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Author manuscript

US Adult Tobacco Users' Absolute Harm Perceptions of Traditional and Alternative Tobacco Products, Information-seeking Behaviors, and (Mis)beliefs about Chemicals in Tobacco Products

Jennifer K. Bernat, PhD[1], **Rebecca A. Ferrer, PhD**[2], **Katherine A. Margolis, PhD**[1], and **Kelly D. Blake, ScD**[2]

[1]Office of Science, Division of Population Health Science, Center for Tobacco Products, US Food and Drug Administration, Silver Spring, MD

[2]Behavioral Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, National Institutes of Health, Bethesda, MD

Abstract

Introduction—Harm perceptions about tobacco products may influence initiation, continued use, and cessation efforts. We assessed associations between adult traditional tobacco product use and absolute harm perceptions of traditional and alternative tobacco products. We also described the topics individuals looked for during their last search for information, their beliefs about chemicals in cigarettes/cigarette smoke, and how both relate to harm perceptions.

Methods—We ran multivariable models with jackknife replicate weights to analyze data from the 2015 administration of the National Cancer Institute's Health Information National Trends Survey (N=3376).

Results—Compared to never users, individuals reported lower perceived levels of harm for products they use. Among current tobacco users, ethnicity, thinking about chemicals in tobacco, and information-seeking were all factors associated with tobacco product harm perceptions. In the full sample, some respondents reported searching for information about health effects and cessation and held misperceptions about the source of chemicals in tobacco.

Corresponding author: Jennifer K. Bernat, 10903 New Hampshire Ave., Silver Spring, MD, 20993, 240-402-1078, Jennifer.Bernat@fda.hhs.gov.

Conclusions—This study fills a gap in the literature by assessing the absolute harm perceptions of a variety of traditional and alternative tobacco products. Harm perceptions vary among tobacco products, and the relationship among tobacco use, information seeking, thoughts about chemicals in tobacco products, and harm perceptions is complex. Data suggest that some individuals search for information about health effects and cessation and hold misperceptions about chemicals in tobacco products. Future inquiry could seek to understand the mechanisms that contribute to forming harm perceptions and beliefs about chemicals in tobacco products.

INTRODUCTION

Tobacco use is a risk factor for six of the eight leading causes of death in the world and was responsible for 100 million deaths in the 20th century.[1] Understanding individuals' harm perceptions about tobacco products is important because these perceptions may influence initiation,[2] continued use, and future cessation efforts, especially among young adults.[3–6] Past research has assessed relative harm perceptions to gauge harm perceptions compared to combusted cigarettes. This research suggests that smokeless tobacco,[7–10] electronic cigarettes (e-cigarettes),[8,11] hookah/waterpipes,[12–14] cigars and cigarillos,[12,15,16] and roll-your-own tobacco (RYO) [17] are all perceived as less harmful than combusted cigarettes.

These differences in tobacco product harm perceptions have potential behavioral implications. Since combusted cigarettes are often perceived as the most harmful tobacco product on the market, individuals may believe that switching from combusted cigarettes to another type of tobacco product may lessen the harmful health consequences of tobacco, including risk of tobacco-related illness, disease, and death.[18] This product switching, however, may lead to dual use and continued dependence.[19] Proponents of harm reduction advocate for increased public education about the tobacco risk continuum, stating that individuals may be able to satisfy their nicotine cravings while using relatively less risky tobacco products.[20,21]

The information environment and knowledge gained from information-seeking may influence one's tobacco product harm perceptions. Past research on tobacco information-seeking has focused on describing source characteristics of information-seeking across different levels of tobacco use.[22] In past e-cigarette literature, media exposure to e-cigarette information was associated with reduced harm perceptions about e-cigarettes,[23] and individuals who searched for e-cigarette information were more likely to be interested in retail and price information than health or cessation.[24] Little else is known about tobacco information-seeking, including topics of information searches.

Individuals have reported a desire for more information about chemicals in tobacco and health effects of tobacco use [25,26] and may benefit from obtaining information about these topics. Research suggests that adults in the United States exhibit a lack of knowledge and misunderstanding about chemicals in tobacco products. Participants in a focus group study have communicated unfamiliarity about the amount and nature (e.g., type, health effects) of

chemicals in tobacco products.[26] Individuals also misunderstand the source of chemicals in tobacco and incorrectly believe that the harmful chemicals are added during manufacturing by tobacco companies, and are not naturally occurring in the plant.[25–27]

