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Flavour loyalty may predict cessation or substitution following a cigarillo flavour ban among young adults in the USA

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ABSTRACT

Significance The purpose of this research was to measure flavour loyalty and identify how current cigarillo users may respond to a hypothetical flavour ban in the USA.

Methods Cigarillo users aged 21–28 (n=531) were recruited between October 2020 and April 2021 to participate in an online survey. Respondents categorised their preferred, usual and current cigarillo flavours. Individuals who preferred tobacco flavours were compared with individuals who preferred any other flavours. Strength of preferences, or flavour loyalty, was defined when an individual's preferred flavour matched what they use both usually and currently creating a spectrum of individuals with a strong tobacco preference (n=34), weak tobacco preference (n=20), weak flavour preference (n=162) and strong flavour preference (n=315). Those preferring tobacco were aggregated into any tobacco preference (n=54).

Results Individuals who preferred any flavour scored higher on a scale of nicotine dependence. There was a dose–response relationship in those who said they would discontinue cigarillos if flavoured options were not available: 11.4% of individuals with any tobacco flavour preference, 27.8% of those with a weak flavour preference and 38.1% of those with a strong flavour preference. A similar trend was noted among those who would switch to another product: 19.2% of those with tobacco flavour preference, 34.3% of those with a weak flavour preference and 43.2% of those with a strong flavour preference.

Conclusion Individuals who display strong flavour preferences were more likely to say they would discontinue use or seek out alternative flavoured products following a ban on flavoured cigarillos.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Flavour is a common reason why young adult populations initiate and sustain cigarillo use. Studies evaluating flavour ban policies suggest that individuals may switch to alternative tobacco products yet little is known about how flavour preference may play a role in how young adult cigarillo users may respond to a hypothetical cigarillo flavour ban.

WHAT THIS STUDY ADDS

⇒ This study is the first to examine flavour use as a dimension of consumer loyalty. Individuals with strong flavour preferences are more likely to concurrently use other flavoured products and, when faced with a hypothetical cigarillo flavour ban, were more likely to say that they would discontinue cigarillo use or switch to another flavoured product compared with those who prefer tobacco flavours.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study is the first to define flavour loyalty with respect to cigarillo use and suggests that the magnitude of flavour preference is likely to impact subsequent behavioural change when faced with a flavour ban.

INTRODUCTION

Use of flavoured tobacco products remains a substantial public health concern particularly for youth and young adults.[1–3] While the use of cigarettes has declined, little cigar and cigarillo (LCC) product use has remained stable over the past decade.[4–6] The availability of flavour is a common reason why adolescent populations initiate LCC use[7]; and may also sustain the behaviour for younger populations. In the USA, among those who report current LCC use, more than half, or 60.0%, of adolescent users aged 12–17 years and 70.7% of current young adult users aged 18–24 years report the availability of preferred flavours is among the reasons they use LCCs.[8] Attributes that go in hand with flavour beyond taste, such as smell and descriptors on product packaging, may also contribute to the appeal of flavoured products.[9 10]

In April 2022, the US Food and Drug Administration (FDA) proposed a new product standard that would ban menthol in cigarettes and non-tobacco characterising flavours including menthol in cigars including LCCs.[11] Research evaluating the effectiveness of comprehensive bans of flavoured tobacco products describes a reduction in the prevalence of flavoured product use or sales of flavoured products but prevalence increases among other unflavoured tobacco products among teens and young adults.[12 13] A study on the hypothetical impact of the proposed US restrictions on menthol cigarettes and characterising flavours in cigars found many adult users of these products would substitute with flavoured products still available, such as

e-cigarettes.[14] This pattern suggests current flavoured product users may switch products or find a more accessible substitute, yet little research exists on what populations this may affect or what may be driving substitution behaviour.

One potential factor driving substitution behaviour could be the commonality of polytobacco use among younger populations.[15] The majority of adolescent and young adult cigarillo users use one or more other products.[4] In a conceptual model for multiple product use, researchers argue flavour, among other product characteristics, is an important component contributing to product substitutability and dynamic complementarity.[16] Some research has found individuals report using the same flavour across multiple products[17] while others have found inconsistencies in flavour selection across products noting, however, cigarillo/filtered cigar users had the lowest inconsistency in flavour selection across multiple products.[18] A substantial portion of flavoured cigarillo research focuses on flavours within distinct categories, such as fruit or menthol, rather than an overarching characteristic altering the flavour of the tobacco itself making the product more desirable.

This presents an opportunity to explore flavour as a dimension of consumer loyalty, or the likelihood a tobacco user will continue to purchase tobacco products, which may transcend a specific product type. Discounting and advertising content have been much more comprehensively explored as dimensions of consumer loyalty and engagement.[19] Cigarette-based research has found specific attributes, including flavour, have been shown to contribute to or lead to product switching across or within brands.[20] There is limited research, however, on if this holds for other products such as cigarillos or filtered cigars.

