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Beliefs about FDA tobacco regulation, modifiability of cancer risk, and tobacco product comparative harm perceptions: Findings from the HINTS-FDA 2015★

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Abstract

Smokers who inaccurately believe that FDA evaluates cigarettes for safety hold lower harm perceptions of cigarettes compared to those who do not hold this belief. However, not much is known about associations between beliefs about FDA tobacco regulatory authority and *comparative* harm perceptions of tobacco products. Data were analyzed from the Health Information National Trends Survey, HINTS-FDA 2015 ($N=3738$), which is a cross-sectional, probability-based, nationally representative survey of U.S. non-institutionalized civilian adults aged 18 years or older. Weighted multinomial and logistic regression analyses regressed comparative harm perceptions on sociodemographic factors, beliefs about FDA regulatory authority, perceptions of FDA credibility, and beliefs about modifiability of cancer risk (behavioral cancer causal beliefs and cancer fatalism). Findings indicate that, compared to non-users, current tobacco users are more likely to report believing that e-cigarettes are less harmful than cigarettes, to report believing that some cigarette types may be less harmful than others, and to report believing that tobacco products are safer now than they were five years ago. Awareness of FDA regulatory authority was associated with reporting the belief that tobacco products are safer now than five years ago, that e-cigarettes are less harmful than cigarettes, and that some cigarette types are less harmful than other cigarette types. Believing behavior as a cause of cancer and endorsing cancer fatalism were associated with uncertainty of comparative harm perceptions. Communication efforts can help target inaccurate beliefs by raising awareness about regulation of tobacco products as well as the risks of tobacco products.

★*Note.* The views and opinions expressed in this manuscript are those of the authors only and do not necessarily represent the views, official policy, or position of the U.S. Department of Health and Human Services or any of its affiliated institutions or agencies.

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Conflicts of interest

The authors declare there is no conflict of interest.

Keywords

Tobacco; Risk perceptions; FDA regulation; Causal attributions

1. Introduction

The Family Smoking Prevention and Tobacco Control Act (TCA) amended the Federal Food, Drug, and Cosmetic Act (FD&C Act) and granted the U.S. Food and Drug Administration (FDA) broad regulatory authority over the manufacture, distribution, and marketing of cigarettes, roll-your-own tobacco products, and smokeless tobacco products (Family Smoking Prevention and Tobacco Control Act, 2009). In May 2016, FDA issued the Final Deeming Rule extending FDA's authority to e-cigarettes, hookah, cigars, and all other tobacco products (Deeming Tobacco Products To Be Subject to the Federal Food, Drug, and Cosmetic Act, as Amended by the Family Smoking Prevention and Tobacco Control Act, 2016). To inform regulatory activities defined by the TCA, FDA's Center for Tobacco Products (CTP) identified research priorities, which include understanding consumer perceptions of tobacco products (Ashley & Backinger, 2012). Because harm and risk perceptions about tobacco products may influence initiation and use (Song et al., 2009; Ambrose et al., 2014; Brose et al., 2015), it is important to consider factors which may impact consumer perceptions of risk and harm.

1.1. Risk management beliefs

Beliefs surrounding risk management are cognitions that an individual uses to evaluate risks while also identifying ways to minimize negative outcomes (Connor & Normal, 2005). Risk management beliefs about consumer products are likely to affect consumer risk and harm perceptions of those products. One category of risk management beliefs involves organizational or institutional risk management beliefs held by the consumer. For example, to assess and minimize risk of consumer products, such as prescription drugs and medical devices (Cook et al., 2009; Task Force on Risk Management, 1999; Hamburg & Sharfstein, 2009), FDA implements risk management strategies (e.g., standards of product efficacy and safety) (Hamburg & Sharfstein, 2009; Federal Food, Drug, and Cosmetic Act, 1938; Greene & Podolsky, 2012; Kefauver Harris Amendment (Drug Amendments of 1962), 1962). Consumers who are aware of FDA regulatory authority over products such as drugs or medical devices are likely to perceive increased safety associated with those products as the role of FDA is to minimize risk through regulation and enforcement (Hamburg & Sharfstein, 2009). A second category of risk management beliefs involves personal strategies in risk management. These strategies may include beliefs about modifiability of disease (e.g., whether tobacco use can influence one's cancer risk). Understanding these risk management beliefs (institutional and personal) may shed light on how tobacco users and non-users develop tobacco product harm and safety perceptions to inform product regulation.

