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## Harm Perceptions of Alternative Tobacco Products among US Adolescents

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### Abstract

**Objectives:** In this study, we identified groups of adolescents who share similar awareness and perceptions of harm regarding e-cigarettes, cigars, hookah, and smokeless tobacco.

**Methods:** We used latent class analyses (LCA) with the data from Wave 1 (2013–14) of the Population Assessment of Tobacco and Health youth and parent survey (PATH; N = 13,650) to address the research goal. Multinomial logistic regression analysis assessed the associations between identified classes with demographic characteristics and tobacco use.

**Results:** LCA identified 5 classes: (1) perceived harm across all alternative tobacco products (36.6%); (2) perceived harm for e-cigarettes and smokeless tobacco but never heard of cigars and

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Conflict of Interest Statement

None to report.

hookah (48.2%); (3) never heard of alternative tobacco products (8.6%); (4) mix of no harm and harm across alternative tobacco products (5.2%); and (5) “don’t know” the harm across alternative tobacco products (1.4%). Relative to the class who perceived harm across all alternative tobacco products, classes of adolescents who were unaware of the products or did not know the harms were more likely to be non-white, younger, have lower parental education, and less likely to have tried an alternative tobacco product.

**Conclusions:** Tobacco prevention should target vulnerable youth, such as adolescents who are non-white, young, and have low parental education.

### Keywords

latent class analysis; tobacco; harm perceptions; adolescents

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Preventing adolescent tobacco use is critical to decreasing the overall tobacco epidemic and tobacco-related morbidity and mortality, as the majority of tobacco use starts in adolescence.<sup>1</sup> A challenge to adolescent tobacco prevention efforts is the rapid growth in use of tobacco products other than cigarettes (ie, alternative tobacco products). Data from the 2016 National Youth Tobacco Survey found that e-cigarettes were the most commonly used tobacco product among high school students in the past 30 days (11.3%), followed by cigarettes (8.0%), cigars (7.7%), smokeless tobacco (5.8%), and hookah (4.8%).<sup>2</sup> Epidemiological evidence also indicates that poly-tobacco use among adolescents is common: 43% of adolescents in the United States (US) who used tobacco in the past 30 days reported poly-tobacco use.<sup>3</sup> Understanding adolescents’ awareness of a wide range of tobacco products and harm perceptions of these tobacco products can inform tobacco prevention efforts.

Various behavioral theories<sup>4-6</sup> suggest that harm perceptions and substance use, including tobacco use are related. Notably, the Theory of Planned Behavior posits that cognitions, such as attitudes, normative beliefs, and perceived behavioral control influence an individual’s behaviors.<sup>4</sup> Indeed, adolescents who perceive fewer risks from conventional cigarettes are more likely to smoke cigarettes than adolescents who perceive greater risks.<sup>7-11</sup> Much of the existing research on harm perceptions has focused on cigarettes. The growing popularity of alternative tobacco products among adolescents makes the task of understanding tobacco harm perceptions more difficult because each tobacco product has unique risks associated with its use; therefore, the perceptions of harm may differ across these products.

Studies have begun to examine harm perceptions of alternative tobacco products. For instance, Barrington-Trimis et al<sup>12</sup> found that adolescents who perceived that e-cigarettes were not harmful were 23.5 times as likely to report past 30-day use of e-cigarettes as those who perceived that e-cigarettes were harmful. Roditis et al<sup>13</sup> observed that adolescents rated cigarettes as the riskiest, followed by cigars and smokeless tobacco, and viewed hookah and e-cigarettes as least risky. The perceptions of low harm of e-cigarettes may be related to increased use of e-cigarettes among adolescents.

