

# Flavor Inconsistencies between Flavored Tobacco Products among US Adults

Liane M. Schneller, PhD, MS  
Dongmei Li, PhD  
Zahira Quiñones Tavárez, MD  
Maciej L. Goniewicz, PhD, PharmD  
Amanda J. Quisenberry, PhD  
Zidian Xie, PhD

Irfan Rahman, PhD  
Scott McIntosh, PhD  
Richard J. O'Connor, PhD  
Deborah J. Ossip, PhD

**Objective:** Banning flavors in some tobacco products, while allowing them in others, may shift consumer preferences towards products in which flavors are still allowed. In this study, we examine flavor popularity and inconsistencies in flavor preference across non-cigarette tobacco products among US adults. **Methods:** We used data from the Population Assessment of Tobacco and Health Study Wave 3 to assess the prevalence of flavor preference for users of non-cigarette tobacco products (N = 9037), as well as flavor inconsistencies between products among polyusers (N = 3183). **Results:** Most users of flavored tobacco products reported using one flavor category per product. Fruit and tobacco were among the most commonly used flavor categories of ENDS, hookah, traditional cigars, and cigarillo/filtered cigars. Menthol/mint was the most common flavor among snus/smokeless users. Polyusers of ENDS and traditional cigars had the largest inconsistency, where about 68%-76% used different flavors across products. Conversely, polyusers of traditional cigars and cigarillos/filtered cigars had the lowest inconsistency (25%-28%). **Conclusions:** Flavor preferences differed according to product, suggesting that consumers are not likely to switch across products to maintain a flavor preference. Future research should assess flavor preferences prospectively to improve understanding of the potential benefits of flavor bans.

**Key words:** flavored tobacco products; electronic nicotine delivery systems (ENDS); cigars; hookah; smokeless tobacco; tobacco polyusers

*Am J Health Behav.*™ 2020;44(5):617-630

DOI: doi.org/10.5993/AJHB.44.5.6

Characterizing flavors, excluding tobacco and menthol, were banned in cigarettes by the United States (US) Food and Drug Administration (FDA) following the Family Smoking Prevention and Tobacco Control Act of 2009.<sup>1</sup> Although the FDA now has the authority to ban characterizing flavors in non-cigarette tobacco products marketed in the US as per the Deeming Rule of

May 2016,<sup>2</sup> this policy was not immediately extended to currently marketed other non-cigarette tobacco products. However, some states (eg, New Jersey, New York, and Rhode Island) and localities (eg, Chicago, and Santa Clara County) did ban characterizing flavors in electronic nicotine delivery systems (ENDS).<sup>3-8</sup> Furthermore, following the spike in cases of lung injury and deaths associated

*Liane M. Schneller, Postdoctoral Fellow, the Clinical and Translational Science Institute, University of Rochester Medical Center, Rochester, NY. Dongmei Li, Associate Professor, the Clinical and Translational Science Institute, University of Rochester Medical Center, Rochester, NY. Zahira Quiñones Tavárez, Doctorate Student, Translational Biomedical Science, University of Rochester Medical Center, Rochester, NY. Maciej L. Goniewicz, Associate Professor of Oncology, Department of Health Behavior, Roswell Park Comprehensive Cancer Center, Buffalo, NY. Amanda J. Quisenberry, Assistant Professor of Oncology, Department of Health Behavior, Roswell Park Comprehensive Cancer Center, Buffalo, NY. Zidian Xie, Senior Analyst and Programmer, the Clinical and Translational Science Institute, University of Rochester Medical Center, Rochester, NY. Irfan Rahman, Professor, Department of Environmental Medicine, University of Rochester Medical Center, Rochester, NY. Scott McIntosh, Associate Professor, Department of Public Health Sciences, University of Rochester Medical Center, Rochester, NY. Richard J. O'Connor, Professor of Oncology, Department of Health Behavior, Roswell Park Comprehensive Cancer Center, Buffalo, NY. Deborah J. Ossip, Professor, Department of Public Health Sciences, University of Rochester Medical Center, Rochester, NY.*  
Correspondence Dr Schneller; [Liane\\_Schneller@URMC.Rochester.edu](mailto:Liane_Schneller@URMC.Rochester.edu)

with the use of ENDS,<sup>9</sup> several states and localities have issued emergency rules banning the sale of flavored ENDS.<sup>10</sup> The FDA has prioritized the enforcement of the sale of flavored cartridge-based ENDS, except tobacco or menthol, while leaving other ENDS and flavored tobacco products alone to ensure that manufacturers are taking the proper precautions to minimize youth access.<sup>11</sup>

Flavors are added to tobacco products, in part, to mask the harsh taste of tobacco or nicotine.<sup>12-17</sup> This facilitates consumer initiation and continuation of tobacco use.<sup>12-17</sup> It has been reported that flavored tobacco products are viewed as more favorable than unflavored products, as they increase satisfaction, create a better feel and taste, and allow consumers to customize their experience.<sup>18-20</sup> Previous studies have shown that young adult ENDS users (generally 18-30 years of age) are more attracted to sweet flavors (eg, fruit and candy).<sup>21-26</sup> Similar patterns can be seen among adult vapers, although more bitter flavors (eg, menthol/mint<sup>27</sup> and tobacco<sup>12-17</sup>) are also common among adults,<sup>28,29</sup> especially smokers.<sup>26</sup> ENDS, however, are not the only tobacco products that are available in flavors. ENDS, as well as smokeless tobacco, hookah, and cigarillos/cigars are available in flavors. In 2013-2014, more than 50% of adults reported trying flavored hookah or snus before the age of 18 years.<sup>30</sup> First time use of a flavored cigar, especially cigarillos and filtered cigars, was also prevalent among the youth and young adult population.<sup>30,31</sup> Furthermore, about 60% of current cigarillo and filtered cigar users reported using a flavored product.<sup>32</sup> It has been shown that sweeter flavors, such as fruit, candy/other sweets, chocolate or alcohol-flavors, are popular among young adult hookah and cigar users,<sup>33,34</sup> whereas mint flavored snus is preferred by combustible cigarette smokers.<sup>35</sup>

Public health officials continue to gather data on the use of flavored tobacco products to determine if the flavor ban should be extended beyond that of flavored cartridge-based ENDS. However, the ban on flavored cartridge-based ENDS or the implementation of any extension to this ban will likely alter the tobacco market share. As of 2018, about 49.1 million or 19.7% of US adults reported currently using any tobacco products.<sup>36</sup> Cigarettes were the most prevalent tobacco product used with 13.7% of US adults using cigarettes followed by

cigars (3.9%), ENDS (3.2%), smokeless tobacco (2.4%), and the use of regular pipe, water pipe or hookah (1.0%).<sup>36</sup> Although any form of flavor ban is likely implemented to reduce appeal and, therefore, overall prevalence of use, the ban on flavored cartridge-based ENDS may not result in a change in ENDS use, but rather a shift in the type of ENDS device used (eg, open, modifiable ENDS devices). In the event of a more intense ban on all flavored ENDS, the market share of tobacco use may shift to other products that are still available in flavors (eg, cigars or smokeless tobacco).