Objectives

Our objectives for this study are threefold. Most studies have examined relative harm perceptions of tobacco products compared to combusted cigarettes. The first objective of this study fills a research gap by exploring absolute product harm perceptions (i.e., not compared to combusted cigarettes) of a variety of tobacco products. We define "traditional tobacco products" as combusted cigarettes, cigars, and traditional smokeless tobacco other than snus, and "alternative tobacco products" as electronic cigarettes (e-cigarettes), hookah, RYO, pipe tobacco, and snus. To fulfill the first objective, we assess the association between individuals' traditional tobacco product use and absolute harm perceptions among several traditional and alternative tobacco products in a sample of US adults. Our second objective is to understand how information seeking influences harm perceptions by describing the topics individuals looked for during their last search for information, their beliefs about chemicals in cigarettes/cigarette smoke, and how both relate to their harm perceptions. Our third objective is to describe how incorrect beliefs about chemicals in tobacco products can influence harm perceptions by exploring whether information-seeking about chemicals was associated with harm perceptions of each specific tobacco product.

METHODS

Data source

The US Food and Drug Administration (FDA) and the National Cancer Institute (NCI) fielded a 2015 cycle of the Health Information National Trends Survey (HINTS), herein referred to as HINTS-FDA-2015. HINTS-FDA-2015 was approved by the Office of Management and Budget (OMB) in April 2015 (OMB #0925-0538), was deemed exempt by the NIH Office of Human Subjects Research in June 2014 and approved by the Westat Institutional Review Board in July 2014.

Data collection, response rates, and sample

HINTS-FDA 2015 was a self-administered paper survey mailed to adults aged 18 and older in the US civilian non-institutionalized population. Data were collected May 29-September 8, 2015 using a random sample of US postal addresses, stratified by county-level smoking rates, with an oversample of high and medium-high smoking strata in an attempt to increase the yield of current smokers responding to the survey. The response rate for HINTS-FDA 2015 was 33% (N=3738) which is comparable to other iterations of HINTS[28] and other mail surveys.[29] Details about HINTS-FDA 2015 methodology have been published elsewhere.[30]

Measures

Traditional tobacco product use status—We classified individuals into three traditional tobacco product use categories: never users, former users, or current users based on responses to the following items related to combusted cigarettes, cigars, and smokeless tobacco. We assessed cigarette use with two questions: "Have you ever smoked at least 100

cigarettes in your entire life?" (yes, no) and "Do you now smoke cigarettes every day, some days, or not at all?" We defined cigarette users with the following criteria: current cigarette smokers as smoking 100 lifetime cigarettes and now smoking every day or some days; former cigarette smokers as smoking 100 lifetime cigarettes and now not smoking at all; and never cigarette smokers as not smoking 100 lifetime cigarettes and now not smoking at all. We assessed cigar use with two questions: "How many cigars, cigarillos, or little filtered cigars have you smoked in your entire life? Some popular brands include Macanudo, Romeo y Julieta, Black and Mild, Swisher Sweets, Prime Time, and Cheyenne." (none, 1-10, 11–10, 21–50, 51–99, 100 or more) and "Do you now smoke cigars, cigarillos, or little filtered cigars every day, some days, or not at all?" We defined cigar users with the following criteria: current cigar users as those who had smoked at least one cigar in their lifetime and currently reporting smoking cigars every day or some days; former cigar users as those who had smoked at least one cigar in their lifetime but now not smoking cigars at all; and never cigar users as those answering "none" to how many lifetime cigars have been smoked and "not at all" to current cigar smoking. We assessed smokeless tobacco use with two questions: "Have you used chewing tobacco, snus, snuff, or dip at least 20 times in your entire life? Some popular brands include Red Man, Levi Garrett, BEECH-NUT, Skoal, or Copenhagen." (yes, no) and "Do you now use chewing tobacco, snus, snuff, or dip every day, some days, or not at all?" We defined smokeless tobacco users with the following criteria: current smokeless tobacco users as those who answered "yes" to using smokeless tobacco at least 20 times and now using smokeless tobacco every day or some days; former smokeless tobacco users as those who answered "yes" to using smokeless tobacco at least 20 times and now using not at all; and never smokeless tobacco users as those who answered "no" to using smokeless tobacco 20 times and "not at all" to now using smokeless tobacco.

Alternative tobacco product trial—We assessed alternative tobacco product trial using one "mark all that apply" question that read, "Which of the following tobacco products have you ever tried even once?" Response options were: hookah or water pipe filled with tobacco; electronic cigarettes (such as blu, NJOY or Logic), also known as vape-pens, hookah pens, e-hookahs, or evaporizers; pipe filled with tobacco; RYO cigarettes; snus (such as Camel snus, General snus, Marlboro snus, and Nordic Ice); I have never tried any of these tobacco products. We grouped alternative tobacco product into the following categories based on the number of products they selected: non-triers, tried one product, tried two or more products.