The majority of the literature about harm perceptions on alternative tobacco products examined comparative perceptions to cigarettes, which showed that adolescents perceived greater harm associated with cigarettes relative to e-cigarettes,<sup>14-17</sup> smokeless tobacco,<sup>18,19</sup>

hookah,<sup>20</sup> and cigarillos.<sup>21</sup> There is also evidence that absolute harm measures (ie, assessing harm for each product) rather than relative harm measures (ie, comparative perceptions to cigarettes) produce higher estimates of harm.<sup>22</sup> Furthermore, poly-tobacco users have lower tobacco harm perceptions relative to single-tobacco users.<sup>23,24</sup> Given the high rate of poly-tobacco use, growing popularity and reduced harm perceptions regarding alternative tobacco products among adolescents, there is a need to examine perceived absolute harm across various tobacco products to inform the development of effective youth-based tobacco prevention campaigns. National prevention/education campaigns that target the adolescent population as a whole must take into account whether this population is aware of alternative tobacco products and whether they perceive harm across these products. Furthermore, information on adolescent awareness and harm perceptions of alternative tobacco products could provide guidance to healthcare providers who work with adolescents on an individual basis in developing preventive screening to assess tobacco awareness, perceptions of harm, and use behaviors.

Latent class analysis (LCA) can be used to identify classes of adolescents who share similar perceptions of harm regarding a variety of tobacco products. LCA has been used to identify groups of adolescents who share similar tobacco use patterns.<sup>25–29</sup> However, we know of only one study that has used LCA to examine harm perceptions.<sup>14</sup> Ambrose et al<sup>14</sup> conducted LCA on harm perceptions of cigarettes (general cigarette harm perceptions: eg, “How much do you think people harm themselves when they smoke a few cigarettes every day?”) and e-cigarettes (harm perception of e-cigarettes relative to cigarettes: eg, “Do you believe that electronic cigarettes or e-cigarettes, such as Ruyan or NJOY, are [less harmful, equally harmful, or more harmful] than regular cigarettes?”) using a nationally representative sample of US adolescents. They identified 3 latent classes: 64% of adolescents perceived that the harm of cigarettes was dose-dependent (ie, harm perceptions were higher if cigarettes were used more frequently and in greater amount), 33.4% perceived high harm for both tobacco products, and 2.4% perceived low harm for both.

Our objective in this study was to expand upon existing research by using LCA to identify groups of adolescents who group together in their awareness of and harm perceptions across various alternative tobacco products using the youth (ages 12–17 years) dataset from the first wave of the Population Assessment of Tobacco and Health (PATH) Study. Furthermore, we aimed to examine how demographic and tobacco use were associated with classes of adolescents who share similar awareness of alternative tobacco products and harm perceptions.

## METHODS

Data were drawn from Wave 1 of the PATH Study, a nationally-representative, longitudinal cohort study of 45,971 adults and youth (12–17 years old) in the US. This analysis used data from 13,651 youth interviews. Wave 1 data collection was conducted from September 12, 2013 to December 15, 2014. The design and methods of the PATH Study were described in detail elsewhere.<sup>30</sup> Details regarding the PATH Study design and methods are also available on the PATH Study’s website ([www.pathstudyinfo.nih.gov](http://www.pathstudyinfo.nih.gov)).

## Measures

**Alternative tobacco awareness and harm perceptions.**—Alternative tobacco awareness and harm perception variables for each tobacco product (e-cigarettes, hookah, smokeless tobacco, and cigars [filtered cigars, cigarillos, traditional cigars]) was coded as “never seen/heard of it,” “don’t know harm,” “no harm,” and “any harm” based on a 2-step interview questioning. The interviewer showed an image of each tobacco product and asked each adolescent whether they have seen or heard about that product. Adolescents who had not seen or heard about a tobacco product were coded as “never seen/heard of [tobacco product name].” Those who had heard of the tobacco product were also asked a harm perception question about that tobacco product: “How much do you think people harm themselves when they smoke or use [tobacco product name]?” All adolescents were asked a harm perception question regarding cigarettes. Responses were “don’t know,” “no harm,” “little harm,” “some harm,” and “a lot of harm.” For the purposes of this analysis, “little harm,” “some harm,” and “a lot of harm” were collapsed into one category (“any harm”) because of small sample sizes when different levels of harm were being considered in the LCA.