The availability of flavored tobacco products is known to be a top reason for using non-cigarette tobacco products.<sup>31,37,38</sup> The flavor additives used in various tobacco products could differ in quality; hookah tobacco may be flavored with natural additives, such as fruit and honey, whereas e-liquid may be artificially flavored. The quality of flavor additives in various tobacco products could alter the sensory perception among consumers, and therefore, alter flavor preference between tobacco products. In the event of a partial flavor ban, such as the ban of flavored cartridge-based ENDS, the observation of shifts in the tobacco market is likely. Although we would expect a reduction in the prevalence of use,<sup>39,40</sup> the use of other tobacco products that are still available in flavors could also be expected,<sup>39,41-43</sup> which would continue to pose a risk to the public health.<sup>44</sup> Therefore, understanding inconsistencies in flavor preference across products may portend switching to another product with a comparable flavor rather than remaining loyal to the current product. To our knowledge, the flavor preference across various tobacco products and among polytobacco users has not been assessed beyond flavor use among cigarette and ENDS users.<sup>45</sup> Using data from Wave 3 (W3) of the Population Assessment of Tobacco and Health (PATH) Study, the purpose of this study was to: (1) examine the popularity of flavors among exclusive and polytobacco users of various type of flavored tobacco products, and (2) analyze inconsistencies in flavor preference among polytobacco users of different types of flavored tobacco products in the US.

## METHODS

### Study Design and Population

The PATH Study is a nationally representative,

longitudinal cohort study of tobacco use and its health effects among non-institutionalized adults and youth in the US, through the National Institute of Health and the FDA. Data from W3 of the PATH Study were collected between October 19, 2015 and October 23, 2016 among 28,148 adult and 13,651 youth respondents. More information about the PATH Study design and methods can be found elsewhere.<sup>46</sup> This analysis provides W3 cross-sectional estimates from 9037 adult flavored tobacco users. Analyses were done to assess the popularity of flavors of various non-cigarette tobacco products, as well as inconsistencies in preferred flavor across various non-cigarette tobacco products, among adult users of multiple flavored tobacco products.

### Flavored Tobacco Product Use

Adult participants were asked to report on their tobacco product use. Products of interest included ENDS, traditional cigars, cigarillos, filtered cigars, hookah, snus, and smokeless tobacco. Variables were derived by Westat for use of each tobacco product, which included current established users (have ever used the product fairly regularly and currently use them every day or some days), current experimental users (never used the product fairly regularly, and currently use them every day or some days), non-current 30-day users (former experimental, new former, or still former established users in W3 who have used the product in the past 30 days), and new former established users (former established user, were current established or current experimental users in W2, have ever used the product fairly regularly, and did not use them in the past 12 months or currently use them not at all). Cigarettes were excluded from the analysis of flavor inconsistencies because they are not marketed in flavors other than menthol.

All participants who reported current, established, or experimental use, were former established users, or non-current 30-day users (as defined by Westat) of ENDS, traditional cigars, cigarillos, filtered cigars, hookah, snus, or smokeless tobacco were asked to report on the regular flavor of their tobacco product(s). Participants who reported ENDS use could choose from tobacco, menthol/mint, clove/spice, fruit, chocolate, an alcoholic drink, a non-alcoholic drink, candy/desserts/other

sweets, or some other flavor. Participants who reported using traditional cigars, cigarillos, filtered cigars, or hookah could choose from menthol/mint, clove/spice, fruit, chocolate, an alcoholic drink, candy/other sweets, or some other flavor. Finally, those who reported using snus or smokeless tobacco could choose menthol/mint, wintergreen/spearmint/frost, clove/spice, fruit, chocolate, alcoholic drinks, candy/other sweets, or some other flavor. Tobacco flavor was offered only explicitly as a flavor option among those who used an ENDS as the other tobacco products are by default tobacco flavored. Therefore, if users of traditional cigars, cigarillos, filtered cigars, hookah, snus or smokeless answered no to, “[Is/Was] [your regular brand/the last brand] you [use/used] flavored to taste like menthol, mint, clove, spice, fruit, chocolate, alcoholic drinks, candy or other sweets?” then they were assumed to use tobacco flavor. For the purpose of this analysis, menthol/mint and wintergreen/spearmint/frost were combined (menthol/mint from here on), as well as an alcoholic drink and a non-alcoholic drink (beverage from here on), to allow for common flavor categories across products.

### Data Analysis

We assessed the prevalence of reported flavor categories according to tobacco products among users of one or more flavored tobacco products. We also conducted a stratified analysis according to age (young adults versus older adults) among those using one or more flavored tobacco products.<sup>47</sup> We assessed the probability of reporting a flavor category for a particular product among all adult users of flavored tobacco products using generalized estimating equations (GEE) to account for polyuse. Models used a logit link function and an unstructured correlation matrix. We adjusted models for sex, age race/ethnicity, and cigarette smoking and smoking of regular or menthol cigarettes. We reported adjusted odds ratios (aORs) and 95% confidence intervals (95% CI). We also assessed prevalence in flavor preference inconsistencies among adult polytobacco users. An inconsistency in flavor preference was identified when a polytobacco user reported a different flavor(s) for each of their reported tobacco products. Therefore, the prevalence in flavor preference inconsistencies represents the number of participants that reported

**Table 1**  
**Demographic and Smoking Behavior Characteristics of Adult Users of Flavored Tobacco Products (N = 9037) – The Population Assessment of Tobacco and Health Wave 3**

Characteristics	Tobacco Users	
	N	%
<b>Age</b>		
18-24 years old	3208	23.2
25-34 years old	2211	25.4
35-54 years old	2354	31.9
55 years and older	1264	19.5
<b>Sex</b>		
Male	5608	67.5
Female	3425	32.5
<b>Race/Ethnicity</b>		
Non-Hispanic White	6495	77.5
Non-Hispanic Black	1333	13.5
Other	997	9.1
<b>Cigarette Smoking Status</b>		
Never	2494	26.8
Former	1826	26.7
Current	4187	46.5
<b>Current Smoker Mentholation Status</b>		
Non-Menthol	2275	60.2
Menthol	1670	39.9
<b>Number of Tobacco Products Used,</b>		
1 product	5854	68.9
2 products	2166	21.8
3 products	730	6.7
4 products	249	2.2
5 products	38	0.4
<b>Type of Tobacco Products</b>		
Used ENDS	4676	62.2
Used traditional cigars	2169	43.3
Used cigarillos/filtered cigars	2875	57.5
Used hookah	1961	25.7
Used snus/smokeless tobacco	1881	29.5

use of a specific flavor for one of the products in the comparison, but not the other. For this, each flavor category was evaluated individually. We conducted analyses using Stata 16 software (StataCorp LLC, College Station, TX, USA) with W3 replicate

weights and balanced repeated replication methods with Fay’s adjustment of 0.3.