Absolute harm perceptions—We assessed absolute harm perceptions, independent of comparison to combusted cigarettes, using a matrix item that asked "How harmful do you think each of the following is to a person's health?" across seven product use behaviors (cigarette smoking, cigar smoking, smokeless tobacco use, electronic cigarette use, smoking tobacco in a hookah, smoking RYO cigarettes, and smoking a pipe filled with tobacco). Response options were: not at all harmful; moderately harmful; and very harmful.

Information-seeking about tobacco topics—We assessed information-seeking about tobacco topics using one "mark all that apply" question that read, "Have you ever looked for any of the following information about tobacco products (e.g., cigarettes, cigars, or chewing tobacco) from any source?" Response options were: health effects; products that claim to

reduce exposure to certain chemicals or present less risk of disease; quitting help/ information; list of chemicals in tobacco products; cost/coupons; instructions/tutorials; where to buy; information about new kinds of tobacco products; never looked for any of this information; something else - specify (open ended). We coded all responses, including those that were open-ended, as yes or no to indicate whether or not the individual engaged in information-seeking.

Chemicals—We used two items to explore individuals' thoughts about chemicals in tobacco products. One item assessed whether respondents had ever thought about chemicals in tobacco products. It read, "In the past year, how often have you thought about the chemicals contained in tobacco products?" with response options being never, rarely, sometimes, and often. Because of the distribution, responses were dichotomized to never and rarely/sometimes/often (i.e., ever). This coding approach is consistent with research dichotomizing frequency responses in previous iterations of HINTS (e.g., "How often do you worry about cancer?" with the same frequency response options being dichotomized in the same way).[31,32] The second item assessed beliefs about the origin of chemicals in cigarettes and cigarette smoke. It read, "Where do you think the chemicals in cigarettes and cigarette smoke come from? Mark only one." Response options included: all the chemicals come from the tobacco leaf; most of the chemicals come from the tobacco leaf; the chemicals come equally from the tobacco leaf and things added to the tobacco; most of the chemicals come from things added to the tobacco; all the chemicals come from things added to the tobacco; and I do not believe there are any chemicals in cigarettes and cigarette smoke. During analysis, we combined "all the chemicals come from the tobacco leaf" with "most of the chemicals come from the tobacco leaf" and "most of the chemicals come from things added to the tobacco" with "all the chemicals come from things added to the tobacco."

Sociodemographics—We included the following sociodemographic variables in the analysis: sex, age, education, race, Hispanic ethnicity, income, and cohabitation with a tobacco user. See Table 1 for variable categories.

Statistical analyses

We performed all analyses in SAS-callable SUDAAN Version 11.0.0. To account for the complex sampling design and to generate nationally representative statistical estimates, we incorporated jackknife replicate weights.

For each product-specific harm perception outcome, we conducted a two-step series of analyses in both the full sample and the subsample of current traditional tobacco user (i.e., individuals who report current use of cigarettes, cigars, and/or smokeless tobacco.) First, we conducted a series of linear regressions, regressing the harm perception outcome on each predictor independently. Predictors that were significant in this first step were then entered simultaneously in the final multivariable regression model. We controlled for age, gender, education, income, race/ethnicity, and tobacco user cohabitation status in all analyses.

RESULTS

Sociodemographics and descriptive statistics

Table 1 reports sociodemographic characteristics of the full weighted sample, as well as sociodemographic characteristics stratified by traditional tobacco use status (never used cigarettes, cigars, or smokeless tobacco; formerly used one or more of those products but currently not using any; or currently using one or more traditional tobacco products). There were slightly more females than males, and almost half of the sample were college graduates (46%) and about a third had an annual household income over $75,000 (32%). Approximately 20% of the sample consisted of current tobacco users.

Table 2 reports the distribution of absolute harm perceptions in the sample. The majority of respondents reported that each tobacco product was "very harmful" and very few respondents reported that each tobacco product was "not at all harmful."

Table 3 reports descriptive frequencies for the tobacco-related topics about which respondents searched for information, and reports where individuals believe chemicals in cigarettes and cigarette smoke come from (number and weighted percentages). The majority of the sample did not search for information about tobacco products (68.4%), but for those who did, the top search topic was tobacco health effects (21.6%). A little over half of the sample (52%) incorrectly believed that most or all chemicals in tobacco were from additives and do not exist naturally in the tobacco leaf.