**Demographic variables.**—Demographic variables included age (12–14 years old, 15–17 years old), sex (boys, girls), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other), and parental education (up to high school, high school degree, college degree, beyond college degree [reported by parents]). Parental education is a commonly used proxy for socioeconomic status (SES) for adolescents.<sup>31</sup>

**Tobacco use status.**—Use of each tobacco product (ie, cigarettes, e-cigarettes, cigars, hookah, smokeless tobacco) was coded as “never” if an adolescent reported never had heard or seen the product before or had heard or seen the tobacco product before but never had tried it, and was coded “ever” if they had tried it (eg, “have you ever smoked tobacco in a hookah, even 1 or 2 puffs?”). We also created an “any tobacco product use” variable if an adolescent reported ever trying any of the tobacco products.

## Data Analysis

Table 1 contains the weighted percentages for all demographic, tobacco use, and alternative tobacco harm perception variables. The weighted percentages were created using replicate weights using the balanced repeated replication (BRR) method. LCA was conducted using Mplus 8<sup>32</sup> to identify groups of adolescents who grouped together in their awareness of alternative tobacco products and harm perceptions across tobacco products. Specifically, LCA included tobacco awareness and harm perception variable (“never seen/heard of it,” “don’t know harm,” “no harm,” and “any harm”) for each alternative tobacco product (ie, e-cigarettes, smokeless tobacco, cigars, hookah). We did not include harm perceptions of cigarettes in our examination due to limited variability in responses; 99% of adolescents perceived harm related to cigarettes. For LCA, we used the COMPLEX command in Mplus to adjust estimates and standard errors to account for the complex survey design, and, as such, we were able to incorporate the PATH Survey sampling weights and design variables.

A series of LCA models were calculated with increasing number of latent classes starting from 1-class. The optimal number of latent classes is determined typically by considering the solution that has a lower Bayesian Information Criteria (BIC), a lower sample size-adjusted BIC (calculated using the formula:  $-2LL + m * \ln((n+2)/24)$ ),<sup>33</sup> a lower Akaike Information Criterion (AIC) value, a higher entropy value, and a significant Lo-Mendell-Rubin test (LMR), relative to the prior solution. Selection of the optimal solution is also influenced by theory, parsimony interpretability, and average latent class probabilities of the solutions.<sup>34</sup> In addition to these fit indices, class membership is based on the highest class assignment probability derived from the LCA.

Once the optimal number of classes was identified, we conducted a multinomial regression analysis using the R3STEP command in MPlus<sup>35</sup> to assess associations between the observed latent classes and demographics and tobacco product use variables. We examined “any tobacco product use” in the multinomial models because of small sample sizes of smokeless tobacco, hookah, and cigar use (Table 1). We used Class 1 (perceived harm across all alternative tobacco products) as a reference group in the models because previous literature showed that those who perceived harm for a tobacco product were at lower risk for using that tobacco use.<sup>12,13</sup> Missingness across variables was minor (ranged from 0.02% to 0.7%). Mplus accounts for the missingness by estimating the model using full information maximum likelihood.

## RESULTS

Table 1 contains detailed information on demographic and tobacco use variables for the total sample.

### Prevalence of Alternative Tobacco Product Awareness and Harm Perceptions

The tobacco products that the most adolescents have “never heard of” were cigars (43.7%), followed by hookah (38.5%), smokeless tobacco (24.2%), and e-cigarettes (10.6%). Among alternative tobacco products, the endorsement of any harmfulness was the highest for e-cigarettes (80.1%), followed by smokeless tobacco (73.8%), hookah (57.0%), and cigars (56.7%). Endorsement of “no harm” was highest for e-cigarettes (7.0%), followed by cigars (5.4%), hookah (3.0%), and smokeless tobacco (0.8%). Few adolescents said that they “don’t know” the harmfulness of tobacco products (ranged from 0.2% to 2.3%).

### Latent Class Analysis

The LCA modeling awareness of alternative tobacco products and harm perceptions revealed that a 5-class model fit the data best. Fit indices of the latent class models are listed in Table 2. The 5-class model had the lowest BIC value, one of the most reliable information criteria<sup>34</sup> and the Lo-MendelRubin test for significance<sup>34</sup> revealed that a 5-class model was the best fitting model.