1.2. Beliefs about FDA authority to regulate tobacco products

There is low consumer awareness of FDA regulatory authority over tobacco products (Fix et al., 2011; Kaufman et al., 2015; Jarman et al., 2017), and previous findings from the Health

Information National Trends Survey (HINTS) indicated that in 2013 less than half (41%) of respondents correctly believed that FDA regulated tobacco products (Kaufman et al., 2015). Despite low awareness of FDA tobacco product regulatory authority, the majority of smokers and non-smokers endorse high FDA credibility in this domain (i.e., believing that FDA can effectively regulate tobacco products) (Boynton et al., 2016). Smokers who believe that FDA evaluates cigarettes for safety may hold lower harm perceptions of cigarettes (Kaufman et al., 2011). It is important to note that this belief is inaccurate. In contrast to drugs and devices, FDA does not regulate tobacco products using standards of safety and efficacy - that is, FDA regulation of a tobacco product should not be interpreted as relevant to its safety or efficacy. Instead, FDA regulates tobacco products using a *population health standard*, considering risks and benefits for the population as a whole (Deeming Tobacco Products To Be Subject to the Federal Food, Drug, and Cosmetic Act, as Amended by the Family Smoking Prevention and Tobacco Control Act, 2016). For example, the FDA considers how the marketing of a tobacco product might affect initiation among non-users and cessation among existing users. Not much is known about associations between beliefs about FDA tobacco regulatory authority and comparative harm perceptions held by the consumer. Comparative harm perceptions assess consumer's beliefs of harms of a specific tobacco product relative to another product (e.g., perceived harm of e-cigarettes compared to traditional cigarettes) and reflect consumer cognitive strategies in making sense of tobacco product harm and risk.

1.3. Beliefs about modifiability of tobacco-related disease risk

An individual who believes that she has control over her health outcomes is likely to engage in health promotive and preventive behaviors, including smoking cessation (Blair et al., 2014; Helmer et al., 2012; Kaplan & Cowles, 1978). Beliefs about the modifiability of disease risk include the modifiable risk and behavioral factors (e.g., tobacco use) individuals believe to be the *cause* of health and disease, called behavioral causal beliefs. Individuals who endorse behavioral causal health beliefs are more likely to engage in healthy behaviors (Nguyen et al., 2015; Knerr et al., 2016). Cancer fatalism refers to deterministic thoughts about external causes of cancer and the inability to prevent it (Niederdeppe & Levy, 2007). It is possible that endorsement of cancer fatalistic beliefs may engender beliefs in the immutability of disease, leading to lower acceptance of personal strategies for mitigating disease risk (i.e., strategies which are based on the premise that use of some tobacco products is less harmful than use of others).

Little is known about the relation between beliefs about modifiability of tobacco-related disease risk and comparative tobacco harm perception. Whereas absolute harm perceptions capture overall judgements of a tobacco product's harm, comparative harm perceptions measure judgements about the harms of a tobacco product harm relative or compared to another tobacco product. Research has shown that people use knowledge about known risks of a product (e.g., cigarettes) to judge the risks of other products (e.g., more novel products such as e-cigarettes) (Visschers et al., 2007). Thus, alternative tobacco products maybe viewed more favorably compared to cigarettes than when judged alone because the consequences of smoking are well known (Kaufman et al., 2016). It is possible that tobacco users who endorse the modifiability of cancer risk and have lower levels of cancer fatalism

may endorse the belief that use of some products is less harmful than others as this represents a potential personal strategy in harm reduction.

1.4. Purpose of the current study

The current study sought to examine the associations between beliefs surrounding risk management of tobacco products and comparative tobacco product harm perceptions. The study objectives were to examine: (1) the association between FDA regulatory beliefs and comparative tobacco product harm perceptions; and (2) the association between beliefs about the modifiability of cancer risk and comparative tobacco product harm perceptions. It is hypothesized that awareness of FDA regulatory authority, higher perceptions of FDA qualification, and endorsement of the modifiability of tobacco-related disease risk will be associated with beliefs that use of some products is less harmful than others (i.e., endorse stronger comparative harm perceptions).

2. Methods

2.1. Participants and design

The Health Information National Trends Survey (HINTS) is a nationally-representative cross-sectional survey which has been administered periodically by the National Cancer Institute (NCI) since 2003. The HINTS population is adults aged 18 years or older in the civilian non-institutionalized population of the U.S. Data were analyzed from HINTS-FDA 2015 ($N = 3738$), which was a separate cycle of data collection conducted by NCI in partnership with FDA to combine the traditional HINTS topics with additional tobacco-relevant modules. The data were collected in 2015 through self-administered mail surveys sent to a random sample of residential addresses. The weighted response rate was 33%. Additional methodological information is available elsewhere (Westat, 2015; Blake et al., 2016).

2.2. Measures

2.2.1. Comparative tobacco product harm perceptions—Four items assessed comparative tobacco product harm perceptions. The *smokeless tobacco (SLT) comparative harm perception* asked, “In your opinion, do you think that some smokeless tobacco products, such as chewing tobacco, snus and snuff are less harmful to a person’s health than cigarettes?” The *cigarette type comparative harm perception* item asked, “Do you think that some types of cigarettes are less harmful to a person’s health than other types?” Options for both items were “Yes,” “No,” and “Don’t know.” Respondents who answered “Yes” were coded as agreeing that smokeless products/some types of cigarettes were less harmful while those who answered “No” were coded as believing that the products were not less harmful than cigarettes. The *e-cigarette comparative harm perception* item stated, “Compared to smoking cigarettes, would you say that electronic cigarettes are...” Respondents selected from the following options: “Much less harmful,” “Less harmful,” “Just as harmful,” “More harmful,” “Much more harmful,” “I’ve never heard of electronic cigarettes,” and “I don’t know enough about these products.” Participants selecting “Much less harmful” or “Less harmful” were coded as rating e-cigarettes as less harmful than cigarettes; those selecting “I don’t know” were coded as “Don’t know;” those selecting “Just as harmful,” “More