Predictors of absolute harm perceptions

Table 4 reports the results of the final regression models for predictors of absolute harm perceptions in the full sample. Results show that product use was related to harm perceptions about specific products. Compared to never cigarette smokers, cigarette harm perceptions were lower among those who are current or were former cigarette smokers and smokeless tobacco users ($\beta = -.05$, $p = .008$; $\beta = -.08$, $p = .002$, respectively). Compared to never cigar smokers, cigar harm perceptions and pipe harm perceptions were lower among those who are current or were former cigar smokers ($\beta = -.15$, $p = <.001$; $\beta = -.07$, $p < .001$, respectively). Compared to those who had never tried an alternative product, e-cigarette and hookah harm perceptions were lower among those who had tried one ($\beta = -.15$, $p = .026$; $\beta = -.19$, $p = .001$) or more ($\beta = -.17$, $p = .014$; $\beta = -.15$, $p = .006$) alternative products. Higher cigarette and cigar harm perceptions were predicted by whether respondents had thought about chemicals in tobacco in the past year ($\beta = .08$, $p < .001$; $\beta = .10$, $p = .005$, respectively); however, thoughts about chemicals were associated with lower RYO harm perceptions ($\beta = -.01$, $p = .043$). Higher harm perceptions of smokeless tobacco were predicted by information-seeking about tobacco health effects ($\beta = .12$, $p = .007$) and by whether respondents had thought about chemicals in tobacco ($\beta = .18$, $p = .010$).

We examined each product's harm perceptions among current traditional tobacco users (i.e., individuals who report current use of cigarettes, cigars, and/or smokeless tobacco) to determine if other significant associations beyond tobacco use existed. Table 5 reports the results of the final regression models for predictors of harm perceptions among current traditional tobacco users. Compared with all other ethnicities, non-Hispanic black current

tobacco users had higher smokeless tobacco ($\beta = .27$, $p = .034$), $\beta = .28$, cigar ($p = .007$), RYO $\beta = .33$, ($p = .017$), pipe ($\beta = .59$, $p = .002$), and hookah $\beta = .21$,($p = .028$) harm perceptions. Seeking information about the chemicals in tobacco was associated with higher cigar ($\beta = .35$, $p = .002$) and pipe ($\beta = .26$, $p = .017$) harm perceptions. Current tobacco users who thought about chemicals in tobacco in the past year had higher cigarette ($\beta = .27$, $p = .003$), smokeless tobacco ($\beta = .25$, $p = .006$), roll-your-own tobacco ($\beta = .26$, $p = .025$), e-cigarette ($\beta = .24$, $p = .013$), and hookah ($\beta = .33$, $p < .001$) harm perceptions.

DISCUSSION

Our study assessed the association between traditional tobacco product use and absolute harm perceptions about traditional and alternative tobacco products. In the full sample, the majority of individuals rated each tobacco product as very harmful. When examining harm perceptions by traditional tobacco use status, we found that individuals held distinct harm perceptions for different tobacco products. Similar to other studies where individuals perceived the products they use to be less harmful,[8,13,15–17] we found that same nuanced view in the full sample, wherein specific tobacco product use was associated with lower harm perceptions of that product. This was true for both traditional (e.g., cigar harm perceptions were lower among those who had ever smoked cigars) and alternative tobacco products (e.g., hookah harm perceptions were lower among those who had tried one or more alternative products). Pipe harm perceptions were lower among those who had ever smoked cigars, which was expected given that past research suggests similarities between the demographic characteristics of exclusive pipe and cigar smokers and that pipe users typically also smoke cigars.[33] We measured absolute harm perceptions in our study, which are independent from harm perceptions that are compared to cigarettes (relative harm). Relative harm perceptions have been a common measure used in past research[7,8,11–17]; however, comparison to a referent product can influence harm perceptions due to contextual effects of message framing.[18] For example, research on snus [34] and e-cigarettes[35] has assessed the differences between direct (relative/comparative) and indirect (absolute) risk perceptions. Both studies found that individuals rated harm perceptions lower using indirect (absolute) measures, suggesting that individuals' harm perceptions were influenced when asked to compare one product to a referent product (i.e., cigarettes). While lower harm perceptions may influence initiation,[2] continued use, and future cessation efforts among users,[3–6] our findings support further research to inform absolute and relative harm perceptions about tobacco products, as the relationship between harm perceptions and tobacco use is complicated.

This research supports the need to carefully consider the comparison product if relative harm perception measures are used, as we discovered nuances in harm perceptions.[18] The studies we reviewed lacked a consistent naming convention for each measure. "Absolute" and "indirect" were interchangeable terms, as were "relative", "comparative", and "direct". Future methodological research should strive to develop a consistent naming convention.

Our study also fills a gap in the information-seeking literature. We described the topics individuals looked for during their last search for information, as well as their beliefs about chemicals in cigarettes/cigarette smoke. The majority of our sample did not search for

information about tobacco, but for those who did, the top search topics were health effects and cessation. Contrary to past research,[24] only 3% of our sample searched for information about where to buy tobacco. The difference in findings is potentially due to the difference in measurement methods. Our study used self-report, while Ayers and colleagues examined Google Trends data.[24] The participants in our study may have been a unique demographic who were interested in tobacco health-related topics. Future research on the topics of tobacco information searches would inform public education efforts.