Table 3 shows the conditional probabilities of harm perceptions for each alternative tobacco product across all 5 latent classes. Class 1 (36.6%) comprised adolescents who were aware of and perceived harm across all alternative tobacco products. Class 2 (48.2%) comprised adolescents who perceived harm for e-cigarettes and smokeless tobacco but had not heard of

cigars or hookah. Class 3 (8.6%) comprised adolescents who had never heard of any tobacco products. Class 4 (5.2%) comprised adolescents who had a mix of no harm and any harm across all alternative tobacco products. Finally, Class 5 (1.4%) comprised adolescents who “didn’t know” the harm across all alternative tobacco products.

### Multinomial Logistic Regression

Table 4 presents the results of the multinomial logistic regression analysis that examined the associations between latent classes and study variables. Multinomial regression analysis showed that relative to Class 1, (1) all 4 classes were younger; (2) Class 5 (“don’t know” harm) was more likely to be comprised of male adolescents; (3) adolescents in Class 3 (never heard of any tobacco products), Class 4 (mix of no harm/any harm), and Class 5 (“don’t know” harm) were more likely to be nonwhite; (4) Class 2 (perceives harm for e-cigarettes/ smokeless tobacco and never heard of cigars/hookah), Class 3 (never heard of any tobacco products), and Class 4 (mix of no harm/any harm) were less likely to include adolescents whose parents had advanced education; and (5) Class 2 (perceived harm for e-cigarettes/smokeless tobacco and never heard of cigars/hookah), Class 3 (never heard of any tobacco products), and Class 5 (“don’t know” harm) were less likely to include adolescents who have used a tobacco product, and those adolescents in Class 4 (mix of no harm/any harm) were more likely to have used a tobacco product.

## DISCUSSION

LCA identified groups or classes of adolescents who shared similar patterns of awareness of and harm perceptions toward a variety of alternative tobacco products (ie, cigarettes, e-cigarettes, cigars, hookah, smokeless tobacco) using a nationally representative dataset of US adolescents. Results showed that awareness of alternative tobacco products varied; adolescents were most unaware of hookah, followed by cigars, smokeless tobacco, and e-cigarettes. Endorsement of any perceived harmfulness was the highest for e-cigarettes, followed by smokeless tobacco, hookah, and cigars. LCA results showed that the largest class included high probabilities of perceiving harm for e-cigarettes and smokeless tobacco but never heard of cigars or hookah, and the second largest class included high probabilities for perceiving harm across all alternative tobacco products. The remaining 3 latent classes included a mix of adolescents who had never heard of alternative tobacco products and who were aware of alternative tobacco products but did not know harms associated with them. Adolescents in these 3 classes were more likely to be younger and less likely to have ever tried a tobacco product, relative to adolescents in the class who perceived harm across all alternative tobacco products. We also observed sex differences: adolescents in the “don’t know harm class” (Class 5) were less likely to be females.

We also observed that adolescents in classes who had generally not heard of alternative tobacco products and who did not perceive harm were more likely to have parents with low education (a proxy for low SES)<sup>31</sup> and to be non-white. These findings suggest that adolescents from disadvantaged backgrounds may need targeted tobacco prevention/ education efforts to inform them about the different harms of the products that are currently available. These adolescents may be at an elevated risk for tobacco use. Existing literature

on vulnerable youth shows that low SES in this population is associated with poly-tobacco, e-cigarette, and cigarette use.<sup>26</sup> Research also has shown that advertising and sales of certain tobacco products, like cigars, are being targeted toward low SES and racial minority communities.<sup>36</sup> However, it appears that other types of tobacco products, such as hookah, may be more popular among higher SES than lower SES adolescents.<sup>37</sup> Although the research is limited, the evidence to date on the associations among SES, race/ ethnicity, and various tobacco product use shows that these associations vary across tobacco products and across sub-populations of adolescents. Future studies should continue to monitor how various alternative tobacco product use behaviors emerge, as well as factors associated with emergent use behaviors across adolescent populations to develop tailored and targeted prevention interventions, particularly focusing on disadvantaged youth.