harmful,” and “Much more harmful” were coded as rating e-cigarettes as not less harmful as cigarettes, following similar strategies by others (Brose et al., 2015; Persoskie et al., 2017). Response options for e-cigarette comparative harm were combined to match response options for SLT and cigarette type comparative harm. The *tobacco product comparative harm perception* item stated, “Tobacco is safer to use now than it was 5 years ago.” Response options included “Strongly agree,” “Somewhat agree,” “Somewhat disagree,” and “Strongly disagree.” Responses were dichotomized such that those who answered “Strongly agree” and “Somewhat agree” were coded as agreeing with the statements, and those who answered “Strongly disagree” and “Somewhat disagree” were coded as disagreeing.¹

2.2.2. FDA tobacco regulatory authority beliefs—*Belief about FDA tobacco regulation* was assessed with the statement, “Do you believe that the United States Food and Drug Administration (FDA) regulates tobacco products in the U.S.?” Response options included “Yes,” “No,” and “Don’t know.” *Perception of FDA Qualification* was assessed with the statement, “In your opinion, how qualified is the United States Food and Drug Administration (FDA) to regulate tobacco products?” Response options included “Not at all,” “A little,” “Somewhat,” and “Very.”

2.2.3. Beliefs about modifiability of cancer risk—*Behavioral causal belief of cancer* was assessed with the statement, “Cancer is most often caused by a person’s behavior or lifestyle.” *Cancer fatalism* was assessed with the statement, “There’s not much you can do to lower your chances of getting cancer.” For both items, respondents indicated their degree of agreement with the statements. Response options included “Strongly agree,” “Somewhat agree,” “Somewhat disagree,” and “Strongly disagree.” Responses were dichotomized such that those who answered “Strongly agree” and “Somewhat agree” were coded as agreeing with the statement, and those who answered “Strongly disagree” and “Somewhat disagree” were coded as disagreeing.²

2.2.4. Demographic covariates—Demographic variables included age (four levels: 18–24; 25–44; 45–64; 65+ years), sex (male; female), health insurance status (insured; uninsured), urban-rural status (urban; rural), marital status (recoded into three categories: single, never been married; married/living with a partner; widowed/separated/divorced), and educational attainment (recoded into four levels: less than high school diploma/high school graduate/GED; some college/vocational or technical training; college graduate; postgraduate). Racial/ethnic identity included one Hispanic category and four non-Hispanic categories: White, Black, Asian and Pacific Islander (API), and Other (including American Indian, Alaska Native, and multiple races, which were combined due to small samples).

2.2.5. Current tobacco use—Respondents were classified as current tobacco users if they were current cigarette smokers (i.e., smoked at least 100 cigarettes and now smoke every day or some days), and/or current cigar smokers (i.e., smoked at least 50 cigars and now smoke every day or some days), and/or current smokeless tobacco (SLT) users (i.e., used smokeless tobacco at least 20 times and now use every day or some days) based on

¹Due to non-normally distributed responses, non-parametric testing was pursued and led to dichotomized response categories.

²Due to non-normally distributed responses, non-parametric testing was pursued and led to dichotomized response categories.

previous lifetime use thresholds (Hu et al., 2016). Respondents were classified as non-users if they did not use products every day or some days and/or did not meet lifetime use thresholds. HINTS-FDA 2015 did not assess current use of any other tobacco products.

2.3. Data analysis—Analyses were conducted using SAS 9.3 and SAS-callable SUDAAN 11.0. Analyses used jackknife replicate weights to generate nationally representative estimates and to account for the complex sampling design (Westat, 2015). Weighted multinomial and logistic regression analyses regressed comparative tobacco product harm perceptions on demographic factors, beliefs about FDA regulatory authority, and beliefs about modifiability of cancer risk. In each analysis, all independent variables were entered simultaneously. Multinomial analyses modeled the odds of responding “Don’t know” and “Not less harmful” compared to “Less harmful” (reference level), adjusting for all covariates. While we adjust for and report demographic variables in multivariate model tables, they are not the main variables of interest and thus are not described or interpreted in text.

3. Results

Demographic characteristics of the full sample and descriptives of the study’s variables of interest are presented in Table 1.

3.1. Current tobacco use

Current tobacco users had significantly higher proportions of those who believe that e-cigarettes are less harmful than cigarettes, that some types of cigarettes are less harmful than other types, and that tobacco is safer to use now than it was five years ago compared to non-users. Refer to Table 2.