Similar to past research,[25–27] the current study found that individuals lack knowledge about the source of chemicals in tobacco products. More than half the sample incorrectly believed that most or all chemicals were added to tobacco, not naturally occurring in the plant. These data suggest that individuals may need clarifying information about the source of chemicals in tobacco products. Research to understand information-seeking about chemicals in tobacco products would be informative because past research has documented that individuals report less discouragement from smoking when they believed chemicals in tobacco were naturally occurring in the plant and not added during manufacturing.,[27] and beliefs that cigarettes with additives are more harmful than cigarettes without.[25] These incorrect harm beliefs may influence initiation,[2] continued use, and future cessation efforts among users.[3–6]

We found that information-seeking was associated with harm perceptions of a specific tobacco product. In the full sample, thinking about chemicals in tobacco was associated with higher cigarette and cigar harm perceptions and lower RYO tobacco harm perceptions. Those individuals who reported information-seeking about health effects and chemicals also had higher harm perceptions of smokeless tobacco. Among current tobacco users, those who thought about chemicals in tobacco had higher cigarette, smokeless tobacco, RYO tobacco, and hookah harm perceptions. Seeking information about chemicals in tobacco was positively associated with higher e-cigarette and cigar harm perceptions. These findings seem intuitive because our current study, as well as past research, suggests that individuals believe the chemicals in tobacco products are additives, and that these additives are harmful.[27] It is logical to infer that if an individual is thinking about and searching for information about chemicals and believes that chemicals in tobacco are additives, the information they find may shape their harm perceptions. Research may provide insight about the mechanisms behind the formation of tobacco harm perceptions. Compared to other ethnic groups, non-Hispanic black tobacco users had higher smokeless tobacco, e-cigarette, cigar, hookah, and pipe harm perceptions. Past research suggests increased harm perceptions maybe related to lower prevalence of use, yet non-Hispanic black individuals have higher little cigar/cigarillo and premium cigar prevalence of use compared to other ethnic groups.[36,37] Future research can help inform how harm perceptions may be associated with prevalence of use among non-Hispanic black individuals.

Limitations

HINTS-FDA 2015 data are cross-sectional; therefore, temporality and causal inference cannot be established. The response rate for HINTS-FDA 2015 is low which can lead to biases in the data. However, achieving response representativeness is a more important factor for reducing potential bias.[38] HINTS-FDA 2015 employed numerous methods to achieve

response representativeness and reduce potential bias including modality coverage and sampling.[39] More information about the HINTS-FDA 2015 data collection and response rate have been published elsewhere.[30] Recent methodological research suggests that the potential for bias resulting from declining response rates may be less significant than previously assumed.[40–42]

HINTS-FDA 2015 employed standard measures to assess traditional tobacco use status, but only asked about trial or experimentation with alternative tobacco products. Respondents did not indicate recency or frequency of alternative tobacco product use. As such, caution should be used when interpreting whether harm perceptions are associated with alternative tobacco product use. Caution should also be used when interpreting results regarding the association between harm perceptions and thinking about chemicals in tobacco products. We dichotomized responses to individuals' frequency of thoughts about chemicals in tobacco products. Although this method is consistent with past HINTS analyses,[31,32] information on individual differences may be lost.

Lastly, it is possible that other substance use (e.g., alcohol, marijuana) may influence absolute harm perceptions of tobacco products. This analysis measured tobacco product use only. Future research may investigate how other substance use may influence absolute harm perceptions of tobacco products.

CONCLUSIONS

The present study fills a gap in the literature on absolute harm perceptions of a variety of traditional and alternative tobacco products. We found that people hold different harm perceptions about different tobacco products, and that the relationship among tobacco use, information-seeking, thoughts about chemicals in tobacco products, and harm perceptions is complex. We found that non-Hispanic black tobacco users have higher harm perceptions across all tobacco products except cigarettes and e-cigarettes. Future inquiry into tobacco harm perceptions could seek to untangle these associations in order to elucidate the mechanisms that contribute to their formation.

Acknowledgments

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Highlights

- Individuals reported lower perceived levels of harm for tobacco products they use.

- Ethnicity was associated with increased harm perceptions.

- Information-seeking and thinking was associated with increased harm perceptions.

- Individuals searched for information about tobacco health effects and cessation.

- Individuals incorrectly believe that chemicals are added to tobacco.