**RESULTS**

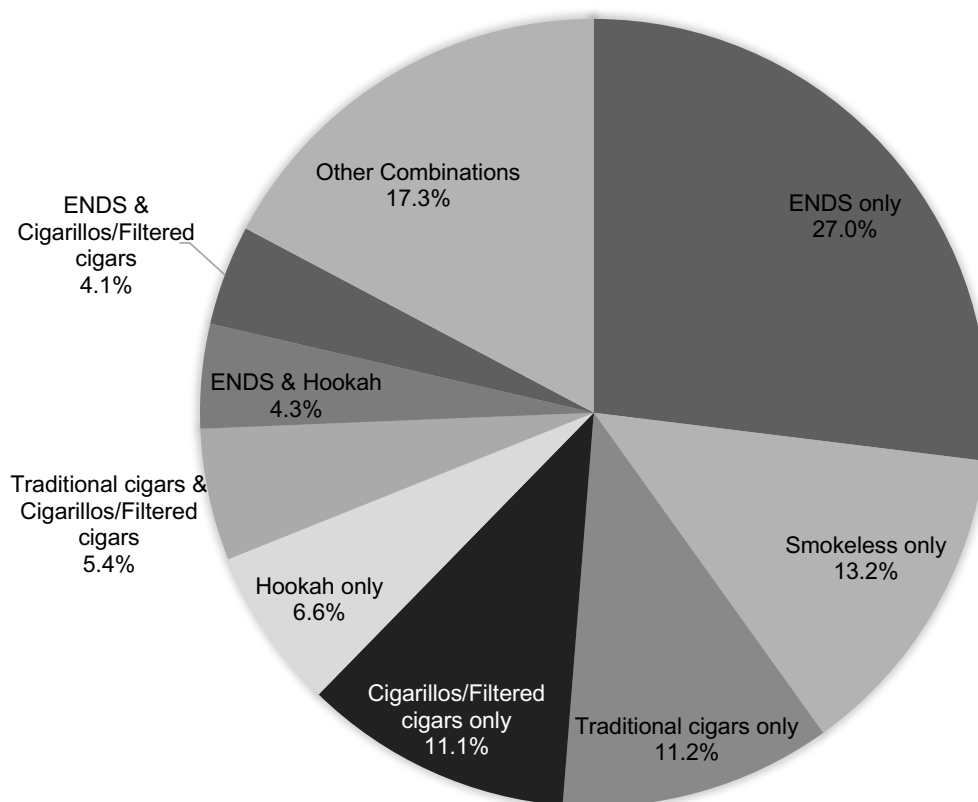
**Demographic and Smoking Behavior Characteristics**

A total of 9037 adults used one or more flavored non-cigarette tobacco products. The highest percentages of tobacco users were 35-54 years of age (31.9%), male (67.5%), and non-Hispanic white (77.5%). Just over half were current combustible cigarette smokers (54.9%) and used non-mentholated cigarettes (60.2%). When examining tobacco products that are available in characterizing flavors (ENDS, traditional cigars, cigarillos/filtered cigars, hookah, and snus/smokeless tobacco), most users reported using only one product (68.9%; Table 1). ENDS only use was the most popular product (27.0%), followed by snus/smokeless only (13.2%). Traditional cigars and cigarillos/filtered cigars were the most popular products used in combination (5.4%), followed by ENDS and hookah (4.3%; Figure 1 and Supplemental Table 1).

**Flavor Use among All Adult Flavored Tobacco Users**

Of the 9037 adults who used one or more flavored non-cigarette tobacco products, 9033 users provided flavor-related data. Most users of a flavored tobacco products reported only using one flavor category (ENDS: 79.9%; Traditional cigars: 95.6%; Cigarillos/filtered cigars: 87.8%; Hookah: 66.7%; Snus/smokeless: 96.0%). When examining those who only use one flavor category, tobacco and fruit were among the most common flavors reported alone. For users of traditional cigars (79.9%) and cigarillos/filtered cigars (59.3%), tobacco flavor was the most common, while fruit was the most common flavor category among users of ENDS (31.8%) and hookah (44.2%). Menthol/mint was the most common flavor reported alone by snus/smokeless users (53.2%). Menthol/mint was also among the top 3 flavors used alone for all of the other flavored tobacco products. When looking at users who reported 2 or more flavor categories, fruit was the most popular flavor category used in combination with other flavor categories for all tobacco products (ENDS: 79.7%; Traditional cigars: 68.0%; Cigarillos/filtered cigars: 61.8%; Hookah:

**Figure 1**  
**Flavored Tobacco Products Used among Adult Tobacco Users (N = 9037) -**  
**The Population Assessment of Tobacco and Health Wave 3**



**Note.**

Only products that are available in characterizing flavors were analyzed; cigarettes were excluded from this analysis; the “other combinations” category prevalence ranged from 0.1% to 2.2%.

93.4%), except for snus/smokeless where menthol/mint was the most common (90.6%) flavor used in combination with other flavors. Candy/other sweets and menthol/mint were also commonly reported flavor combinations (Table 2).

Statistically significant differences in prevalence of regular flavor categories reported according to tobacco product among adults using one or more flavored tobacco products were seen when stratified by age. Tobacco flavor was significantly more prevalent among older adults ( $\geq 25$  years of age; 32%-78%) compared to young adults (18-24 years; 8%-70%) for all tobacco products except for hookah (26.6% vs 21.9%, respectively). On the other hand, fruit flavors were significantly more preva-

lent among young adults (13%-64%) compared to older adults (7%-58%) for all tobacco products except for snus/smokeless (4.0% vs 4.2%, respectively). Menthol/mint flavor was significantly more prevalent among older adults compared to young adults when looking at ENDS (23.7% vs 17.0%, respectively) and cigarillos/filtered cigars (14.8% vs 9.7%). Conversely, menthol/mint was significantly more prevalent among young adults (72.5%) compared to older adults (54.2%) who were snus/smokeless tobacco users (Supplemental Table 2).

When comparing traditional cigars to ENDS, users of traditional cigars had significantly greater odds of reporting use of some other flavor (aOR: 1.77; 95% CI: 1.25, 2.50). However, users of tra-

**Table 2**  
**Flavor Category Use According to Flavored Tobacco Product among Adult Exclusive and Polytabacco Users (N = 9033) – The Population Assessment of Tobacco and Health Wave 3**

	Used ENDS N = 4676	Used traditional cigars N = 2169	Used cigarillos/ filtered cigars N = 2871	Used hookah N = 1955	Used snus/ smokeless tobacco N = 1878
<b>Number of flavor categories used, N (%)</b>					
One flavor	3667 (79.9)	2047 (95.6)	2499 (87.8)	1316 (66.7)	1793 (96.0)
2 or more flavors	1009 (20.1)	122 (4.4)	372 (12.2)	639 (33.3)	85 (4.0)
<b>Flavor categories used alone, N (%)</b>					
Tobacco	801 (25.2)	1578 (79.9)	1417 (59.3)	486 (36.3)	734 (43.1)
Fruit	1273 (31.8)	143 (5.5)	372 (13.1)	580 (44.2)	24 (1.3)
Menthol/mint	651 (18.3)	76 (3.4)	206 (8.4)	105 (8.9)	995 (53.2)
Candy/other sweets	663 (17.0)	63 (2.7)	118 (4.5)	85 (5.9)	5 (0.2)
Beverage	121 (3.3)	66 (2.6)	172 (5.7)	14 (0.9)	5 (0.4)
Some other flavor	87 (2.5)	62 (3.2)	89 (3.8)	24 (2.3)	23 (1.2)
Chocolate	44 (1.2)	35 (1.6)	35 (1.3)	14 (0.8)	3 (0.4)
Clove/spice	27 (0.7)	24 (1.1)	90 (3.9)	8 (0.6)	4 (0.2)
<b>Flavor categories used in combination, N (%)</b>					
Included tobacco	212 (22.9)				
Included fruit	819 (79.7)	86 (68.0)	239 (61.8)	595 (93.4)	55 (65.4)
Included menthol/mint	341 (35.5)	40 (32.7)	154 (44.6)	334 (55.5)	77 (90.6)
Included candy/other sweets	718 (69.9)	59 (48.3)	178 (46.2)	391 (55.4)	16 (19.2)
Included beverage	213 (19.9)	40 (34.3)	133 (37.2)	154 (21.5)	10 (13.4)
Included some other flavor	31 (2.7)	31 (26.8)	84 (21.2)	79 (11.6)	21 (23.0)
Included chocolate	143 (14.7)	45 (35.7)	87 (25.9)	94 (15.5)	7 (8.4)
Included clove/spice	56 (4.9)	24 (20.7)	80 (23.6)	72 (11.5)	1 (0.9)