Findings from the multivariate models revealed that current tobacco use was associated with comparative e-cigarette harm perceptions. Compared to current tobacco users, non-users were more likely to report believing that e-cigarettes were not less harmful than cigarettes *or* report being unsure. In addition, compared to non-users, current tobacco users were less likely to report being unsure of comparative harm *or* report believing that some cigarette types were not less harmful than others. Last, compared to non-users, current tobacco users were more likely to report believing that tobacco products are safer now. Refer to Table 3.

3.2. FDA tobacco regulatory authority beliefs

Awareness of FDA regulatory authority was associated with comparative e-cigarette harm perceptions. Compared to those who reported awareness, those who were unsure of *or* did not believe FDA had regulatory authority were more likely to report being unsure of comparative e-cigarette harm. In addition, those who reported being unsure of FDA regulatory authority were more likely to report that e-cigarettes were not less harmful than cigarettes compared to those who reported awareness of FDA regulatory authority. Also, compared to those who reported awareness of FDA regulatory authority, those who reported being unsure were more likely to report being unsure of SLT comparative harm. Awareness of FDA regulatory authority was also associated with comparative cigarette type harm.

Compared to those who reported awareness of FDA regulatory authority, those who reported being unsure were more likely to report being unsure of cigarette type comparative harm *or* responding that some cigarettes types were not less harmful than others. Last, awareness of FDA regulatory authority was associated with perception of tobacco product safety.

Compared to those who reported awareness of FDA's regulatory authority, those who reported not being aware were less likely to report believing that tobacco products are safer now.

Perception of FDA credibility was associated with comparative SLT harm. Compared to those who answered "a little" and "somewhat," those who reported that FDA was "very qualified" to regulate tobacco products were more likely to report being unsure of SLT comparative harm. Compared to those who answered "somewhat," those who reported "very qualified" were more likely to report believing that SLT was not less harmful than cigarettes. Refer to Table 3.

3.3. Beliefs about modifiability of cancer risk

Behavioral causal belief of cancer was associated with comparative e-cigarette harm perceptions. Compared to those who did not agree that behavior causes cancer, those who endorsed the belief were more likely to be unsure of e-cigarette comparative harm. In addition, cancer fatalism was associated with comparative cigarette type harm. Compared to those who did not endorse cancer fatalism, those who endorsed cancer fatalism were more likely to report being unsure of comparative cigarette type harm. Finally, cancer fatalism was associated with perception of tobacco product safety. Compared to those who did not endorse cancer fatalism, those who endorsed cancer fatalism were more likely to report believing that tobacco products are safer now. Refer to Table 3.

4. Discussion

This study examined consumer beliefs surrounding risk management of tobacco products and their associations with harm perceptions of tobacco products. Because harm and risk perceptions about tobacco products may influence initiation and use (Song et al., 2009; Ambrose et al., 2014; Brose et al., 2015), understanding factors that impact consumer perceptions of tobacco product risk and harm is important in promoting public health. Our findings indicate that, compared to non-users, current tobacco users are more likely to report believing that some tobacco products are less harmful than others (e.g., believing e-cigarettes are less harmful than cigarettes). Our findings are aligned with previous research showing that current tobacco users had lower product harm perceptions compared to non-users (Bernat et al., 2017). Compared to non-users, current tobacco users believed that tobacco use is safer to use now than it was five years ago and had stronger comparative harm perceptions. Our study findings shed light on possible lay theories on tobacco regulation and institutional risk management held by consumers. Smokers who endorse the belief that use of some products is less harmful than others may reflect individuals engaged in personal strategies in perceived harm reduction.

Our findings revealed that awareness of FDA regulatory authority was associated with the belief that some tobacco products are less harmful than others (e.g., believing some cigarette

types are less harmful than other cigarette types or that products may become less harmful over time). These findings are aligned with those in a previous study that showed that tobacco product harm perceptions were associated with beliefs about tobacco product regulation by the FDA (Kaufman et al., 2015). It is possible that some consumers are more likely to both be aware of FDA regulatory authority *and* to believe that some products pose less harm than others. For example, research has shown that individuals have distinct harm perceptions for specific tobacco products (i.e., holding lower harm perceptions for the products that they use) (Bernat et al., 2017). As a result, motivated tobacco users may engage in information seeking behaviors to find information relevant to tobacco product harm and risk, leading to exposure to FDA regulatory policies. Because studies have shown consumer beliefs and support for the role of the FDA in regulating tobacco products (Jarman et al., 2017; Boynton et al., 2016), it is important to communicate to the public that FDA tobacco regulation does *not* imply that any tobacco product is safe. Tobacco products cannot be regulated using standards of product efficacy and safety as they are not considered therapeutics or drug devices (Hamburg & Sharfstein, 2009; Federal Food, Drug, and Cosmetic Act, 1938; Greene & Podolsky, 2012; Kefauver Harris Amendment (Drug Amendments of 1962), 1962); rather, tobacco products are regulated under population health standards for both tobacco users and non-users. (Family Smoking Prevention and Tobacco Control Act, 2009).

