility of source and recipient's attitude: Factors in the perception and retention of information on smoking behavior. *Perceptual and Motor Skills*. 1966; 23:155–168. DOI: 10.2466/pms.1966.23.1.155 [PubMed: 5962756]
- Zhu S-H, Sun JY, Bonnevie E, Cummins SE, Gamst A, Yin L, Lee M. Four hundred and sixty brands of e-cigarettes and counting: Implications for product regulation. *Tobacco Control*. 2014; 23(suppl 3):iii3–iii9. DOI: 10.1136/tobaccocontrol-2014-051670 [PubMed: 24935895]

Table 1

Description of e-cigarette use category by demographic characteristics and conventional cigarette use, HINTS-FDA 2016 ($n = 3,243$).

	Overall	Never E-cigarette Users	Ever E-cigarette Users	p-value ^a
	% (95% CI)	% (95% CI)	% (95% CI)	
	($n = 3,243$)	($n = 2,746$)	($n = 497$)	
Gender	50.1 (48.9, 51.4)	49.0 (47.2, 50.8)	54.4 (48.1, 60.7)	.15
Male ($n = 1,320$)	49.9 (48.6, 51.1)	51.0 (49.2, 52.8)	45.6 (39.3, 51.9)	
Female ($n = 1,757$)				
Age Group	10.7 (8.7, 13.0)	9.1 (7.0, 1.8)	16.4 (11.6, 22.7)	<.001
18–24 ($n = 98$)	20.6 (18.7, 22.6)	15.7 (13.7, 17.9)	38.2 (31.0, 45.9)	
25–34 ($n = 328$)	15.5 (14.2, 16.9)	15.5 (13.9, 17.1)	15.8 (11.4, 21.4)	
35–44 ($n = 362$)	16.8 (15.8, 17.9)	17.9 (16.4, 19.6)	12.9 (9.9, 16.5)	
45–54 ($n = 535$)	16.8 (16.0, 17.7)	18.5 (17.4, 19.7)	10.4 (8.0, 13.4)	
55–64 ($n = 765$)	19.6 (18.5, 20.8)	23.3 (21.6, 25.0)	6.3 (4.5, 8.8)	
65+ ($n = 1,118$)				
Race/Ethnicity	67.1 (65.7, 68.4)	65.2 (62.9, 67.4)	73.8 (65.9, 80.4)	.05
White, nonHispanic ($n = 2,378$)	15.6 (14.4, 16.9)	15.7 (13.9, 17.6)	15.2 (10.2, 22.0)	
Hispanic ($n = 196$)	10.5 (9.3, 11.8)	11.4 (9.7, 13.4)	7.3 (3.9, 13.3)	
African American ($n = 188$)	4.4 (3.7, 5.4)	5.4 (4.5, 6.6)	0.8 (0.2, 4.8)	
Asian ($n = 90$)	2.4 (2.2, 2.7)	2.3 (1.8, 2.8)	2.8 (1.7, 4.8)	
Other ($n = 124$)				
Household Income	12.1 (10.2, 14.2)	11.0 (8.9, 13.6)	15.6 (10.9, 21.9)	.18
<\$15k ($n = 351$)	19.8 (17.2, 22.7)	19.4 (16.7, 22.4)	21.3 (15.3, 28.8)	
\$15k–<\$35k ($n = 592$)	30.2 (27.6, 33.0)	29.8 (26.7, 33.1)	31.7 (25.1, 39.1)	
\$35k–<\$75k ($n = 921$)	37.9 (35.3, 40.6)	39.8 (37.1, 42.6)	31.4 (23.9, 39.9)	
>\$75k ($n = 1036$)				
Education Level	9.2 (7.6, 11.1)	9.1 (7.1, 11.5)	9.6 (6.4, 14.1)	<.001
<HS ($n = 170$)	28.6 (26.4, 30.9)	27.3 (24.8, 29.9)	33.5 (27.0, 40.8)	
HS graduate ($n = 861$)	25.8 (24.0, 27.6)	22.8 (20.4, 25.4)	36.5 (30.2, 43.3)	
Some college ($n = 726$)	36.4 (35.3, 37.6)	40.8 (38.8, 42.9)	20.4 (15.4, 26.5)	
College graduate+ ($n = 1,447$)				
Conventional Cigarette Use	57.8 (55.5, 60.1)	67.6 (65.3, 69.9)	21.7 (15.6, 29.3)	<.001
Never User ($n = 1,714$)	42.2 (39.9, 44.5)	32.4 (30.1, 34.7)	78.3 (70.7, 84.4)	
Ever User ($n = 1,478$)				

n = sample size; CI = Confidence Interval.