**Note.**

Product categories are not mutually exclusive as both exclusive and polytabacco users are included. Tobacco flavor is only asked for those who reported ENDS use since the other tobacco products are by default tobacco flavored. It was assumed that those who responded that their product was not flavored are using a tobacco-flavored product. Therefore, only consumers of ENDS can use tobacco flavor in combination with another flavor (indicated by the greyed cells).

ditional cigars had significantly lower odds of reporting use of a fruit (aOR: 0.17; 95% CI: 0.14, 0.21), menthol/mint (aOR: 0.21; 95% CI: 0.16, 0.26), or candy/other sweets (aOR: 0.18, 95% CI: 0.14, 0.23) flavor when compared to ENDS users. Similarly, users of cigarillos/filtered cigars had significantly greater odds of reporting use of a beverage flavor (aOR: 1.36; 95% CI: 1.10, 1.69), some other flavor (aOR: 2.21; 95% CI: 1.65, 2.96), and

clove/spice (aOR: 3.99; 95% CI: 2.78, 5.74) compared to ENDS users. On the other hand, users of cigarillos/filtered cigars had significantly lower odds of reporting using a fruit flavor (aOR: 0.34; 95% CI: 0.30, 0.39), menthol/mint (aOR: 0.38; 95% CI: 0.32, 0.46), a candy/other sweets flavor (aOR: 0.24; 95% CI: 0.20, 0.30) compared to ENDS users. Users of hookah had significantly higher odds of reporting use of a fruit flavor (aOR: 1.70; 95%

**Table 3**  
**Flavor Use According to Tobacco Product among Adult Polytobacco Users (N = 9033) -**  
**The Population Assessment of Tobacco and Health Wave 3**

	Traditional Cigar vs. ENDS		Cigarillos/Filter Cigars vs. ENDS		Hookah vs. ENDS		Smokeless vs. ENDS	
	Crude OR (95% CI)	Adjusted OR <sup>a</sup> (95% CI)	Crude OR (95% CI)	Adjusted OR <sup>a</sup> (95% CI)	Crude OR (95% CI)	Adjusted OR <sup>a</sup> (95% CI)	Crude OR (95% CI)	Adjusted OR <sup>a</sup> (95% CI)
<b>Fruit</b>	<b>0.15</b> (0.12, 0.17)	<b>0.17</b> (0.14, 0.21)	<b>0.31</b> (0.28, 0.35)	<b>0.34</b> (0.30, 0.39)	<b>2.02</b> (1.79, 2.28)	<b>1.70</b> (1.49, 1.94)	<b>0.06</b> (0.04, 0.07)	<b>0.07</b> (0.05, 0.09)
Mint/ Menthol <sup>b</sup>	<b>0.23</b> (0.19, 0.28)	<b>0.21</b> (0.16, 0.26)	<b>0.43</b> (0.36, 0.50)	<b>0.38</b> (0.32, 0.46)	1.14 (0.99, 1.32)	1.16 (0.98, 1.37)	<b>0.21</b> (0.16, 0.27)	<b>0.26</b> (0.20, 0.35)
<b>Candy/ sweets</b>	<b>0.15</b> (0.12, 0.18)	<b>0.18</b> (0.14, 0.23)	<b>0.23</b> (0.19, 0.28)	<b>0.24</b> (0.20, 0.30)	<b>0.72</b> (0.63, 0.83)	<b>0.59</b> (0.51, 0.69)	<b>0.02</b> (0.01, 0.04)	<b>0.02</b> (0.01, 0.04)
Beverage	0.72 (0.56, 0.92)	0.84 (0.64, 1.09)	1.21 (0.99, 1.48)	1.36 (1.10, 1.69)	1.13 (0.89, 1.43)	0.99 (0.77, 1.26)	<b>0.09</b> (0.05, 0.18)	<b>0.13</b> (0.07, 0.26)
<b>Other flavor</b>	<b>1.86</b> (1.35, 2.56)	<b>1.77</b> (1.25, 2.50)	<b>2.23</b> (1.68, 2.97)	<b>2.21</b> (1.65, 2.96)	<b>2.17</b> (1.59, 2.95)	<b>2.01</b> (1.42, 2.84)	0.68 (0.43, 1.06)	0.76 (0.47, 1.22)
<b>Chocolate</b>	0.87 (0.65, 1.16)	0.98 (0.71, 1.35)	0.83 (0.60, 1.15)	0.92 (0.66, 1.29)	<b>1.46</b> (1.09, 1.95)	<b>1.37</b> (1.02, 1.85)	<b>0.16</b> (0.07, 0.41)	<b>0.21</b> (0.08, 0.56)
<b>Clove/ Spice</b>	1.37 (0.89, 2.11)	1.46 (0.91, 2.34)	<b>3.51</b> (2.55, 4.82)	<b>3.99</b> (2.78, 5.74)	<b>2.60</b> (1.79, 3.78)	<b>2.64</b> (1.72, 4.05)	<b>0.27</b> (0.10, 0.73)	<b>0.25</b> (0.08, 0.81)

**Note.**

**Bolded point estimates indicate statistical significance at  $p < .05$ ; a: Adjusted for age, sex, race/ethnicity, and cigarette smoking; b: The adjusted menthol model was adjusted for age, sex, race/ethnicity, cigarette smoking status/current menthol status.**

CI: 1.49, 1.94), some other flavor (aOR: 2.01; 95% CI: 1.42, 2.84), a chocolate flavor (aOR: 1.37; 95% CI: 1.02, 1.85), and clove/spice (aOR: 2.64; 95% CI: 1.72, 4.05) compared to ENDS users. Conversely, users of hookah had significantly lower odds of reporting using a candy/ other sweets flavor (aOR: 0.59; 95% CI: 0.51, 0.69) compared to ENDS users. Finally, users of snus/smokeless tobacco had a lower odds of reporting use of a fruit flavor (aOR: 0.07; 95% CI: 0.05, 0.09), a menthol/mint flavor (aOR: 0.26; 95% CI: 0.20, 0.35), a candy/other sweets flavor (aOR: 0.02; 95% CI: 0.01, 0.04), a beverage flavor (aOR: 0.13; 95% CI: 0.07, 0.26), a chocolate flavor (aOR: 0.21; 95% CI: 0.08, 0.56), and clove/spice (aOR: 0.25; 95% CI: 0.08, 0.81; Table 3).