Our study findings indicate that higher perceptions of FDA credibility were associated with a lower likelihood of being unsure about SLT comparative harm and that being unsure of FDA regulatory authority was associated with being unsure of comparative harm perceptions. These results are aligned with previous findings from an earlier study using 2012/2013 HINTS data which showed that uncertainty about FDA regulation was associated with uncertainty about the harmfulness of tobacco products (Kaufman et al., 2011). In addition, findings from a recent focus group study indicated consumer approval of FDA's role in tobacco regulation and support for the role of FDA in communicating tobacco product risks (Jarman et al., 2017). Utilizing these findings, communication strategies could focus on areas where individuals' perceptions may be unclear or inaccurate (e.g., correcting misperceptions that the FDA regulates tobacco products under standards of safety and efficacy while raising consumer awareness of population health standards under which FDA regulates tobacco products).

Beliefs about the modifiability of cancer risk were associated with uncertainty of comparative harm perceptions. Specifically, those who reported believing that behavior or lifestyle most often causes cancer (behavioral causal beliefs) were more likely to report being unsure of comparative e-cigarette harm. In addition, those who reported believing that there was little that could be done to prevent cancer (cancer fatalism) were also more likely to report being unsure of comparative cigarette type harm. Perhaps those who endorsed behavioral causal beliefs are more likely to see e-cigarette use as a behavior which carries as yet undetermined health risks and/or are unlikely to endorse behaviors which they perceive as having unclear or unknown health risks. Regarding cancer fatalism, perhaps those who endorsed cancer fatalism are more likely to be indifferent to the question of whether certain types of cigarette are less harmful than others, given their belief that cancer would not be preventable. Individuals who endorsed cancer fatalism were also more likely to report

believing that tobacco is safer now than it was five years prior. The implications of this are unclear. Perhaps these individuals believe that, although they perceive cigarettes to be safer than they were previously, other potential causes of cancer have become more widespread or more hazardous.

5. Limitations and conclusions

There are limitations which should be considered when interpreting these findings. First, the cross-sectional nature of HINTS-FDA 2015 data does not allow for causal inferences. Additionally, we would encourage caution given the reliance on single-items to assess constructs, especially those typically assessed with validated multi-item scales (e.g., cancer fatalism); this may limit conclusions, even though the items used were global items. Furthermore, the assessment of current tobacco use was limited to a few products (cigarettes, cigars, and smokeless tobacco), as HINTS-FDA 2015 did not include questions regarding use of other products; it will be important to determine whether these trends hold with the inclusion of use of other products. Of similar concern, there were a larger number of current smokers compared to current cigar and current smokeless tobacco users, though sensitivity analyses limited to current smokers yielded similar results. Last, data for HINTS-FDA 2015 were collected before the Deeming Rule became effective, so it is possible that product harm perceptions have shifted. Despite limitations, the findings have potential use to inform tobacco awareness and knowledge campaigns. Specifically, results pertaining to tobacco user status, as well as those pertaining to awareness of FDA regulatory authority and credibility indicate some inaccurate understanding of harms associated with tobacco product use. Similarly, results pertaining to behavioral causal belief and cancer fatalism indicate some inaccurate understandings of harm associated with tobacco product use and the ability to decrease risk. Communication efforts can target inaccurate beliefs by raising awareness about regulation of tobacco products (i.e., FDA does not regulate tobacco products on standards of safety or efficacy) as well as the risks of tobacco products.

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Table 1

Demographic Characteristics of the HINTS-FDA 2015 Sample and Descriptives of the Study Variables.

	# (%) ^a
Sex	
Male	1497 (49.10%)
Female	2018 (50.90%)
Age in years	
18–24	108 (36.33%)
25–44	775 (36.33%)
45–64	1457 (34.10%)
65+	1288 (18.98%)
Health insurance status	
Insured	3444 (91.49%)
Uninsured	207 (8.51%)
Urban-Rural status	
Urban	3654 (98.48%)
Rural	84 (1.52%)
Marital status	
Single/never been married	551 (26.76%)
Married/living with a partner	2091 (57.11%)
Widowed/separated/divorced	1096 (16.13%)
Educational attainment	
High school/GED or less	964 (31.91%)
Some college/vocational or technical training	1132 (32.83%)
College graduate	906 (20.30%)
Postgraduate	672 (14.95%)
Race/ethnicity	
White	2847 (64.81%)
Black	273 (12.41%)
Hispanic	241 (15.16%)
Asian and Pacific Islander	133 (5.43%)
Other	148 (2.19%)
Current tobacco use ^b	
Current user	618 (18.93%)
Not a current user	2981 (81.07%)
Belief of FDA regulatory authority	
Yes	1609 (45.04%)
No	663 (18.16%)
Don't know	1386 (36.80%)
FDA qualification	
Not at all	851 (23.36%)
A little	1531 (40.95%)

	# (%) ^a
Somewhat	666 (19.98%)
Very qualified	548 (15.71%)
Behavioral causal belief	
Agrees that behavior causes cancer	1890 (50.96%)
Disagrees	1736 (49.04%)
Cancer fatalism	
Agrees that prevention not possible	900 (26.49%)
Disagrees	2714 (73.51%)
E-cigarette comparative harm ^c	
Less harmful than cigarettes	873 (26.65%)
Not less harmful than cigarettes	1351 (38.52%)
Don't know	1350 (34.82%)
Smokeless tobacco comparative harm ^d	
Less harmful than cigarettes	445 (10.95%)
Not less harmful than cigarettes	2444 (66.81%)
Don't know	796 (22.24%)
Cigarette type comparative harm ^e	
Less harmful than other cigarettes	515 (13.62%)
Not less harmful than other cigarettes	2159 (59.84%)
Don't know	1004 (25.54%)
Tobacco product comparative harm ^f	
Disagree, tobacco not safer now	3320 (90.23%)
Agree, tobacco safer now	323 (9.77%)

^aCounts are unweighted, proportions are weighted.