Cigarillos, or short narrow cigars containing 3–4 g of tobacco and typically do not have a filter, comprise most (94.2%) of the unit sales for cigar products in the USA.[21] This research, as a result, focuses specifically on cigarillo product use. The purpose of this research was to propose a measure of the strength of cigarillo flavour preferences as an indicator of flavour loyalty and identify different ways current young adult cigarillo users may respond to a cigarillo flavour ban in the USA.

METHODS

Population

Study participants were recruited between October 2020 and April 2021 from the Young Cigarillo User Study,[22] as well as online using targeted social media advertising via Facebook and Instagram platforms. Young adults are a vulnerable population designated by the US FDA's Center for Tobacco Products and the minimum legal purchasing age for tobacco products in the USA is 21 years.[23] As a result, this study focused on young adults aged 21–28. Additionally, eligible participants had to reside in the USA and self-report use of two or more cigarillos in the past 7 days. Sexual and gender minority individuals who identified as women who did not identify as heterosexual and individuals who identified as transwomen were oversampled due to higher prevalence of cigarillo use within that population.[24] Participants were administered an online survey regarding their tobacco use behaviours and flavour preferences and received a $15 incentive on survey completion. Valid surveys were determined based on several quality control measures such as duplicate IP addresses and those determined to be outside of the USA as well as respondents missing more than two out of three attention check questions.[25]

Overall, 7086 individuals were screened for participation. Of these, 3183 (44.9%) met the eligibility criteria and were invited to participate; 1037 (32.6%) began the survey and 844 (81.4%) completed the survey. Overall, 586 (69.4%) individuals were determined to have a valid survey response. Individuals who had partial or incomplete responses, or answered fewer than 80% of questions, were excluded from analysis per guidelines from the American Association for Public Opinion Research[26] leading to a total sample of 531 (90.6%).

Strength of flavour preference

Participants were asked an open-ended question to identify their favourite flavour for smoking a cigarillo and were then asked, 'In which category does your top flavour choice fit?'. Respondents were given the following options: fruit, sweet and candy, mint, alcohol, menthol, tobacco and other. All respondents selecting any flavour besides tobacco were combined into a flavour preference group while those selecting tobacco were considered the tobacco preference group. Strength of preference, or flavour loyalty, was measured by determining if their recent and usual cigarillo use behaviours matched their preference (flavour or tobacco). To capture this, they were asked what flavours, if any, they used in the past 30 days and what flavours, if any, they usually use. A spectrum of flavour loyalty was created reflecting a preference (flavour or tobacco) and whether or not their preference was both recently and usually used (strong if both recently and usually used and weak if recently or usually used or not used recently/usually at all): strong tobacco preference (n=34), weak tobacco preference (n=20), weak flavour preference (n=162) and strong flavour preference (n=315). Due to the low sample sizes observed among those preferring tobacco, this group was aggregated in any tobacco preference (n=54) regardless of the strength of their preference.

Demographic characteristics

Demographic characteristics of interest included gender, sexual, racial and ethnic identities. Each group was dichotomised to explore any issues in equity between traditional majority population and minoritised populations. Participants were asked to self-report their current gender identity: male identifying (male, trans male/man) and female identifying (female, trans female/woman); racial identity: white and non-white (American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian or Pacific Islander, multiracial, another unlisted); and ethnic identity: non-Hispanic and Hispanic. Individuals who did not provide a gender, racial or ethnic identity, or who identified as gender queer, non-conforming or non-binary were not included in demographic comparisons due to limited sample sizes.

Polytobacco and flavoured tobacco use

To identify differences in tobacco product use among those along the spectrum of flavour preference, we examined both ever and current use of non-menthol cigarettes, menthol cigarettes, e-cigarettes, smokeless tobacco, and hookah or waterpipe. Ever and current product use was measured using questions from the Population Assessment of Tobacco and Health study.[27] For non-menthol and menthol cigarettes, ever use was measured using 'Have you ever smoked a [cigarette], even one or two puffs?'. E-cigarette use was measured using 'Have you ever used an electronic cigarette, e-cigarette, or vape such as JUUL, SMOK, Suorin, Vuse, Blu, Posh or Mojo?'. Smokeless tobacco was measured using 'Have you ever used smokeless tobacco, chewing tobacco, snuff, or snus?'. Hookah was measured using 'Have you ever used a hookah or water pipe?'. Current use of each

of the products was measured using 'When did you last smoke a [tobacco product]?'. Individuals who reported use within the past 30 days were defined as current users.

An additional product-neutral measure of nicotine dependence, developed by Flocke *et al*,[28] was included to account for levels of dependence across flavour preference categories. Nicotine dependence was calculated based on 10 items, each with a 5-point response scale with scores ranging from 1 (low) to 5 (high). Average response scores were calculated among participants who responded to at least seven items.