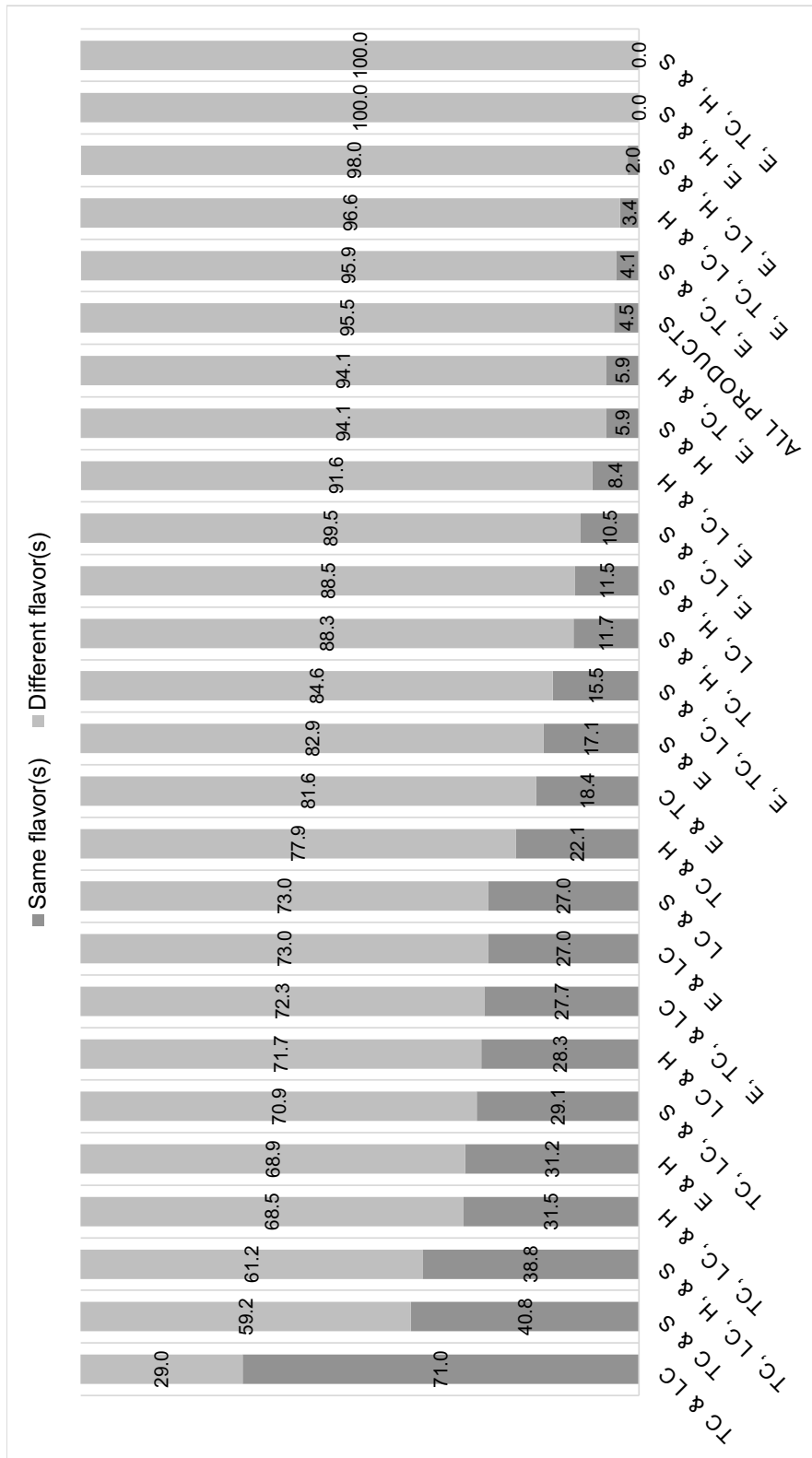
### Flavor Inconsistency across Flavored Products among Polytobacco Users

There were 3183 (31.1%) users who used 2 or more tobacco products that are marketed in characterizing flavors. There were 26 unique product combinations. When exploring the inconsistency between preferred flavor(s), those using tradition-

al cigars and cigarillos/filtered cigars had the least amount (29%) of flavor inconsistency. Conversely, no user of combined ENDS, hookah and snus/smokeless used the same flavor(s). This was also true those using combined ENDS, traditional cigars, hookah, and snus/smokeless. For the other 23 unique product combinations, 59.2%-98% of users used a different flavor(s) when using various products (Figure 2).

When examining across pairs of products for each flavor category, those who used ENDS and traditional cigars had the largest inconsistency in flavor category use. For each flavor category, 68.2%-76.3% of users reported using a flavor category for one product but not the other. Users of traditional cigars and hookah showed a considerable amount of flavor inconsistency across products (56.0%-64.1%). Similarly, users of traditional cigars and smokeless/snus had a considerable level of flavor inconsistency (50.8%-63.1%). Users of cigarillos/filtered cigars and hookah, as well as users of cigarillos/filtered cigars and snus/smokeless tobacco, showed moderate level of flavor inconsistency for most flavor categories (with hookah: 34.2%-

**Figure 2**  
**Flavor Category Combination Inconsistencies between Tobacco Product Combinations Used among Polyto tobacco Users**  
**(N = 3183) – The Population Assessment of Tobacco and Health Wave 3**



**Note.**  
 Abbreviations: E: ENDS, TC: Traditional cigars, LC: Cigarillos/Filtered cigars, H: Hookah, S: Snus/Smokeless, All Products: ENDS, Traditional cigars, Cigarillos/Filtered cigars, Hookah and Snus/Smokeless.



**Table 4**  
**Inconsistencies in Flavor Categories between Flavored Tobacco Products**  
**among Adult Polytobacco Users Only (N = 3183) –**  
**The Population Assessment of Tobacco and Health Wave 3**

Flavor, N (%)	ENDS vs Traditional Cigars N = 677	ENDS vs Cigarillos/ Filtered cigars N = 1101	ENDS vs Hookah N = 955	ENDS vs Smokeless N = 548	Traditional cigars vs Cigarillos/ Filtered cigars N = 1021	Traditional cigars vs Hookah N = 374	Traditional Cigars vs Smokeless N = 393	Cigarillos/ Filtered cigars vs Hookah N = 531	Cigarillos/ Filtered cigars vs Smokeless N = 420	Hookah vs Smokeless N = 210
Fruit	508 (76.3)	687 (62.8)	448 (47.4)	332 (58.7)	304 (28.1)	217 (64.1)	227 (56.1)	262 (50.7)	235 (56.0)	134 (67.0)
Mint/ menthol	484 (73.1)	596 (55.0)	388 (39.8)	447 (80.4)	281 (26.1)	203 (57.6)	258 (63.1)	203 (40.0)	285 (67.8)	144 (68.8)
Candy/ sweets	495 (74.9)	641 (58.8)	449 (45.6)	270 (47.8)	293 (26.7)	207 (60.2)	214 (54.1)	227 (43.2)	183 (45.3)	82 (39.7)
Beverage	477 (70.6)	603 (55.1)	304 (31.4)	172 (31.3)	277 (25.5)	201 (57.4)	211 (52.6)	213 (40.8)	189 (46.5)	59 (27.3)
Other flavor	453 (69.2)	51 (47.9)	263 (26.4)	165 (31.2)	269 (25.3)	195 (56.0)	203 (50.8)	183 (34.2)	177 (44.0)	59 (28.5)
Chocolate	459 (69.2)	403 (47.3)	275 (27.5)	163 (31.2)	273 (25.1)	204 (58.3)	201 (51.6)	179 (34.9)	164 (43.0)	56 (29.1)
Clove/spice	444 (68.2)	521 (49.3)	264 (25.6)	148 (27.8)	273 (25.2)	197 (58.1)	201 (51.4)	201 (40.0)	173 (44.6)	61 (30.2)

**Note.**

The prevalence of inconsistencies represents the percent of consumers who report using the flavor category for one of the products but not the other. Five flavored tobacco product users were missing data for regular flavor.

43.2%; with snus/smokeless tobacco: 43.0%-46.5%). The exceptions were the fruit category where there was a considerable amount of inconsistency (with hookah: 50.7%; with snus/smokeless tobacco: 56.0%), as well as menthol/mint for cigarillos/filtered cigars and snus/smokeless tobacco (67.8%). Hookah and snus/smokeless showed low to moderate levels of flavor inconsistency (27.3%-39.7%), except for the fruit category (67.0%) and menthol/mint (68.8%). Users of ENDS and snus/smokeless tobacco showed moderate level of flavor inconsistency, except for fruit flavor where they showed considerable inconsistency (58.7%) and low levels of inconsistency for clove/spice (27.8%) across products. ENDS and hookah users showed low to moderate level of inconsistency in flavor use (25.6%-47.4%). The lowest amount of inconsistency was seen for all flavor categories among users of traditional cigars and cigarillos/filtered cigars (25.1%-28.1%; Table 4).

