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## Flavored Tobacco Product Use among Youth and Young Adults: What if Flavors Didn't Exist?

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### Abstract

**Objective**—We aimed to determine the potential for reductions in the prevalence of young people's e-cigarette and tobacco use if characterizing flavors were not present.

**Methods**—Two parallel cross-sectional surveys of 2483 youth (TATAMS: Texas Adolescent Tobacco and Marketing Surveillance System) and 4326 young adults (M-PACT: Marketing and Promotions across Colleges in Texas) in Texas (Houston, Dallas/Ft. Worth, San Antonio, Austin). Current use of e-cigarettes and other tobacco (cigarettes, cigar products, hookah, smokeless tobacco). Users were asked: “When you use [product], do you usually use any of the following flavors?” Flavored product users were asked: “Would you continue using [product] if it were not flavored?”

**Results**—Over 80% of youth and young adult tobacco users reported using flavored tobacco. Three-fourths of flavored product users said they would no longer use the product if it was not

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#### Human Subjects Statement

The Institutional Review Board at University of Texas' Health Science Center, Houston approved all protocols specific to TATAMS (HSC-SPH-13-0377). The University of Texas at Austin's Institutional Review Board approved all protocols for M-PACT (2013-06-0034).

#### Conflict of Interest Statement

These authors have no conflicts of interest to disclose.

flavored. This was highest for e-cigarettes and hookah and lowest for cigarettes. Few demographic differences in findings were observed.

**Conclusions**—Restricting flavors in tobacco products would not eradicate e-cigarette or other tobacco use among young people, but the potential for substantial reductions in the prevalence of young people’s e-cigarette and other tobacco use seems high if flavors were removed.

### Keywords

youth; young adults; tobacco product flavors; tobacco use reduction

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Flavored tobacco products, including menthol cigarettes, candy flavored e-cigarettes, and other flavored products like grape cigars, are widely available. For example, there are more than 7500 characterizing flavors available on the market for e-cigarettes, alone.<sup>1–3</sup> With the exception of some e-cigarettes that are nicotine-free, all of these products contain nicotine and so are of particular concern to the well-being of young people, because nicotine is addictive.<sup>4,5</sup> Characterizing flavors also present their own unique health risks.<sup>6,7</sup>

There is concern that characterizing flavors may be contributing to observed increases in some types of tobacco product use among young people.<sup>2,3</sup> All characterizing flavors except menthol were banned from conventional cigarettes in 2009 to reduce youth smoking, as flavored cigarettes were particularly attractive to young smokers and often used as a starter product.<sup>8</sup> Data from the National Youth Tobacco Survey (NYTS)<sup>9</sup> as well as the Population Assessment of Tobacco and Health (PATH)<sup>10</sup> suggest flavored tobacco products remain appealing to young people. The prevalence of flavored tobacco use among youth varied between 60% and 85% in these national studies from 2014.<sup>7,8</sup>

Removing or restricting characterizing flavors in these products may be helpful to prevent the onset and decrease tobacco use among young people, as use of these products often begins in adolescence or young adulthood.<sup>1</sup> However, it remains unknown whether removing characterizing flavors from these products would lead to reductions in the prevalence of their use. Therefore, we sought to determine the potential for reductions in the prevalence of young people’s tobacco use if characterizing flavors were not present. We examined preferences for flavored e-cigarette and other tobacco products (cigarettes, cigar products, hookah, smokeless tobacco) in 2 large, representative samples of youth and young adults residing in major metropolitan areas of Texas. Importantly, we asked users if they would continue their tobacco use if characterizing flavors were not present.

## METHODS

Data are derived from 2, cross-sectional parallel studies of youth (12–17 years old) and young adults (18–29 years old) living in the 5 counties surrounding the 4 largest metropolitan areas in Texas (Houston, Dallas/Fort Worth, San Antonio, Austin). The Texas Adolescent Tobacco and Marketing Surveillance System (TATAMS) surveyed 6<sup>th</sup>, 8<sup>th</sup>, and 10<sup>th</sup> grade students (n = 2483; weighted N = 461,069; 61% response rate; 49% female and 54.5% Hispanic, 18.2% non-Hispanic white, 17.6% non-Hispanic black) enrolled in 79 participating schools. The Marketing and Promotions Across Colleges in Texas project (M-

PACT) surveyed students in 2-year and 4-year colleges (N = 4326; 79% response rate; 63.4% female and 36.3% non-Hispanic white, 31.1% Hispanic, 8.1% non-Hispanic black, 16.9% Asian). More details about the study designs employed in each study, including eligibility criteria, are presented elsewhere.<sup>11,12</sup> Active, informed consent was obtained from both parents and students in TATAMS and from young adults in M-PACT.