Table 1

Demographic characteristics of full sample and stratified by traditional tobacco product[a] use status (N=3376)

Variable	Full Sample	Never User	Former User	Current User	Wald Statistic (unadjusted)
Sample size	3376	1469 (47.4%)	1286 (31.9%)	621 (20.7%)	
Sex					
Male	1440	454 (39.6%)	648 (34.4%)	338 (26.0%)	20.70
Female	1936	1015 (54.9%)	638 (29.5%)	283 (15.7%)	p < .0001
Age					
18–49	1086	521 (51.4%)	337 (27.1%)	228 (21.5%)	
50–64	1177	506 (34.5%)	410 (32.7%)	261 (23.9%)	
65–74	722	265 (35.3%)	344 (45.7%)	113 (19.9%)	19.94
75+	501	224 (46.3%)	240 (46.0%)	37 (7.7%)	p < .0001
Education					
Less than High School	221	73 (43.3%)	76 (25.6%)	72 (31.1%)	
High School Graduate	997	412 (44.2%)	338 (30.7%)	247 (25.1%)	
Some College	811	327 (42.9%)	320 (31.9%)	164 (25.3%)	11.21
College Graduate	1549	751 (54.0%)	630 (35.8%)	168 (10.3%)	p < .0001
Annual Income					
< $20K	637	245 (44.1%)	197 (24.7%)	195 (31.2%)	
$20K to <$50	878	353 (45.0%)	340 (33.3%)	185 (21.7%)	
$50K to <$75K	586	258 (47.1%)	247 (37.2%)	81 (15.7%)	4.26
$75K or more	1076	517 (49.8%)	428 (33.0%)	131 (17.3%)	p = .0016
Race/Ethnicity					
Non-Hispanic White	2587	1057 (39.6%)	1062 (37.0%)	468 (23.5%)	
Non-Hispanic Black	223	110 (55.8%)	60 (21.2%)	53 (23.0%)	
Hispanic	219	123 (64.3%)	60 (24.2%)	36 (11.6%)	11.30
Non-Hispanic Other[b]	258	136 (67.8%)	77 (23.2%)	45 (9.0%)	p < .0001
Cohabitation with Tobacco User					
Yes	667	144 (23.2%)	145 (21.5%)	378 (55.3%)	72.63
No	2864	1394 (54.7%)	1207 (35.5%)	263 (9.8%)	p < .0001

Note.

[a] Use status is delineated for never, former, and current users of traditional tobacco products (i.e., combusted cigarettes, cigars, and smokeless) and does not include trial or experimentation with alternative tobacco products, as defined in the manuscript.

[b] Non-Hispanic "other race" combines low-frequency responses for American Indian/Alaska Native, Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, other Asian, Native Hawaiian, Guamanian or Chamorro, Samoan, and other Pacific Islander).

Table 2

Distribution of absolute harm perceptions in the full sample (N=3376). Unadjusted. (Number and weighted percent)

	Not at all Harmful N (%)	Moderately Harmful N (%)	Very Harmful N (%)
Cigarettes	23 (0.6)	312 (8.9)	3315 (90.5)
Smokeless tobacco	114(3.3)	1062 (30.0)	2363 (66.6)
Cigars	60 (1.8)	950 (25.4)	2582 (72.8)
Roll your own	33 (1.3)	552 (16.2)	2975 (82.5)
Pipe	39 (1.0)	870 (22.5)	2658 (76.5)
E-cigarettes	314 (9.4)	1488 (41.9)	1698 (48.7)
Hookah	81 (2.7)	1080 (31.5)	2320 (65.8)

Table 3

Topics of tobacco product information searches and origin of chemicals. Unadjusted. (Number and weighted percent)

Information Searches	N	%
Never Searched for Information about Tobacco	2514	68.40
Health Effects	648	21.56
Quitting	458	12.68
Cost	321	10.50
Chemicals	281	9.46
Reduced Exposure Products	175	5.39
Where to Buy	104	3.05
Other	96	2.81
New Products	81	2.61
Instructions for Use	37	1.12
Origin of Chemicals	N	%
All in Additives	507	16.2%
Most in Additives	1168	35.8%
Equally in Tobacco Leaf and Additives	1149	30.6%
Most in Tobacco Leaf	355	7.9%
All in Tobacco Leaf	222	7.3%
No chemicals in cigarettes and cigarette smoke	73	2.3%

Table 4

Final regression models (weighted, fully adjusted, multivariable) predicting tobacco product harm perceptions (N=3376, Full Sample)