## DISCUSSION

Most adults who were recent former users or were currently using flavored tobacco, alone or in combination, reported using only one tobacco product. ENDS was the most popular tobacco product to be used alone, and using traditional cigars and cigarillos/filtered cigars was the most common product combination. In addition, most tobacco users reported using only one flavor category. Fruit and tobacco flavors were among the top individually reported flavor categories across all tobacco products, and fruit was the most popular flavor category to be reported in combination with other flavors. Finally, notable inconsistencies in flavor preference across products were found for polytobacco users in which adults who reported using 2 or more tobacco products appeared to report using a specific flavor for one tobacco product but not the other. Users of traditional cigars and cigarillos/filtered cigars had the least inconsistency in flavor category

preference, whereas we found moderate to high inconsistency in most cases across other products of interest. However, there are some specific combinations where there is not a notable inconsistency in flavor preference across products (eg, candy/other sweets and menthol/mint for traditional cigars vs ENDS).

About 31% of consumers reported using 2 or more non-cigarette tobacco products, which aligns with previous research.<sup>48</sup> The availability of flavored tobacco products has been shown to be associated with dual or polytobacco use.<sup>30,37</sup> Few flavor preferences were consistent across products. However, where they were consistent could suggest that users may maintain flavor loyalty if that flavor were to be eliminated in their current product. On the other hand, notable inconsistencies in flavor preference across products could suggest that users may maintain product loyalty. The inconsistencies in flavor preference may be due to the quality of flavor additives, or simply the amount of variability in available flavors. We observed both of these outcomes with the US implementation of a ban on non-menthol flavors in cigarettes, in that the sale of other flavored tobacco products and the market share of menthol cigarettes increased following the ban.<sup>49,50</sup>

Although the PATH study has strong external validity, internal validity, and retention rates, there are some limitations to note. First, the PATH study has a large overall sample size, but this study had limited statistical power to assess certain flavors that are used by a relatively small percentage of the sample (eg, clove/spice), as well as certain covariates. Second, the flavor options provided are flavor *categories*. Therefore, we cannot distinguish if multiple *specific* flavors that fall under the same category (eg, strawberry and blueberry) were used. Third, the flavor category participants select for their flavor is based on personal perception (eg, apple pie may be listed as a candy/other sweets only, or as fruit and candy/other sweets). Fourth, studies have observed changes in flavor preferences.<sup>25,26</sup> Future studies should identify a systematic method to identify flavor use, such as the e-liquid flavor wheel suggested by Krusemann et al,<sup>51</sup> and follow flavor preferences over time to identify changes in preference. Finally, we cannot identify the flavor additives used to create a single flavor profile. The quality and type of additives used between tobacco products could dif-

fer greatly, which could impact flavor preference among various tobacco products. In the future, the association of cigarette use and preferred flavor of each non-cigarette tobacco product should be assessed further.

This analysis will inform future research, which should assess flavor preferences prospectively to improve insight about the potential benefits of the current policy on flavored cartridge-based ENDS,<sup>11</sup> as well as potential future flavor bans or policies, that may inform the pattern of switching between tobacco products, especially among those who have used or currently use multiple tobacco products. Previous studies have indicated that a partial ban on flavored ENDS would reduce the use of ENDS,<sup>39,40</sup> but the use of other tobacco products that are still available in flavors would also be expected.<sup>39,41-43</sup> Our finding of significant differences in flavor preference according to product suggests that there is an association of particular flavorings to particular tobacco products. Therefore, with the enforcement of the sale of flavored cartridge-based ENDS that are appealing to children,<sup>11</sup> consumers of non-cigarette tobacco products may not be likely to switch across products to maintain use of a particular flavor category given the currently available flavors. For example, the JUUL flavor ban may have resulted in the switching to disposable ENDS that do have flavors. However, more than 30% of participants have used 2 or more flavored tobacco products fairly regularly at some point in their lifetime. Therefore, these participants may be more inclined to continue or switch products to maintain their nicotine addiction. In addition, a longitudinal study<sup>25</sup> that examined changes in flavor use in response to hypothetical flavor bans found that about 50% of the participants would “find a way” to buy their preferred flavor or aftermarket flavor additives.<sup>25</sup> This continued use of tobacco products would still pose a risk to public health,<sup>44</sup> and future policies should then be implemented. Although our data do not suggest that users will switch non-cigarette tobacco products to maintain flavor preference, past research has indicated that use of other products is likely, as well as consumers finding a way to maintain the use of their flavor.

### Human Subjects Approval Statement

The Population Assessment of Tobacco and

Health Study was approved by the Westat Institutional Review Board.

### Conflict of Interest Disclosure Statement

MLG receives fees for serving on an advisory board from Johnson & Johnson and grant support from Pfizer. All other authors did not have any conflicts to report.

### Acknowledgements

This work was supported by the US Food and Drug Administration and National Cancer Institute (U54CA238110) and by the University of Rochester CTSA award number TL1 TR002000 from the National Center for Advancing Translational Sciences of the National Institutes of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or the US Food and Drug Association.