Students were asked about their past 30-day use of tobacco products, including cigarettes, e-cigarettes, cigars (little filtered cigars, cigarillos, large cigars), hookah, and smokeless tobacco. Each item was asked separately and pictures, product descriptions, and exemplar brands were included with each measure.<sup>13</sup> For each product they reported using, students were asked if the product was typically flavored (eg, “When you use [tobacco product], do you usually use any of the following flavors?”). Flavor options varied by product and could include menthol/mint, candy, fruit, coffee, alcohol, spice, or other. Then, if students reported the use of a flavored product, they were asked if they would still use the product if it were not flavored (eg, “Would you continue using [tobacco product] if it were not flavored?”).

All responses were dichotomized in analyses so that any flavor for a product was coded as “flavored product use” vs “unflavored product use.” For “any product use,” responses were coded yes if any flavored product use was endorsed across all of the products considered. Prevalence estimates and 95% confidence intervals were calculated for all measures. Estimates from denominators of less than 20 users are suppressed; this only affected youth smokeless tobacco use. All TATAMS analyses were weighted to account for the complex survey design, so as to generalize back to the population from which the sample was drawn. M-PACT analyses were not weighted, as this was not necessary, given the study’s design.<sup>11</sup> Missing data did not exceed 5% for any variable. Two-sided chi-square tests were used to test for differences between subgroups (sex and school/age level), such that differences were statistically significant if the p-value was < .05. Non-overlapping confidence intervals provided evidence for significant differences between tobacco products.

## RESULTS

Among those who had used any tobacco product in the past 30 days, flavored tobacco use was high for both youth (89%) and young adults (83%). This finding was reasonably robust across tobacco products and subgroups (Table 1). The use of flavored e-cigarettes and hookah was most common (> 90% of past 30-day users), whereas the use of menthol cigarettes was least prevalent and significantly lower than any other product (eg, 41% of past 30-day young adult users). No differences in flavored product use by sex or school level were observed for youth (all  $p > .05$ ). Among young adults, the use of menthol cigarettes and flavored cigar products was significantly more prevalent among females compared to males ( $p < .05$  both), while the use of any tobacco product was significantly higher for 18–24 year-olds compared to 25–29 year-olds ( $p < .01$ ).

The majority of past 30-day e-cigarette and tobacco product users reported they would *not* use the product if it were not flavored, including 84% of youth and 76% of young adult past 30-day users of any flavored product (Table 1). More than 3 out of every 4 youth- (78%) and young adult- (74%) flavored e-cigarette users said that they would *not* use an e-cigarette if it

was not available in a flavored form (eg, candy, fruit, mint/menthol, etc.). For youth, no statistically significant differences in preferences for flavored product use were observed by sex or school level. Significantly more young adult females than males reported that they would *not* use the product if it were not flavored, for e-cigarettes (77% vs 69%,  $p = .03$ ), cigar products (65% vs 48%,  $p = .02$ ), and smokeless tobacco (87% vs 53%,  $p = .03$ ), and any tobacco use (87% vs 53%,  $p = .03$ ). However, no differences in their preferences for flavored product use by age were noted for young adults (all  $p > .05$ ).

## DISCUSSION

Our results add to the body of literature showing flavored tobacco product use is high appeals to both youth<sup>9,10,14–16</sup> and young adults.<sup>16,17</sup> More than 4 out of every 5 past 30-day e-cigarette or tobacco users in our studies from Texas reported using a flavored product. This finding was consistent by sex and school level for youth, and only a few differences were noted for young adults, with females and 18–24 year-old current users reporting more flavored product use than males and 25–29 year-olds. These findings differ from those for older adults (> 30 years old), for whom flavored tobacco product use is lower.<sup>16</sup> Although youth often start their tobacco use with flavored products,<sup>10</sup> this study reinforces that use of flavored tobacco products among current users after initiation and experimentation is also high.

Our study builds upon previous ones by reporting on the potential for reductions in e-cigarette and other tobacco product use, if characterizing flavors were no longer available. The possibilities are apparent in these data. Overall, three-fourths of youth and young adult current users said they would *no longer use* the product if it was *not* flavored. This is not a small minority of users, so the potential for reductions in the prevalence of young people's use seems high if flavors were restricted or removed. Given these results, these reductions would be expected to impact adolescent boys and girls across middle school and high school in Texas about equally. However, restricting or removing flavors may have a larger impact on young adult female than male e-cigarette and other tobacco product use. These findings corroborate the tobacco industry's research that female cigarette preferences are strongly influenced by taste, enjoyment, and aroma,<sup>18</sup> and extend it by indicating that removal of flavors may result in reductions in the prevalence of use.