^bRespondents were classified as current tobacco users if they were current cigarette, cigar, or SLT users.

^cRespondents were grouped into three levels of e-cigarette comparative harm based on responses to “compared to smoking cigarettes, would you say that electronic cigarettes are...”: *Less Harmful* (much less harmful/less harmful) - *Not Less Harmful* (just as harmful/more harmful/much more harmful), and *Don't Know* (I don't know).

^dRespondents were grouped into three levels of smokeless tobacco comparative harm based on responses to “In your opinion, do you think that some smokeless tobacco products, such as chewing tobacco, snus, and snuff, are less harmful to a person's health than cigarettes?": *Less Harmful* (yes) - *Not Less Harmful* (no), and *Don't Know* (don't know).

^eRespondents were grouped into three levels of cigarette comparative harm based on responses to “Do you think that some types of cigarettes are less harmful to a person's health than other types?": *Less Harmful* (yes) - *Not Less Harmful* (no), and *Don't Know* (don't know).

^fRespondents were grouped into two levels of tobacco product safety perception based on responses to “Tobacco is safer to use now than it was 5 years ago”: *Agree* (strongly agree/somewhat agree), and *Disagree* (strongly disagree/somewhat disagree).

Table 2

Current Tobacco Use and Comparative Tobacco Product Harm Perceptions in HINTS-FDA 2015.

	Current tobacco use^b	
	Current tobacco user % (95 CI)^a	Not a current tobacco user % (95 CI)^a
E-cigarette comparative harm^c		
Less harmful than cigarettes	35.70 (29.43; 42.50)	24.66 (22.00; 27.54)
Not less harmful than cigarettes	35.63 (28.40; 43.59)	39.78 (37.12; 42.49)
Don't know	28.67 (22.24; 36.09)	35.56 (32.78; 38.44)
Smokeless tobacco comparative harm^d		
Less harmful than cigarettes	13.03 (9.41; 17.76)	10.61 (8.64; 12.96)
Not less harmful than cigarettes	67.79 (62.66; 72.52)	67.01 (63.69; 70.17)
Don't know	19.18 (14.32; 25.21)	22.38 (19.78; 25.22)
Cigarette type comparative harm^e		
Less harmful than other cigarettes	19.51 (14.37; 25.92)	11.98 (10.40; 13.76)
Not less harmful than other cigarettes	62.32 (54.90; 69.20)	60.25 (57.02; 63.39)
Don't know	18.18 (12.80; 25.16)	27.77 (24.73; 31.03)
Tobacco product comparative harm^f		
Disagree, tobacco not safer now	84.41 (79.80; 88.12)	91.78 (89.00; 93.90)
Agree, tobacco safer now	15.59 (11.88; 20.20)	8.22 (6.10; 11.00)

^aWeighted proportions and weighted 95% confidence intervals.

^bRespondents were classified as current tobacco users if they were current cigarette, cigar, or SLT users.

^cRespondents were grouped into three levels of e-cigarette comparative harm based on responses to “Compared to smoking cigarettes, would you say that electronic cigarettes are...”: *Less Harmful* (much less harmful/less harmful) - *Not Less Harmful* (just as harmful/more harmful/much more harmful), and *Don't Know* (I don't know).

^dRespondents were grouped into three levels of smokeless tobacco comparative harm based on responses to “In your opinion, do you think that some smokeless tobacco products, such as chewing tobacco, snus, and snuff, are less harmful to a person's health than cigarettes?": *Less Harmful* (yes) - *Not Less Harmful* (no), and *Don't Know* (don't know).

^eRespondents were grouped into three levels of cigarette comparative harm based on responses to “Do you think that some types of cigarettes are less harmful to a person's health than other types?": *Less Harmful* (yes) - *Not Less Harmful* (no), and *Don't Know* (don't know).

^fRespondents were grouped into two levels of tobacco product safety perception based on responses to “Tobacco is safer to use now than it was 5 years ago”: *Agree* (strongly agree/somewhat agree), and *Disagree* (strongly disagree/somewhat disagree).

Table 3

Factors associated with Comparative E-Cigarette Harm and Comparative SLT Harm –HINTS FDA 2015^d.