### References

1. Family Smoking Prevention and Tobacco Control Act, Pub. L. No. 111-31. <https://www.congress.gov/111/plaws/publ31/PLAW-111publ31.pdf>. Published June 22, 2009. Accessed July 15, 2020.
2. US Food Drug Administration. 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; restrictions on the sale and distribution of tobacco products and required warning statements for tobacco products. Final rule. *Fed Regist.* 2016;81(90):28973-29106.
3. City of Providence. No. 42 An ordinance amending Article XV of Chapter 14 of the Code of Ordinances of the City of Providence, Entitled: "Licenses" by adding thereto the following sections. <http://www.providenceri.gov/eFile/2036.pdf>. Published 2012. Accessed January 8, 2020.
4. NYC Commissioner of Health and Mental Hygiene. Chapter 28: Restriction on the sale of certain flavored tobacco products. <https://www1.nyc.gov/assets/doh/downloads/pdf/about/healthcode/health-code-chapter28.pdf>. Published 2010. Accessed January 8, 2020.
5. City of Chicago. Amendment of Chapter 4-64 of Municipal Code by adding new Section 4-64-098 regarding flavored tobacco products and amending Section 4-64-180 (a) no person shall sell tobacco products or accessories within 100 feet of any building, school or child care facility; (b) no person shall sell tobacco products at any location within 500 feet of public, private or parochial elementary school or secondary school. <https://www.chicago.gov/content/dam/city/depts/bacp/tobacco/flavoredtobaccord04212014.pdf>. Published 2013. Accessed January, 8, 2020.
6. CBS San Francisco, Bay City News Service. Santa Clara County bans sale of flavored tobacco products often marketed towards young people. <https://sanfrancisco.cbslocal.com/2014/11/06/santa-clara-county-bans-sale-of-flavored-tobacco-products-often-marketed-towards-young-people/>. Published 2014. Accessed January, 8, 2020.
7. Bach L. States & localities that have restricted the sale of flavored tobacco products. Campaign for Tobacco-Free Kids. <https://www.tobaccofreekids.org/assets/factsheets/0398.pdf>. Published 2020. Accessed June 8, 2020.
8. New York State Division of the Budget. FY 2021 enacted state budget financial plan. <https://www.budget.ny.gov/pubs/archive/fy21/enac/fy21-enacted-fp.pdf>. 7507-A2020. Published 2020. Accessed July 15, 2020.
9. US Centers for Disease Control and Prevention. Outbreak of lung injury associated with the use of e-cigarette, or vaping, products. [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease.html](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html). Published 2020. Accessed January 30, 2020.
10. Ducharme J. As the number of vaping-related deaths climbs, these states have implemented e-cigarette bans. *Time*. <https://time.com/5685936/state-vaping-bans/>. Published October 15, 2019. Accessed January 30, 2020.
11. US Food and Drug Administration. FDA finalizes enforcement policy on unauthorized flavored cartridge-based e-cigarettes that appeal to children, including fruit and mint. <https://www.fda.gov/news-events/press-announcements/fda-finalizes-enforcement-policy-unauthorized-flavored-cartridge-based-e-cigarettes-appeal-children>. Published January 2, 2020. Accessed January 30, 2020.
12. Carpenter CM, Wayne GF, Pauly JL, et al. New cigarette brands with flavors that appeal to youth: tobacco marketing strategies. *Health Aff (Millwood)*. 2005;24(6):1601-1610.
13. Klein SM, Giovino GA, Barker DC, et al. Use of flavored cigarettes among older adolescent and adult smokers: United States, 2004-2005. *Nicotine Tob Res.* 2008;10(7):1209-1214.
14. Kostygina G, Glantz SA, Ling PM. Tobacco industry use of flavours to recruit new users of little cigars and cigarillos. *Tob Control.* 2016;25(1):66-74.
15. Rabinoff M, Caskey N, Rissling A, Park C. Pharmacological and chemical effects of cigarette additives. *Am J Public Health.* 2007;97(11):1981-1991.
16. Squier CA, Mantz MJ, Wertz PW. Effect of menthol on the penetration of tobacco carcinogens and nicotine across porcine oral mucosa ex vivo. *Nicotine Tob Res.* 2010;12(7):763-767.
17. Sterling KL, Fryer CS, Nix M, Fagan P. Appeal and impact of characterizing flavors on young adult small cigar use. *Tob Regul Sci.* 2015;1:42-53.
18. Soule EK, Lopez AA, Guy MC, Cobb CO. Reasons for using flavored liquids among electronic cigarette users: a concept mapping study. *Drug Alcohol Depend.* 2016;166:168-176.
19. Feirman SP, Lock D, Cohen JE, et al. Flavored tobacco products in the United States: a systematic review assessing use and attitudes. *Nicotine Tob Res.* 2016;18(5):739-749.
20. Ben Taleb Z, Breland A, Bahelah R, et al. Flavored versus nonflavored waterpipe tobacco: a comparison of toxicant

- exposure, puff topography, subjective experiences, and harm perceptions. *Nicotine Tob Res.* 2019;21(9):1213-1219.
21. Goldenson NI, Kirkpatrick MG, Barrington-Trimis JL, et al. Effects of sweet flavorings and nicotine on the appeal and sensory properties of e-cigarettes among young adult vapers: application of a novel methodology. *Drug Alcohol Depend.* 2016;168:176-180.
  22. Kim H, Lim J, Buehler SS, et al. Role of sweet and other flavours in liking and disliking of electronic cigarettes. *Tob Control.* 2016;25(Suppl 2):ii55-ii61.
  23. Audrain-McGovern J, Strasser AA, Wileyto EP. The impact of flavoring on the rewarding and reinforcing value of e-cigarettes with nicotine among young adult smokers. *Drug Alcohol Depend.* 2016;166:263-267.
  24. Hoffman AC, Salgado RV, Dresler C, et al. Flavour preferences in youth versus adults: a review. *Tob Control.* 2016;25(Suppl 2):ii32-ii39.
  25. Du P, Bascom R, Fan T, et al. Changes in flavor preference in a cohort of long-term electronic cigarette users. *Ann Am Thorac Soc.* 2020;17(5):573-581.
  26. Zare S, Nemati M, Zheng Y. A systematic review of consumer preference for e-cigarette attributes: flavor, nicotine strength, and type. *PLoS One.* 2018;13(3):e0194145.
  27. Green BG, Schullery MT. Stimulation of bitterness by capsaicin and menthol: differences between lingual areas innervated by the glossopharyngeal and chorda tympani nerves. *Chem Senses.* 2003;28(1):45-55.
  28. Schneller LM, Bansal-Travers M, Goniewicz ML, et al. Use of flavored e-cigarettes and the type of e-cigarette devices used among adults and youth in the US-results from Wave 3 of the Population Assessment of Tobacco and Health Study (2015-2016). *Int J Environ Res Public Health.* 2019;16(16):2991-3003.
  29. Schneller LM, Bansal-Travers M, Goniewicz ML, et al. Use of flavored electronic cigarette refill liquids among adults and youth in the US-Results from Wave 2 of the Population Assessment of Tobacco and Health Study (2014-2015). *PLoS One.* 2018;13(8):e0202744.
  30. Villanti AC, Johnson AL, Ambrose BK, et al. Flavored tobacco product use in youth and adults: findings from the First Wave of the PATH Study (2013-2014). *Am J Prev Med.* 2017;53(2):139-151.
  31. Rostron BL, Cheng YC, Gardner LD, Ambrose BK. Prevalence and reasons for use of flavored cigars and ENDS among US youth and adults: estimates from Wave 4 of the PATH Study, 2016-2017. *Am J Health Behav.* 2020;44(1):76-81.
  32. Corey CG, Holder-Hayes E, Nguyen AB, et al. US adult cigar smoking patterns, purchasing behaviors, and reasons for use according to cigar type: findings from the Population Assessment of Tobacco and Health (PATH) Study, 2013-2014. *Nicotine Tob Res.* 2018;20(12):1457-1466.
  33. Scott-Sheldon LAJ, Stroud LR. Preferences and perceptions of flavored hookah tobacco among US women. *Am J Health Behav.* 2018;42(3):37-46.
  34. Chen-Sankey JC, Choi K, Kirchner TR, et al. Flavored cigar smoking among African American young adult dual users: an ecological momentary assessment. *Drug Alcohol Depend.* 2019;196:79-85.
  35. Schneller LM, Lindgren BR, Shields PG, et al. Strong preference for mint snus flavor among research participants. *Addict Behav Rep.* 2017;6:51-55.
  36. Creamer MR, Wang TW, Babb S, et al. Tobacco product use and cessation indicators among adults - United States, 2018. *MMWR Morb Mortal Wkly Rep.* 2019;68(45):1013-1019.
  37. Huang LL, Baker HM, Meernik C, et al. Impact of non-menthol flavours in tobacco products on perceptions and use among youth, young adults and adults: a systematic review. *Tob Control.* 2017;26(6):709-719.
  38. Quisenberry AJ, Klein EG, Hinton A, et al. E-cigarette and combustible tobacco use motivations among exclusive and dual e-cigarette users. *Tob Regul Sci.* 2018;4(4):63-72.
  39. Courtemanche CJ, Palmer MK, Pesko MF. Influence of the flavored cigarette ban on adolescent tobacco use. *Am J Prev Med.* 2017;52(5):e139-e146.
  40. Harrell MB, Loukas A, Jackson CD, et al. Flavored tobacco product use among youth and young adults: what if flavors didn't exist? *Tob Regul Sci.* 2017;3(2):168-173.
  41. Buckell J, Marti J, Sindelar JL. Should flavours be banned in cigarettes and e-cigarettes? Evidence on adult smokers and recent quitters from a discrete choice experiment. *Tob Control.* 2018;28(2):168-175.
  42. Chaiton M, Schwartz R, Cohen JE, et al. Association of Ontario's ban on menthol cigarettes with smoking behavior 1 month after implementation. *JAMA Intern Med.* 2018;178(5):710-711.
  43. Rose SW, Ganz O, Zhou Y, et al. Longitudinal response to restrictions on menthol cigarettes among young adult US menthol smokers, 2011-2016. *Am J Public Health.* 2019;109(10):1400-1403.
  44. US Department of Health and Human Services (USDHHS). *The Health Consequences of Smoking - 50 Years of Progress: A Report of the Surgeon General.* Atlanta, GA: USDHHS, US Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2014. [https://www.ncbi.nlm.nih.gov/books/NBK179276/pdf/Bookshelf\\_NBK179276.pdf](https://www.ncbi.nlm.nih.gov/books/NBK179276/pdf/Bookshelf_NBK179276.pdf). Published 2014. Accessed July 15, 2020.
  45. Russell C, McKeganey N, Dickson T, Nides M. Changing patterns of first e-cigarette flavor used and current flavors used by 20,836 adult frequent e-cigarette users in the USA. *Harm Reduct J.* 2018;15(1):33.
  46. Hyland A, Ambrose BK, Conway KP, et al. Design and methods of the Population Assessment of Tobacco and Health (PATH) Study. *Tob Control.* 2017;26(4):371-378.
  47. Soneji SS, Knutzen KE, Villanti AC. Use of flavored e-cigarettes among adolescents, young adults, and older adults: findings from the Population Assessment for Tobacco and Health Study. *Public Health Rep.* 2019;134(3):282-292.
  48. Kasza KA, Ambrose BK, Conway KP, et al. Tobacco-product use by adults and youths in the United States in 2013 and 2014. *N Engl J Med.* 2017;376(4):342-353.
  49. Delnevo CD, Hrywna M. Clove cigar sales following the US flavoured cigarette ban. *Tob Control.* 2015;24(e4):e246-e250.
  50. Delnevo CD, Villanti AC, Giovino GA. Trends in menthol and non-menthol cigarette consumption in the U.S.A.: 2000-2011. *Tob Control.* 2014;23(e2):e154-e155.