	Cigarette		Smokeless		Cigar		Roll Your Own		Pipe		E-Cigarette		Hookah	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Age	.00 (−.00,.00)	.544	.00 (−.00,.00)	.734	.00 (−.00,.00)	.469	.00 (−.00,.00)	.116	−.00 (−.00,.00)	.410	.00 (−.00,.00)	.393	.00 (−.00,.00)	.208
Female	.03 (−.07,.01)	.148	−.06 (−.14,.02)	.622	−.04 (−.12,.04)	.300	−.02 (−.09,.05)	.567	−.05 (−.11,.02)	.140	**−.08 (−.16,.00)**	**.050**	−.04 (−.12,.04)	.317
Education														
Less than High School	−.01 (−.14,.11)	.816	−.07 (−.28,.13)	.799	.08 (−.08,.24)	.315	−.04 (−.18,.11)	.620	.03 (−.12,.19)	.650	.01 (−.23,.26)	.921	−.02 (−.22,.17)	.815
High School Graduate	.00 (−.05,.05)	.933	.01 (−.07,.09)	.469	.03 (−.07,.13)	.506	−.01 (−.07,.04)	.620	.01 (−.06,.09)	.760	.01 (−.10,.12)	.872	.03 (−.08,.14)	.594
Some College	.02 (−.02,.06)	.357	−.02 (−.14,.09)	.899	.02 (−.08,.12)	.662	−.03 (−.13,.07)	.521	.04 (−.03,.12)	.521	.02 (−.11,.15)	.774	.04 (−.05,.14)	.380
College Graduate	ref	ref	ref	ref	Ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Annual Income														
<$20K	−.04 (−.10,.02)	.211	−.07 (−.22,.08)	.227	.07 (−.04,.17)	.210	−.04 (−.16,.08)	.490	.02 (−.06,.10)	.656	−.12 (−.30,.06)	.176	.06 (−.05,.16)	.271
$20K to <$50K	−.04 (−.10,.02)	.217	−.03 (−.11,.05)	.270	−.01 (−.11,.09)	.849	.01 (−.06,.07)	.835	−.02 (−.09,.05)	.511	−.04 (−.14,.07)	.483	.03 (−.07,.13)	.516
$50K to <$75K	−.03 (−.08,.03)	.336	−.00 (−.08,.07)	.474	.03 (−.04,.11)	.369	.03 (−.02,.09)	.230	−.01 (−.07,.05)	.759	.03 (−.14,.07)	.605	.03 (−.05,.12)	.436
$75K or more	ref	ref	ref	ref	Ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Race/Ethnicity														
Non-Hispanic White	ref	ref	ref	ref	Ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Non-Hispanic Black	.03 (−.04,.09)	.393	**−.16 (−.34,−.01)**	**.034**	.09 (−.02,.20)	.101	−.11 (−.29,.06)	.202	**.08 (.00,.16)**	**.044**	.01 (−.23,.24)	.955	.06 (−.07,.19)	.378
Hispanic	−.00 (−.07,.06)	.920	−.02 (−.16,.12)	.773	.07 (−.04,.18)	.197	.02 (−.07,.10)	.682	−.02 (−.13,.08)	.683	.12 (−.07,.30)	.203	−.01 (−.18,.16)	.892
Non-Hispanic Other	.00 (−.05,.06)	.895	−.01 (−.12,.10)	.068	.01 (−.15,.16)	.937	−.09 (−.19,.01)	.078	−.02 (−.11,.08)	.739	.06 (−.09,.20)	.449	.02 (−.09,.12)	.763
Cohabitation with Tobacco User	−.05 (−.12,.01)	.093	−.05 (−.16,.06)	.153	−.05 (−.16,.06)	.372	−.07 (−.16,.02)	.102	−.03 (−.09,.03)	.364	**−.15 (−.26,−.04)**	**.009**	−.04 (−.15,.06)	.413
Ever smoked cigarettes	**−.05 (−.08,−.01)**	**.008**	**−.08 (−.13,−.03)**	**.002**	-	-	-	-	-	-	-	-	-	-
Ever smoked cigars	-	-	-	-	**−.15 (−.22,−.08)**	**<.001**	-	-	**−.07 (−.11,−.03)**	**<.001**	-	-	-	-
Ever used smokeless	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tobacco Experimentation														
None	ref	ref	ref	ref	Ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
1 product	-	-	-	-	-	-	-	-	-	-	**−.15 (−.29,−.02)**	**.026**	**−.19 (−.31,−.08)**	**.001**
2 or more products	-	-	-	-	-	-	-	-	-	-	**−.17 (−.30,−.04)**	**.014**	**−.15 (−.25,−.04)**	**.006**
0 Products	ref	ref	ref	ref	Ref	ref	ref	ref	ref	ref	ref	ref	ref	ref
Tobacco Health Info Seeking	-	-	**.12 (.02,.22)**	**.007**	-	-	-	-	-	-	-	-	-	-

	Cigarette		Smokeless		Cigar		Roll Your Own		Pipe		E-Cigarette		Hookah	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Tobacco Chemical Info Seeking	-	-	.18 (.05,.30)	.010	-	-	-	-	-	-	-	-	-	-
Thought About Chemicals Tobacco	.08 (.04,.12)	<.001	-	-	.10 (.03,.16)	.005	−.01 (−.01,−.00)	.043	-	-	-	-	-	-

Note. We excluded non-significant predictors (indicated by empty table cells) in the final regression model.