	E-cigarette comparative harm ^c “Compared to smoking cigarettes, would you say that electronic cigarettes are...”		SLT comparative harm ^d “In your opinion, do you think that some smokeless tobacco products, such as chewing tobacco, snus, and snuff, are less harmful to a person’s health than cigarettes?”		Cigarette Type comparative harm ^e “Do you think that some types of cigarettes are less harmful to a person’s health than other types?”		Tobacco product Comparative harm ^f “Tobacco is safer to use now than it was 5 years ago...” ^g
	Don’t know OR (95%CI)	Not less harmful OR (95%CI)	Don’t know OR (95%CI)	Not less harmful OR (95%CI)	Don’t know OR (95%CI)	Not less harmful OR (95%CI)	Agree OR (95%CI)
Belief of FDA regulatory authority							
Yes	Referent	Referent	Referent	Referent	Referent	Referent	Referent
No	1.62 (1.04, 2.53)	1.46 (0.83, 2.55)	1.12(0.43, 2.95)	1.59 (0.96, 2.62)	0.90 (0.51, 1.59)	1.55 (0.97, 2.50)	0.23 (0.10, 0.56)
Don’t know	3.41 (2.43, 4.81)	1.51 (1.04, 2.18)	2.41 (1.27, 4.57)	1.09 (0.62, 1.91)	3.42 (2.24, 5.24)	1.77(1.23, 2.54)	0.83 (0.50, 1.40)
FDA qualification							
Not at all	0.86 (0.45, 1.62)	1.09 (0.64, 1.85)	0.78 (0.34, 1.79)	1.42 (0.74, 2.71)	0.90 (0.38, 2.10)	0.97 (0.51, 1.85)	0.49 (0.21, 1.16)
A little	0.99 (0.56, 1.74)	1.09 (0.65, 1.83)	0.42 (0.21, 0.83)	0.66 (0.39, 1.10)	0.79 (0.43, 1.47)	1.04 (0.62, 1.74)	0.52 (0.25, 1.06)
Somewhat	0.88 (0.47, 1.65)	1.27 (0.73, 2.22)	0.24 (0.11, 0.52)	0.51 (0.27, 0.94)	0.99 (0.46, 2.12)	1.37 (0.74, 2.50)	0.88 (0.33, 2.38)
Very qualified	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Behavioral causal belief							
Agrees that behavior causes cancer	1.58 (1.10, 2.29)	1.35 (0.93, 1.97)	1.00 (0.62, 1.64)	0.94 (0.56, 1.58)	1.10 (0.74, 1.64)	1.08 (0.77, 1.51)	0.95 (0.61, 1.48)
Disagrees	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Cancer fatalism							
Agrees that prevention not possible	1.32 (0.86, 2.01)	1.33 (0.86, 2.04)	1.53 (0.71, 3.32)	1.03 (0.54, 1.95)	1.91 (1.18, 3.10)	1.19 (0.76, 1.86)	2.70 (1.76, 4.14)
Disagrees	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Tobacco use status ^b							
Current tobacco user	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Not a current user	1.88 (1.16; 3.01)	1.75 (1.07; 2.86)	1.29 (0.57; 2.93)	1.27 (0.72; 2.25)	2.70 (1.43; 5.08)	1.74 (1.06; 2.84)	0.50 (0.30; 0.82)
Sex							
Male	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Female	1.53 (1.12, 2.12)	1.31 (0.97, 1.76)	1.41 (0.79, 2.52)	1.59 (1.04, 2.45)	1.28 (0.88, 1.86)	1.28 (0.89, 1.83)	0.85 (0.50, 1.46)
Race/ethnicity							