51. Krusemann EJZ, Boesveldt S, de Graaf K, Talhout R. An e-liquid flavor wheel: a shared vocabulary based on

systematically reviewing e-liquid flavor classifications in literature. *Nicotine Tob Res.* 2019;21(10):1310-1319.

**Supplemental Table 1**  
**Flavored Tobacco Products Used Exclusively and in Combination among Adults**  
**(N = 9037) - The Population Assessment of Tobacco and Health Wave 3**

Tobacco product combinations	N	Percent
ENDS only	2539	27.0
Smokeless only	979	13.2
Traditional cigars only	686	11.2
Cigarillos/Filtered cigars only	955	11.1
Hookah only	695	6.6
Traditional cigars & Cigarillos/Filtered cigars	455	5.4
ENDS & Hookah	495	4.3
ENDS & Cigarillos/Filtered cigars	424	4.1
ENDS & Smokeless	227	2.2
ENDS, Traditional cigars, & Cigarillos/Filtered cigars	194	1.8
ENDS & Traditional cigars	152	1.6
Traditional cigars & Smokeless	112	1.4
ENDS, Cigarillos/Filtered cigars, & Hookah	157	1.2
Traditional cigars, Cigarillos/Filtered cigars, & Smokeless	88	1.0
ENDS, Traditional cigars, Cigarillos/Filtered cigars, & Hookah	105	0.9
Cigarillos/Filtered cigars & Hookah	115	0.9
Cigarillos/Filtered cigars & Smokeless	80	0.9
Traditional cigars & Hookah	72	0.8
ENDS, Cigarillos/Filtered cigars, & Smokeless	77	0.7
ENDS, Traditional cigars, Cigarillos/Filtered cigars, & Smokeless	71	0.7
ENDS, Traditional cigars, & Hookah	62	0.5
Traditional cigars, Cigarillos/Filtered cigars, & Hookah	50	0.5
ENDS, Hookah, & Smokeless	45	0.4
ENDS, Traditional cigars, & Smokeless	37	0.4
ENDS, Traditional cigars, Cigarillos/Filtered cigars, Hookah, & Smokeless	38	0.4
ENDS, Cigarillos/Filtered cigars, Hookah, & Smokeless	35	0.3
Hookah & Smokeless	34	0.3
Traditional cigars, Cigarillos/Filtered cigars, Hookah, & Smokeless	20	0.2
ENDS, Traditional cigars, Hookah, & Smokeless	18	0.2
Traditional cigars, Hookah, & Smokeless	9	0.1
Cigarillos/Filtered cigars, Hookah, & Smokeless	11	0.1

**Supplemental Table 2**  
**Flavor Category Use According to Flavored Tobacco Product among Young and Older Adults who were Exclusive or Polyto tobacco Users (N = 9033) – The Population Assessment of Tobacco and Health Wave 3**

Flavor categories	Young adults (18-24 years)					Older adults (≥ 25 years)				
	Used ENDS N = 1930	Used traditional cigars N = 606	Used cigarillos/ filtered cigars N = 995	Used hookah N = 1211	Used snus/ smokeless tobacco N = 593	Used ENDS N = 2746	Used traditional cigars N = 1564	Used cigarillos/ filtered cigars N = 1880	Used hookah N = 750	Used snus/ smokeless tobacco N = 1288
Used tobacco	162 (8.1)	414 (69.7)	453 (45.8)	291 (21.9)	189 (30.8)	851 (31.6)	1164 (77.7)	964 (53.9)	195 (26.6)	545 (43.9)
Used fruit	1123 (57.8)	87 (13.2)	273 (27.6)	747 (63.5)	27 (4.0)	969 (34.7)	142 (7.3)	387 (18.6)	428 (57.6)	55 (4.2)
Used mint/ menthol	324 (17.0)	30 (3.8)	109 (9.7)	261 (23.3)	421 (72.5)	668 (23.7)	86 (4.9)	275 (14.8)	178 (25.7)	717 (54.2)
Used candy/ other sweets	741 (38.6)	31 (5.0)	115 (11.0)	308 (23.8)	8 (1.2)	640 (23.1)	91 (4.7)	199 (9.9)	168 (20.9)	14 (1.0)
Used beverage	163 (8.3)	42 (6.4)	163 (17.2)	104 (8.5)	2 (0.4)	171 (6.0)	64 (3.5)	166 (8.2)	64 (6.9)	14 (1.0)
Used some other flavor	36 (2.0)	18 (2.6)	60 (5.3)	57 (4.6)	19 (3.0)	82 (2.8)	75 (4.5)	125 (6.7)	46 (6.1)	26 (1.9)
Used chocolate	84 (3.9)	23 (4.5)	34 (3.2)	57 (4.2)	2 (0.3)	103 (3.9)	57 (2.8)	95 (5.0)	51 (7.3)	9 (0.8)
Used clove/ spice	32 (1.5)	19 (3.6)	60 (7.1)	38 (2.7)	3 (0.7)	51 (1.5)	29 (1.6)	120 (6.6)	42 (5.8)	3 (0.3)

Note. Bolded point estimates indicate significant differences between age categories in flavor category prevalence according to tobacco product using Chi-square at p < .05. Five non-cigarette tobacco product users were missing data for regular flavor.

Copyright of American Journal of Health Behavior is the property of PNG Publications and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.