^a p value for difference between never and ever e-cigarette users.

Table 2

Trust in sources of general health information by demographic characteristics and tobacco product use, HINTS-FDA 2016 ($n = 3,243$).

Variable	Doctors	Government Health Agencies	Health Organizations
	<i>m</i> (se)	<i>m</i> (se)	<i>m</i> (se)
	(<i>n</i> = 3,186)	(<i>n</i> = 3,243)	(<i>n</i> = 3,162)
Overall	3.65 (.02)	3.24 (.03)	3.17 (.02)
Gender	3.67 (.03)	3.19 (.06)	3.17 (.04)
Male	3.65 (.02)	3.31 (.05)	3.20 (.03)
Female	$p = .17$	$p = .17$	$p = .49$
Age Group	3.58 (.08)	2.98 (.12)	3.10 (.12)
18–24	3.68 (.05)	3.14 (.09)	3.21 (.07)
25–34	3.67 (.05)	3.24 (.09)	3.27 (.07)
35–44	3.62 (.04)	3.27 (.09)	3.24 (.05)
45–54	3.67 (.03)	3.28 (.06)	3.17 (.03)
55–64	3.67 (.03)	3.45 (.11)	3.04 (.04)^a
65+	$p = .57$	$p = .13$	$p = .02$
Race/Ethnicity	3.69 (.02)	3.18 (.04)	3.18 (.02)
White, non-Hispanic	3.72 (.05)	3.30 (.12)	3.32 (.09)
Black, non-Hispanic	3.48 (.08)	3.35 (.16)	3.09 (.09)
Hispanic	3.69 (.06)	3.40 (.14)	3.24 (.12)
Asian	3.58 (.08)	3.19 (.24)	3.00 (.15)
Other	$p = .03$	$p = .48$	$p = .27$
Household Income	3.52 (.05)	3.34 (.15)	3.05 (.09)
<\$15k	3.59 (.06)	3.28 (.13)	3.16 (.06)
\$15k–<\$35k	3.62 (.04)	3.12 (.08)	3.11 (.05)
\$35k–<\$75k	3.75 (.02)^a	3.29 (.05)	3.30 (.03)^a
>\$75k	$p < .001$	$p = .37$	$p = .002$
Education Level	3.59 (.07)	3.60 (.24)	3.17 (.10)
<HS	3.55 (.06)	3.20 (.09)	3.09 (.07)
HS graduate	3.64 (.03)	3.03 (.06)^a	3.11 (.05)
Some college	3.74 (.02)^a	3.39 (.05)	3.29 (.03)^a
College graduate +	$p = .01$	$p < .001$	$p = .004$
E-cigarette Use	3.65 (.02)	3.31 (.04)	3.19 (.02)
Never User	3.65 (.05)	2.99 (.09)^b	3.12 (.07)
Ever User	$p = .83$	$p = .003$	$p = .36$
Conventional	3.65 (.02)	3.25 (.04)	3.20 (.03)
Cigarette Use	3.66 (.03)	3.24 (.06)	3.14 (.03)
Never User	$p = .89$	$p = .90$	$p = .18$

	Doctors	Government Health Agencies	Health Organizations
	<i>m</i> (se)	<i>m</i> (se)	<i>m</i> (se)
	(<i>n</i> = 3,186)	(<i>n</i> = 3,243)	(<i>n</i> = 3,162)
Ever User			

^a significantly different from the mean.

^b significantly different from never users.

Table 3

Trust in sources of e-cigarette health effects by demographic characteristics and tobacco product use, HINTS-FDA 2016 ($n = 3,243$).