Our findings are consistent with the existing literature showing that low tobacco harm perception is associated with greater likelihood of using that product.<sup>12,13</sup> For instance, relative to the class that perceived harm across all alternative tobacco products, the mix class of no harm/any harm was associated with greater odds of ever tobacco use. Additionally, the novel contribution to the literature, which is also a strength of this paper, is the examination of absolute harm across all alternative tobacco products rather than relative harm (compared to cigarettes) for select alternative tobacco products using a nationally-representative sample of US adolescents. In our LCA, we included whether adolescents had heard of each alternative tobacco product and whether they did not know the harms associated with these products, thus utilizing the entire adolescent sample. Other studies have excluded participants who were unaware of the tobacco products or did not know harm perceptions associated with the tobacco products, resulting in removal of about half of the sample.<sup>14,15</sup> By including all adolescents in our examination, we were able to make a better characterization of adolescents' awareness of various alternative tobacco products and harms associated with them. For instance, we observed that only 36.6% of US adolescents perceived harm across all alternative tobacco products, suggesting that better education/prevention efforts are needed to inform all youth about tobacco harm.

Several limitations should be taken into account when interpreting the study findings. Although we have used well-known fit indices to determine class membership (ie, AIC, BIC, LMR test), these indices are not without bias and sometimes do not agree on the number of classes. It is important to take into account theoretical considerations when interpreting the latent class solutions. Although we were able to examine the associations between observed classes and ever use of tobacco products, we could not assess the associations between classes and frequency and intensity of use of each tobacco product, poly-tobacco use, or flavored tobacco use due to a small number of current tobacco users. In addition, although we attempted to examine harm perceptions as a continuum, due to low cell counts we ultimately assessed harm perceptions as categorical variables. Harm perceptions exist on a continuum, however, and varying levels of harm perceptions are differentially associated with frequency and intensity of tobacco use.<sup>14</sup>

Future studies should examine unique and shared benefits and risks of each tobacco product. Harm perceptions are also nuanced. Perceptions that take into account both short- and long-term benefits and risks are important in developing a better understanding of adolescent

tobacco use behaviors.<sup>13,38</sup> Finally, we acknowledge that the data were collected in 2013–14, and that harm perceptions may have changed. Future studies should examine how awareness of alternative tobacco products and perceptions associated with these tobacco products evolve over time and consider other complexities of tobacco harm perceptions. It is likely that as adolescent tobacco use patterns evolve over time and by region, awareness and harm perceptions also may evolve.

## IMPLICATIONS FOR TOBACCO REGULATIONS

This study revealed that among US adolescents, harm perceptions across alternative tobacco products varied and considerable number of adolescents were unaware of alternative tobacco products. This information will be particularly helpful for the US Food and Drug Administration (FDA) when they develop public health campaigns that inform adolescents of the harm of a wide range of tobacco products.<sup>39</sup> National tobacco prevention/education campaigns that target the adolescent population as a whole must consider how best to reach adolescents who are unaware of alternative tobacco products and the harms associated with use. These campaigns should first inform youth about the shared and unique harms of a variety of tobacco products, particularly the lesser known products such as hookah, as well as poly-tobacco use. Similar to the anti-tobacco media campaigns developed by the FDA targeting high-risk groups such as smoking among “hip hop” youth<sup>40</sup> and smokeless tobacco use among rural white youth,<sup>41</sup> additional campaigns should target vulnerable subpopulations such as young, low SES, and non-white adolescents on the harms of alternative tobacco products.

### Human Subjects Approval Statement

The Westat Institutional Review Board (IRB) approved the PATH Study design and the U.S. Office of Management and Budget approved data collection. Yale School of Medicine’s IRB approved the conduct of a secondary data analysis of the deidentified, public-use data files available from the National Addiction & HIV Data Archive Program (NAHDAP) (<http://goo.gl/sABEjv>).