	E-cigarette comparative harm ^c “Compared to smoking cigarettes, would you say that electronic cigarettes are...?”		SLT comparative harm ^d “In your opinion, do you think that some smokeless tobacco products, such as chewing tobacco, snus, and snuff, are less harmful to a person’s health than cigarettes?”		Cigarette Type comparative harm ^e “Do you think that some types of cigarettes are less harmful to a person’s health than other types?”		Tobacco product Comparative harm ^f “Tobacco is safer to use now than it was 5 years ago...”	
	Don't know OR (95%CI)	Not less harmful OR (95%CI)	Don't know OR (95%CI)	Not less harmful OR (95%CI)	Don't know OR (95%CI)	Not less harmful OR (95%CI)	Agree OR (95%CI)	Referent
White	Referent	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Black	4.39 (2.01, 9.61)	3.13 (1.52, 6.42)	2.28 (0.61, 8.59)	0.94 (0.28, 3.10)	3.78 (1.59, 9.00)	2.19 (1.04, 4.59)	2.38 (0.83, 6.84)	Referent
Hispanic	1.81 (1.00, 3.26)	1.57 (0.72, 3.42)	1.22 (0.57, 2.64)	0.51 (0.25, 3.10)	2.07 (0.88, 4.87)	2.17 (1.03, 4.55)	1.65 (0.62, 4.39)	Referent
Asian and Pacific Islander	1.24 (0.67, 2.31)	1.16 (0.70, 1.92)	1.71 (0.61, 4.83)	0.52 (0.18, 1.53)	2.59 (1.04, 6.47)	1.23 (0.56, 2.72)	1.77 (0.59, 5.32)	Referent
Other	2.40 (0.92, 6.26)	2.73 (1.11, 6.69)	0.98 (0.27, 3.61)	0.78 (0.31, 2.00)	1.15 (0.50, 2.61)	0.88 (0.39, 1.96)	1.03 (0.30, 3.51)	Referent
Age (in years)								
18–24	Referent	Referent	Referent	Referent	Referent	Referent	Referent	Referent
25–44	1.27 (0.56, 2.88)	0.87 (0.39, 1.97)	0.39 (0.05, 1.72)	0.39 (0.0, 1.95)	1.08 (0.32, 3.57)	1.01 (0.41, 2.52)	1.14 (0.25, 5.16)	Referent
46–64	1.31 (0.61, 2.88)	0.77 (0.35, 1.69)	0.36 (0.06, 2.23)	0.44 (0.09, 2.09)	1.06 (0.32, 3.52)	0.92 (0.38, 2.22)	1.26 (0.26, 6.05)	Referent
65+	2.96 (1.28, 6.82)	1.03 (0.48, 2.21)	0.47 (0.08, 2.85)	0.37 (0.08, 1.83)	1.59 (0.45, 5.64)	0.95 (0.36, 2.49)	1.43 (0.28, 7.31)	Referent
Educational attainment								
High school/GED or less	Referent	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Some college	0.49 (0.29, 0.84)	0.68 (0.38, 1.20)	0.68 (0.27, 1.42)	0.81 (0.35, 1.86)	0.67 (0.39, 1.15)	0.72 (0.41, 1.27)	1.02 (0.55, 1.90)	Referent
College graduate	0.48 (0.28, 0.81)	0.53 (0.32, 0.88)	0.62 (0.27, 1.41)	0.67 (0.33, 1.35)	0.60 (0.34, 1.03)	0.63 (0.36, 1.11)	0.61 (0.30, 1.24)	Referent
Postgraduate	0.37 (0.20, 0.66)	0.48 (0.24, 0.95)	0.49 (0.20, 1.20)	0.52 (0.26, 1.07)	0.50 (0.27, 0.94)	0.43 (0.25, 0.72)	0.80 (0.36, 1.71)	Referent
Marital status								
Single/never married	Referent	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Married/living as married	1.63 (0.95, 2.80)	2.08 (1.23, 3.53)	1.69 (0.73, 3.93)	1.36 (0.59, 3.13)	1.19 (0.61, 2.33)	1.34 (0.83, 2.18)	0.95 (0.44, 2.03)	Referent
Divorced/widowed/separated	1.40 (0.80, 2.43)	2.40 (1.45, 4.00)	1.26 (0.58, 2.70)	1.11 (0.49, 2.51)	1.28 (0.68, 2.41)	1.62 (1.00, 2.63)	1.01 (0.42, 2.44)	Referent
Region								
Urban	Referent	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Rural Health insurance	0.99 (0.34, 2.96)	1.51 (0.38, 6.02)	0.42 (0.08, 2.12)	0.64 (0.16, 2.56)	1.40 (0.35, 5.57)	1.96 (0.60, 6.41)	1.94 (0.08, 49.07)	Referent
Insured	Referent	Referent	Referent	Referent	Referent	Referent	Referent	Referent
Not insured	1.09 (0.54, 2.18)	0.68 (0.36, 1.26)	1.01 (0.33, 3.06)	0.96 (0.33, 2.80)	0.51 (0.25, 1.02)	0.56 (0.29, 1.08)	0.62 (0.27, 1.39)	Referent

^aWeighted multinomial and logistic regression analyses regressed comparative tobacco product harm perceptions on demographic factors, beliefs about FDA regulatory authority, and beliefs about modifiability of cancer risk. Abbreviations: CI = confidence interval.

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- ^b Respondents were classified as current tobacco users if they were current cigarette, cigar, or SLT users.
- ^c Respondents were grouped into three levels of e-cigarette comparative harm based on responses to “compared to smoking cigarettes, would you say that electronic cigarettes are...”: *Less Harmful* (much less harmful/less harmful) - referent, *Not Less Harmful* (just as harmful/more harmful/much more harmful), and *Don't Know* (I don't know).
- ^d Respondents were grouped into three levels of smokeless tobacco comparative harm based on responses to “In your opinion, do you think that some smokeless tobacco products, such as chewing tobacco, snus, and snuff, are less harmful to a person's health than cigarettes?”: *Less Harmful* (yes) - referent, *Not Less Harmful* (no), and *Don't Know* (don't know).
- ^e Respondents were grouped into three levels of cigarette comparative harm based on responses to “Do you think that some types of cigarettes are less harmful to a person's health than other types?”: *Less Harmful* (yes) - referent, *Not Less Harmful* (no), and *Don't Know* (don't know).
- ^f Respondents were grouped into two levels of tobacco product safety perception based on responses to “Tobacco is safer to use now than it was 5 years ago”: *Agree* (strongly agree/somewhat agree), and *Disagree* (strongly disagree/somewhat disagree) - referent.