Healthcare providers ^T															
Government Health Agencies				Health Organizations				Tobacco Companies				E-cigarette Companies			
m (se)		m (se)		m (se)		m (se)		m (se)		m (se)		m (se)		m (se)	
(n = 3,153)		(n = 3,144)		(n = 3,135)		(n = 3,139)		(n = 3,142)							
Variable															
Overall	3.37 (.03)	2.96 (.03)		3.06 (.03)		1.49 (.02)		1.51 (.03)				1.51 (.03)			
Gender	3.37 (.04)	2.92 (.04)		3.02 (.04)		1.52 (.04)		1.54 (.05)				1.54 (.05)			
Male	3.41 (.03)	3.03 (.04)		3.13 (.03)		1.49 (.03)		1.49 (.03)				1.49 (.03)			
Female	p = .34	p = .06		p = .04		p = .53		p = .34							
Age group	3.47 (.11)	2.96 (.12)		3.03 (.12)		1.64 (.13)		1.71 (.13)				1.71 (.13)			
18–24	3.44 (.09)	3.00 (.09)		3.15 (.09)		1.58 (.08)		1.64 (.08)				1.64 (.08)			
25–34	3.42 (.08)	3.01 (.08)		3.15 (.06)		1.51 (.06)		1.47 (.06)				1.47 (.06)			
35–44	3.40 (.05)	2.99 (.06)		3.07 (.06)		1.56 (.06)		1.59 (.05)				1.59 (.05)			
45–54	3.31 (.04)	2.91 (.04)		2.98 (.04)		1.40 (.04)		1.42 (.04)				1.42 (.04)			
55–65	3.23 (.05)^a	2.85 (.05)		2.95 (.05)		1.32 (.04)^a		1.29 (.03)^a				1.29 (.03)^a			
65+	p = .04	p = .33		p = .09		p = .003		p < .001							
Race/Ethnicity	3.42 (.03)	2.95 (.03)		3.05 (.03)		1.44 (.02)		1.46 (.02)				1.46 (.02)			
White, non-Hispanic	3.27 (.09)	2.97 (.14)		3.22 (.10)		1.84 (.14)^a		1.77 (.13)				1.77 (.13)			
	3.25 (.12)	2.93 (.12)		3.01 (.13)		1.61 (.11)		1.63 (.11)				1.63 (.11)			
Black, non-Hispanic	3.56 (.07)	3.35 (.10)^a		3.27 (.10)		1.31 (.08)^a		1.35 (.13)				1.35 (.13)			
	3.33 (.12)	2.96 (.08)		3.03 (.12)		1.46 (.10)		1.44 (.10)				1.44 (.10)			
Hispanic	p = .15	p = .005		p = .15		p = .01		p = .13							
Asian															
Other															
Household Income	3.14 (.11)	2.84 (.14)		3.03 (.11)		1.80 (.13)		1.80 (.13)				1.80 (.13)			
	3.26 (.07)	2.86 (.06)		3.00 (.07)		1.61 (.07)		1.65 (.07)				1.65 (.07)			
<\$15k	3.39 (.05)	2.91 (.07)		3.00 (.06)		1.54 (.06)		1.54 (.06)				1.54 (.06)			
\$15k–<\$35k	3.52 (.03)^a	3.11 (.05)^a		3.18 (.03)^a		1.35 (.03)^a		1.36 (.03) ^a				1.36 (.03) ^a			
\$35k–<\$75k	p = .002	p = .02		p = .03		p < .001		p < .001				p < .001			
Education Level	3.23 (.14)	2.80 (.11)		3.04 (.12)		1.77 (.14)		1.71 (.13)				1.71 (.13)			