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**Table 1**

Sample Characteristics Such as Demographic and Alternative Tobacco Use, Awareness, and Perceived Harm Variables (N = 13,650)

	Unweighted N	% <sup>a</sup> (95% Confidence Interval of Weighted Percentage)
<i>Awareness/Perceived Harmfulness<sup>b</sup></i>		
<i>E-Cigarettes</i>		
Never seen/heard of it	1473	10.6 (9.9–11.4)
“Don’t know”	312	2.3 (2.0–2.6)
No harm	984	7.0 (6.5–7.5)
Any harm	10,872	80.1 (79.3–80.8)
<i>Cigars</i>		
Never seen/heard of it	5995	43.7 (42.8–44.6)
“Don’t know”	110	0.8 (0.6–1.0)
No harm	62	0.5 (0.3–0.6)
Any harm	7479	55.0 (54.1–55.9)
<i>Hookah</i>		
Never seen/heard of it	5289	38.5 (37.1–40.0)
“Don’t know”	201	1.5 (1.3–1.8)
No harm	402	3.0 (2.6–3.4)
Any harm	7752	56.9 (55.6–58.3)
<i>Smokeless Tobacco</i>		
Never seen/heard of it	352	24.2 (23.3–25.2)
“Don’t know”	153	1.2 (1.0–1.3)
No harm	115	0.8 (0.6–1.0)
Any harm	9848	73.8 (72.8–74.8)
<i>Demographic Variables</i>		
<i>Sex</i>		
Boys	6993	51.3 (51.3–51.3)
Girls	6657	48.7 (48.7–48.7)
<i>Race</i>		
Non-Hispanic White	6614	54.5 (54.5–54.6)
Non-Hispanic Black	1859	13.9 (13.9–13.9)

	Unweighted N	% <sup>a</sup> (95% Confidence Interval of Weighted Percentage)
Hispanic	3920	22.3 (22.3–22.3)
Other	1257	9.3 (9.3–9.3)
<b>Age</b>		
12–14 years old	6997	50.4 (50.4–50.4)
15–17 years old	6653	49.6 (49.6–49.6)
<b>Parent Education</b>		
Up to high school	2834	18.0 (16.8–19.3)
High school degree	6925	50.3 (48.5–52.1)
College degree	2467	20.3 (18.9–21.6)
Beyond college degree	1325	11.4 (10.2–12.6)
<b>Any Tobacco Use<sup>b</sup></b>		
Never	10,643	78.8 (77.8–79.8)
Ever	2872	21.2 (20.2–22.2)

Note.

<sup>a</sup>: All percentages are weighted using the balanced repeated replication (BRR) method. Percentages may not sum to 100 due to rounding.

<sup>b</sup>: Participants were first asked whether or not they had seen or heard of each tobacco product. Only those who have heard of the product were asked about harm perceptions and use.

Fit Indices of Latent Class Analysis of Harm Perceptions for Tobacco Products ( $N_u = 650$ )

Table 2

# of classes	Log-likelihood	AIC	BIC	Adjusted BIC	Entropy	LMR test
1	-42485.08	84994.16	85084.42	85046.28		
2	-40361.30	80772.59	80960.63	80881.18	0.69	$p < .001$
3	-39744.24	79564.49	79850.30	79729.54	0.74	$p < .001$
4	-39448.40	78998.79	79382.39	79220.31	0.75	$p < .001$
5	<b>-39336.41</b>	<b>78800.81</b>	<b>79282.19</b>	<b>79078.80</b>	<b>0.61</b>	<b><math>p = .040</math></b>
6	-39311.14	78776.27	79355.43	79110.73	0.62	$p = .378$

Note. Text in bold indicates the optimal class solution chosen based on the lowest BIC value, a significant LMR test, as well as empirical and theoretical considerations.