Table 5

Final regression models (weighted, fully adjusted, multivariable) predicting tobacco product harm perceptions (N=621, current traditional tobacco users)

	Cigarette		Smokeless		Cigar		Roll Your Own		Pipe		E-Cigarette		Hookah	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p	β (95% CI)	p
Age	-.00 (-.01,.01)	.261	-.00 (-.01,.01)	.734	.00 (-.00,.01)	.788	-.00 (-.01,.01)	.836	.00 (-.00,.01)	.378	-.00 (-.01,.00)	.389	-.00 (-.01,.00)	.399
Female	-.00 (-.11,.11)	.995	-.04 (-.23,.14)	.622	-.01 (-.16,.15)	.959	-.05 (-.26,.16)	.638	.12 (-.12,.35)	.323	.02 (-.05,.12)	.866	-.02 (-.19,.15)	.839
Education														
Less than High School	.13 (-.04,.31)	.130	.04 (-.31,.40)	.799	.22 (-.10,.54)	.179	.14 (-.24,.52)	.452	.05 (-.34,.44)	.785	.20 (-.04,.46)	.115	.28 (.04,.52)	.023
High School Graduate	.08 (-.06,.22)	.275	.08 (-.14,.31)	.469	.10 (-.15,.35)	.413	-.02 (-.28,.25)	.895	-.15 (-.47,.17)	.348	.12 (-.09,.33)	.246	.10 (-.08,.28)	.273
Some College	-.03 (-.17,..10)	.612	-.02 (-.27,.24)	.899	-.13 (-.40,.14)	.331	-.03 (-.32,.25)	.810	-.02 (-.32,.27)	.877	-.09 (-.36,.18)	.513	.06 (-.20,.31)	.661
College Graduate	ref		ref		Ref		ref		ref		ref		ref	
Annual Income														
<$20K	-.12 (-.27,.02)	.100	-.15 (-.40,.10)	.227	.22 (-.02,.46)	.072	.12 (-.21,.45)	.455	-.07 (-.44,.30)	.709	-.02 (-.29,.25)	.881	.00 (-.24,.25)	.972
$20K to <$50K	-.01 (-.13,.11)	.852	.15 (-.13,.41)	.270	.22 (-.03,.48)	.082	.21 (-.07,.50)	.142	.13 (-.20,.46)	.428	.20 (-.03,.43)	.093	.07 (-.13,.28)	.480
$50K to <$75K	-.04 (-.18,.10)	.567	.11 (-.19,.40)	.474	.14 (-.13,.40)	.300	.04 (-.25,.33)	.771	-.04 (-.35,.27)	.806	.13 (-.16,.43)	.370	.04 (-.24,.31)	.794
$75K or more	ref		ref		ref		ref		ref		ref		ref	
Race/Ethnicity														
Non-Hispanic White	ref		ref		ref		ref		ref		ref		ref	
Non-Hispanic Black	.01 (-.17,.19)	.888	.27 (.02,.51)	.034	.28 (.08,.49)	.007	.33 (.06,.59)	.017	.59 (.23,.95)	.002	.01 (-.19,.20)	.926	.21 (.02,.39)	.028
Hispanic	-.09 (-.28,.10)	.357	.03 (-.20,.27)	.773	.18 (-.13,.49)	.255	.08 (-.22,.39)	.595	.26 (-.07,.59)	.125	-.05 (-.31,.21)	.693	-.00 (-.33,.33)	.987
Non-Hispanic Other	-.22 (-.68,.24)	.344	-.33 (-.68,.03)	.068	-.06 (-.56,.44)	.807	-.09 (-.65,.47)	.747	.02 (-.36,.39)	.931	-.17 (-.64,.29)	.465	-.10 (-.58,.39)	.696
Cohabitation with Tobacco User	-.02 (-.13,.10)	.776	.16 (-.06,.37)	.153	.14 (-.10,.37)	.243	.07 (-.24,.28)	.493	.09 (-.15,.34)	.438	.01 (-.19,.21)	.911	.12 (-.06,.30)	.175
Tobacco Chemical Info Seeking	-	-	-	-	.35 (.13,.56)	.002	-	-	.26 (.05,.48)	.017	-	-	-	-
Thought About Chemicals Tobacco	.27 (.10,.44)	.003	.25 (.07,.42)	.006	-	-	.26 (.03,.48)	.025	-	-	.24 (.05,.43)	.013	.33 (.15,.51)	<.001

Note. We excluded non-significant predictors (indicated by empty table cells) in the final regression model.