	Healthcare providers ^T	Government Health Agencies	Health Organizations	Tobacco Companies	E-cigarette Companies
	<i>m</i> (se)	<i>m</i> (se)	<i>m</i> (se)	<i>m</i> (se)	<i>m</i> (se)
<HS	(<i>n</i> = 3,153)	(<i>n</i> = 3,144)	(<i>n</i> = 3,135)	(<i>n</i> = 3,139)	(<i>n</i> = 3,142)
HS graduate	3.25 (.07)	2.88 (.08)	2.97 (.07)	1.64 (.08)	1.67 (.09)
Some college	3.32 (.05)	2.84 (.06)	2.99 (.05)	1.50 (.05)	1.55 (.05)
College graduate+	3.52 (.03)^a	3.15 (.04)^a	3.18 (.03)^a	1.36 (.03)^a	1.35 (.02) ^a
E-cigarette Use	<i>p</i> < .001	<i>p</i> < .001	<i>p</i> = .003	<i>p</i> < .001	<i>p</i> < .001
Never User	3.40 (.03)	3.03 (.03)	3.11 (.03)	1.47 (.03)	1.46 (.03)
Ever User	3.27 (.07)	2.68 (.08)^b	2.88 (.08)^b	1.58 (.05)	1.69 (.05) ^b
Conventional	<i>p</i> = .08	<i>p</i> < .001	<i>p</i> = .008	<i>p</i> = .07	<i>p</i> < .001
Cigarette Use	3.44 (.04)	3.05 (.05)	3.12 (.04)	1.47 (.04)	1.48 (.04)
Never User	3.29 (.05)^b	2.83 (.04)^b	2.98 (.04)^b	1.54 (.04)	1.55 (.04)
Ever User	<i>p</i> = .01	<i>p</i> < .001	<i>p</i> = .03	<i>p</i> = .28	<i>p</i> = .27

^T Includes doctors, pharmacists, and healthcare providers.

^a significantly different from the mean.

^b significantly different from never users.

Table 4

Associations between trust of sources of e-cigarette health effects and perceptions of addictiveness, harm relative to cigarettes, and absolute harm, HINTS-FDA 2016 ($n = 3,243$).

Perceived Addictiveness		
	Model 1	Model 2^a
	OR (95% CI)	AOR (95% CI)
Source		
Healthcare Providers ^T ($n = 1,735$)	1.18 (0.86, 1.61)	1.10 (0.76, 1.59)
Government Health Agency ($n = 1,733$)	1.44 (1.00, 2.09)	1.34 (0.89, 2.00)
Health Organizations ($n = 1,726$)	1.21 (0.84, 1.75)	1.13 (0.78, 1.63)
Tobacco Companies ($n = 1,727$)	0.79 (0.60, 1.04)	0.84 (0.63, 1.12)
E-cigarette Companies ($n = 1,732$)	0.70 (0.53, 0.92)	0.76 (0.58, 1.00)
Perceived Harm of E-cigarettes Relative to Cigarettes		
	Model 1	Model 2^b
	OR (95% CI)	AOR (95% CI)
Source		
Healthcare Providers ($n = 1,771$)	0.79 (0.64, 0.97)	0.72 (0.55, 0.95)
Government Health Agency ($n = 1,772$)	0.97 (0.82, 1.16)	0.86 (0.71, 1.04)
Health Organizations ($n = 1,767$)	1.03 (0.86, 1.23)	0.96 (0.77, 1.20)
Tobacco Companies ($n = 1,767$)	0.92 (0.74, 1.14)	0.94 (0.72, 1.22)
E-cigarette Companies ($n = 1,771$)	0.73 (0.56, 0.94)	0.76 (0.57, 1.02)
Absolute Perceived Harm of E-cigarettes		
	Model 1	Model 2^c
	OR (95% CI)	AOR (95% CI)
Source		
Healthcare Providers ($n = 2,674$)	1.09 (0.87, 1.38)	0.95 (0.72, 1.24)
Government Health Agency ($n = 2,674$)	1.15 (0.91, 1.45)	0.98 (0.76, 1.26)
Health Organizations ($n = 2,663$)	1.13 (0.94, 1.37)	0.99 (0.78, 1.24)
Tobacco Companies ($n = 2,667$)	0.65 (0.48, 0.86)	0.70 (0.51, 0.95)
E-cigarette Companies ($n = 2,671$)	0.56 (0.43, 0.71)	0.60 (0.46, 0.79)

^T Includes doctors, pharmacists, and healthcare providers.

Bolded indicates significance $p < .05$.

^a adjusted for education level and ever e-cigarette use.

^b adjusted for gender, age, race/ethnicity, ever e-cigarette use, and ever cigarette use.

^c adjusted for income category, ever e-cigarette use, and ever cigarette use.