With the exception of menthol, flavored cigarettes have been banned from the market since 2009.<sup>19</sup> Presently, it is estimated that there are more than 7500 types of e-cigarette flavors available on the market.<sup>20</sup> Notably, the use of other flavored tobacco products, like e-cigarettes, was much higher in this study, compared to use of menthol cigarettes. For example, 96% of young adult e-cigarette users reported using a flavored e-cigarette, compared to 41% of young adult cigarette smokers who smoked menthol cigarettes. Thus, simply applying the same type of regulation (ie, restricting availability to a single flavor, like menthol) to e-cigarettes and other tobacco products could lead to reductions in their use, though the largest impact would be expected if all characterizing flavors were entirely removed from the manufacturing process of all tobacco products.

Limitations include the study's reliance on school-going participants, who might not generalize to out-of-school youth or young adults, and cross-sectional analyses that do not allow for direct estimation of the role that flavors have in initiation or cessation among young people. Future research should explore the latter more fully. Although these data are based on self-report, behavioral intentions do predict future tobacco use behaviors among both youth and young adults;<sup>23–25</sup> therefore, our findings should prove useful to informing future regulations on the use or sale of flavored tobacco products. Previously published research specific to menthol cigarettes suggests that many menthol smokers, including young adults, support a ban on the use of this characterizing flavor in this product and would try to quit if such a ban were put into place.<sup>26–28</sup>

Our findings may not generalize beyond metropolitan areas of Texas; however, because they are among the top 5 fastest growing metropolitan areas in the United States,<sup>17</sup> they may serve as an indicator, demographically-speaking, for the state of the nation to come. Approximately 10% of the nation's children under the age of 18 years old live in Texas;<sup>29</sup> the state is also home to 8% of the US Hispanic population, with about one in 6 Hispanic youth in the US living in Texas.<sup>30,31</sup> In 2013, Texas ranked first among all states for tobacco company expenditures on marketing at \$636 million.<sup>32</sup> In the same year, the state spent only 2.4% of US Centers for Disease Control and Prevention's recommended spending for tobacco prevention programs, thereby ranking among the lowest nationwide.<sup>33</sup> Thus, our findings are potentially applicable to the future demographics of the US, and provide some insights on a large percentage of the nation's young people.

## IMPLICATIONS FOR TOBACCO REGULATION

Given our findings, restricting or eliminating characterizing flavors in tobacco products during the manufacturing process, which the US Food and Drug Administration (FDA) has the authority to regulate, could substantially reduce the prevalence of tobacco use among youth and young adults for many types of tobacco products. However, the implementation of a policy like this would not completely eradicate tobacco use among young people. Among these young adults in Texas, for example, 27% of e-cigarette users and 56% of cigarette smokers said they would *not* discontinue the product if it were not flavored; among these youth in Texas, 22% and 46.1% of e-cigarette users and cigarette smokers, respectively, said the same. Yet, this approach could be an important element of comprehensive tobacco control by reducing the appeal of tobacco products for a large proportion of young people. Alternatively, the sale of flavored tobacco products, which the FDA also has the authority to regulate, could be restricted to prohibit uptake, like actions taken in New York City and Chicago.<sup>9,21,22</sup>

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MH led the development of the manuscript, which included obtaining funding for the study, conceptualizing the study, and drafting the manuscript. AL and CP also obtained funding for the study and revised the manuscript for important intellectual content. NM and CJ analyzed the data and revised the manuscript for important intellectual content.

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Prevalence of Flavored Product Use among Past 30-day Product Users, Overall and by Sex and Age Group, 2015