AIC: Akaike Information Criterion

BIC: Bayesian Information Criterion

LMR: Lo-Mendell-Rubin

**Table 3**

Conditional Probability of Class Membership for Alternative Tobacco Awareness and Harm Perception Classes (N<sub>U</sub> = 13,650)

	Class 1 Perceives harm across all alternative tobacco products (36.6%, N = 4992)	Class 2 Perceives harm for e-cigarettes /smoke-less tobacco but never heard of cigars/hookah (48.2%, N = 6581)	Class 3 Never heard of any alternative tobacco products (8.6%, N = 1170)	Class 4 Mix of no harm/any harm (5.2%, N = 710)	Class 5 “Don’t know harm” (1.4%, N = 197)
<b>E-Cigarettes</b>					
Never heard of product	0.02	0.07	0.65	0.01	0.03
“Don’t know”	0.01	0.02	0.02	0.00	0.56
No harm	0.05	0.03	0.06	0.44	0.03
Any harm	0.92	0.89	0.27	0.55	0.37
<b>Cigars</b>					
Never heard of product	0.09	0.53	0.86	0.16	0.46
“Don’t know”	0.00	0.00	0.00	0.13	0.34
No harm	0.08	0.00	0.01	0.31	0.03
Any harm	0.84	0.46	0.13	0.41	0.18
<b>Hookah</b>					
Never heard of product	0.16	0.51	0.88	0.23	0.29
“Don’t know”	0.01	0.00	0.01	0.00	0.54
No harm	0.01	0.01	0.01	0.32	0.01
Any harm	0.82	0.48	0.10	0.46	0.16
<b>Smokeless Tobacco</b>					
Never heard of product	0.06	0.26	0.82	0.29	0.21
“Don’t know”	0.00	0.00	0.01	0.00	0.44
No harm	0.00	0.00	0.00	0.11	0.01
Any harm	0.94	0.73	0.17	0.60	0.34

Note. “Any harm” category included “little harm,” “some harm,” and “a lot of harm.”

**Table 4**

Odds Ratios and Confidence Intervals from Multinomial Regression Analysis Examining the Association Between Latent Classes and Demographics and Tobacco Use

	Class 2 <sup>d</sup> Perceives harm for e-cigarettes/ smokeless tobacco but never heard of cigars/ hookah 48.2%, nu = 6581			Class 3 <sup>d</sup> Never heard of any alternative tobacco products (8.6%, nu = 1170)			Class 4a Mix of no harm/ any harm (5.2%, nu = 710)			Class 5a Don't know harm (1.4%, nu = 197)		
	AOR	95%	CI	AOR	95%	CI	AOR	95%	CI	AOR	95%	CI
<b>Sex</b>												
Girls	0.91	0.75	1.12	0.92	0.76	1.11	1.02	0.82	1.26	0.67*	0.47	0.96
Boys (ref.)												
<b>Race/Ethnicity</b>												
African-American	0.88	0.64	1.21	2.78*	1.99	3.89	4.82*	3.34	6.95	1.85*	1.10	3.10
Hispanic	1.16	0.89	1.51	3.05*	2.24	4.14	2.09*	1.51	2.88	1.20	0.74	1.93
Other	1.37	0.96	1.95	3.11*	2.07	4.68	1.33	0.80	2.22	1.75*	1.02	2.98
White (ref.)												
<b>Age</b>												
15–17 years old	0.20*	0.16	0.24	0.15*	0.12	0.19	0.51*	0.39	0.65	0.46*	0.32	0.66
12–14 years old (ref.)												
<b>Parent Education</b>												
Beyond college degree	0.66	0.43	1.01	0.39*	0.25	0.59	0.38*	0.20	0.70	1.03	0.47	2.26
College degree	0.69*	0.49	0.98	0.38*	0.28	0.52	0.72	0.46	1.14	0.95	0.53	1.70
High school degree	0.64*	0.49	0.85	0.39*	0.31	0.49	0.75	0.55	1.03	0.81	0.51	1.30
Up to high school (ref.)												
<b>Tobacco Use</b>												
Any Product Use	0.13*	0.09	0.18	0.09*	0.05	0.14	2.68*	2.09	3.45	0.31*	0.19	0.52
No Use (ref.)												

\* p < .05

Note.

<sup>d</sup>: Reference class is Class 1 (perceives harm across all alternative tobacco products; 36.6%, nu = 4992).

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AOR = adjusted odds ratio 95%

CI = 95% confidence interval

ref. = reference group

All AORs are adjusted for the variables listed here.

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