Table 1

<i>Percentage Using a Flavored Tobacco Product</i>																	
Youth	Number <sup>a</sup>	Overall			Males			Females			p-value						
		%	95% CI	%	95% CI	%	95% CI	%	95% CI	%		95% CI					
		High school			Middle school			High school			p-value						
		%	95% CI	%	95% CI	%	95% CI	%	95% CI	%		95% CI					
E-Cigarettes	N = 102	92.8	86.4, 99.2	92.0	82.5, 100	93.6	87.8, 99.4	0.70	95.7	86.7, 100	92.1	84.4, 99.7	0.60				
Cigarettes	N = 37	65.4	42.2, 88.6	59.1	24.2, 94.0	73.2	46.1, 100	0.54	73.8	33.2, 100	58.4	36.5, 80.4	0.55				
Cigar Products	N = 37	84.4	72.1, 96.7	85.5	70.0, 100	80.7	55.9, 100	0.76	90.3	69.0, 100	82.0	67.9, 96.0	0.59				
Hookah/Shisha	N = 28	99.2	97.5, 100	100	100, 100	98.2	94.5, 100	0.35	97.2	90.8, 100	100	100, 100	0.25				
Smokeless Tobacco	N = 17	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a				
Any Product Use	N = 143	89.1	83.6, 94.5	89.5	80.7, 98.4	88.5	81.8, 95.3	0.87	87.4	73.7, 100	89.7	84.3, 95.2	0.74				
<b>Young adults</b>																	
		Overall			Males			Females			18–24 years			25–29 years			
		%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
E-Cigarettes	N = 531	96.4	94.5, 97.7	94.9	91.3, 97.1	97.6	95.2, 98.8	0.10	96.9	95.0, 98.1	91.1	79.3, 96.5	0.06				
Cigarettes	N = 749	41.4	37.9, 45.0	37.0	32.0, 42.2	45.0	40.2, 49.8	0.03	40.7	37.0, 44.5	45.8	36.2, 55.8	0.34				
Cigar Products	N = 286	68.2	62.6, 73.3	62.8	55.6, 69.5	77.5	68.4, 84.5	0.01	69.7	63.9, 75.0	52.0	33.5, 70.0	0.07				
Hookah/Shisha	N = 563	99.3	98.2, 99.7	99.1	96.8, 99.8	99.4	97.9, 99.8	0.66	99.2	98.1, 99.7	100	89.9, 100	---- <sup>b</sup>				
Smokeless Tobacco	N = 89	83.1	74.0, 89.5	83.1	72.7, 90.1	83.3	60.8, 94.2	0.98	83.8	74.2, 90.2	77.8	45.3, 93.7	0.65				
Any Product Use	N = 1325	82.9	80.8, 84.9	82.7	79.4, 85.6	83.1	80.3, 85.6	0.84	84.4	82.2, 86.3	70.6	62.5, 77.6	< 0.01				
<b>Percentage Who Would Not Use the Product If It Were Not Flavored<sup>c</sup></b>																	
		Overall			Males			Females			18–24 years			25–29 years			
		%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
E-Cigarettes	N = 90	78.0	66.6, 89.4	78.8	63.1, 94.4	77.2	57.8, 96.7	0.91	93.0	78.6, 100	74.2	61.3, 87.0	0.16				
Cigarettes	N = 20	53.9	17.8, 90.0	72.1	31.7, 100	35.8	0.0, 76.9	0.27	46.5	0.0, 100	61.8	29.6, 93.9	0.67				
Cigar Products	N = 28	80.5	60.9, 100	83.7	60.4, 100	69.5	41.2, 97.8	0.46	86.1	59.4, 100	78.0	53.7, 100	0.68				
Hookah/Shisha	N = 27	73.5	41.1, 100	61.2	12.7, 100	88.1	71.9, 100	0.19	37.9	0.0, 91.0	87.9	72.6, 100	0.06				
Smokeless Tobacco	N = 12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a				
Any Product Use	N = 122	83.7	72.8, 94.6	82.9	68.1, 97.7	84.6	69.9, 99.2	0.87	76.9	52.6, 100	86.3	76.0, 96.7	0.44				
<b>Young adults</b>																	
		Overall			Males			Females			18–24 years			25–29 years			



<i>Percentage Using a Flavored Tobacco Product</i>													
	Number <sup>a</sup>	%	95% CI	%	95% CI	%	95% CI	p-value	%	95% CI	p-value		
E-Cigarettes	N = 509	73.5	69.5, 77.1	68.8	62.4, 74.5	77.1	71.9, 81.6	0.03	74.1	70.0, 77.9	65.9	50.5, 78.4	0.25
Cigarettes	N = 310	44.2	38.8, 49.8	38.1	30.1, 46.8	48.6	41.5, 55.8	0.07	44.7	38.9, 50.7	40.9	27.7, 55.6	0.64
Cigar Products	N = 193	54.9	47.9, 61.8	48.2	39.3, 57.3	65.4	54.3, 75.0	0.02	53.6	46.3, 60.7	75.0	46.8, 91.1	0.16
Hookah/Shisha	N = 559	80.0	76.4, 83.1	76.6	70.6, 81.7	82.1	77.7, 85.8	0.11	80.2	76.6, 83.4	76.5	60.0, 87.6	0.60
Smokeless Tobacco	N = 74	59.5	48.1, 69.9	52.5	40.0, 64.7	86.7	62.1, 96.3	0.03	61.2	49.2, 72.0	42.9	15.8, 75.0	0.36
Any Product Use	N = 1098	76.4	73.8, 78.8	71.7	67.5, 75.5	80.0	76.6, 82.9	0.00	77.1	74.5, 79.6	68.8	58.9, 77.1	0.07

Note.

<sup>a</sup> Sample sizes for past 30-day users of each product. Unweighted sample sizes provided for youth, though percentages are weighted.

<sup>b</sup> No statistical testing conducted because 100% of 25–29-year-olds were flavored hookah users.

<sup>c</sup> Among past 30-day users of each product that answered this question. Sample sizes differ from those above, due to missing data.

n/a Estimates where denominators were < 20 were suppressed, as data are statistically unreliable.