Current use of flavoured tobacco was also examined across products. For cigarillos and e-cigarettes, participants were asked 'In the past 30 days [were/was] any of the flavours you used flavoured to taste like fruit, sweet and candy, mint, alcohol, menthol or other flavour?'. Individuals were asked to select which flavours were used from the following options: fruit, sweet and candy, mint, alcohol, menthol, tobacco and other. If any non-tobacco flavour was selected, they were determined to have used a flavour in the past 30 days. Individuals who stated they used smokeless tobacco or hookah in the past 30 days were asked, 'When you use [tobacco product], do you usually use any of the following flavours: fruit, sweet and candy, mint, alcohol, menthol or other flavour?'. If they reported 'Yes' they were determined to be current flavour users.

Discontinuation and substitution

Cigarillo discontinuation was assessed with a single item adapted from Harrell *et al*,[29] asking participants 'Would you continue using cigarillos if flavored options were no longer available?'. Product substitution was measured using an item adapted from O'Connor *et al*,[30] 'What would you do if you could not get flavored cigarillos? (choose all that apply)'. Response options included: I would switch to non-menthol cigarettes; I would switch to unflavoured e-cigarettes or vapes; I would switch to another unflavoured tobacco product that is not a cigarette or e-cigarette; I would switch to menthol cigarettes; I would switch to flavoured e-cigarettes or vapes; and I would switch to another flavoured tobacco product that is not a cigarette or e-cigarette. Flavoured and unflavoured products were grouped together but not mutually exclusive as respondents may have selected multiple flavoured/unflavoured products. Pathways for discontinuation and substitution were examined to identify those who would discontinue cigarillo use and not switch to another product; those who would continue using cigarillos and not switch to another product; those who may or may not continue to use cigarillos but would switch to an unflavoured product; and those who may or may not continue to use cigarillos but would switch only to another flavoured product.

Analysis

Bivariate relationships were examined using χ^2 tests across categorical demographics, tobacco use histories, cigarillo continuation and substitution behaviours. Continuous variables such as nicotine dependence were examined using analysis of variance tests. Fisher's exact tests were used in place of χ^2 when sample sizes were less than 10. Logistic regression was used to examine the odds of discontinuation and the odds of substitution with another tobacco product given the strength of flavour preference and controlling for nicotine dependence and current, past 30-day use of other tobacco products as described earlier. One final logistic model was used to examine the odds of substitution with only a flavoured tobacco product given the strength of flavour preference controlling also for nicotine dependence and current use of any other flavoured products as described earlier. All analyses were conducted using SAS (V.9.4).[31]

RESULTS

The majority of the sample identified as non-white (59.7%) and non-Hispanic (80.0%) (table 1). Nearly half (42.3%) of participants had some college or an associate's degree. Use of other tobacco products was common with about two-thirds or more reporting having ever used menthol cigarettes (76.6%), non-menthol cigarettes (70.2%), hookah (66.3%) and e-cigarettes (65.7%) with 61.5% of ever menthol cigarette users, 58.3% of ever non-menthol cigarette users and 67.6% of ever e-cigarette users, having smoked within the past 30 days. Having any flavour preference was associated with higher nicotine dependence scores compared with those with any tobacco preference at 2.98 (95% CI 2.88 to 3.08) and 2.64 (95% CI 2.42 to 2.87), respectively.

Overall, use of flavoured cigarillos within the past 30 days was reported among 81.7% of the study population while current use of the tobacco-flavoured options was much lower at 23.9%. Despite strength of flavour preference, 9.5% (95% CI 6.3% to 12.8%) of those with a strong flavour preference reported using an unflavoured cigarillo in the past 30 days and 46.3% (95% CI 32.6% to 60.0%) of those with a tobacco preference reported using a flavoured cigarillo in the past 30 days (online supplemental table 1). Individuals with a strong flavour preference were more likely to use other flavoured products such as e-cigarettes and hookah.

Flavour loyalty was associated with product discontinuation with 38.1% (95% CI 32.7% to 43.6%) of those with a strong flavour preference saying they would not continue to use cigarillos versus just 11.4% (95% CI 2.6% to 20.5%) of those with any tobacco flavour preference (table 2). This group was also most likely to indicate they would switch to another product with that product most likely being a flavoured option, specifically menthol cigarettes, flavoured e-cigarettes or another flavoured tobacco product, and less likely to be an unflavoured or tobacco-flavoured option.

Pathways for how current cigarillo users may respond to a ban on cigarillo flavours are depicted in figure 1. Nearly one-fifth, 19.8% (n=99), indicated they would not continue using cigarillos and would also not switch to another product (red) while 42.0% (n=210) would continue using unflavoured cigarillos and not switch to another product (orange). Only 13.6% (n=68) would switch to any unflavoured product and may or may not continue using unflavoured cigarillos, with 6.2% overall (n=31) switching only to unflavoured products (yellow) and 7.4% (n=37) switching to both unflavoured and flavoured products (green). Approximately a quarter (24.6%, n=123) may or may not continue using unflavoured cigarillos but would switch to only another flavoured product (blue). No differences were observed between these pathways' demographic compositions, but their ever or current use of other tobacco products was different (table 3). Individuals who had ever used non-menthol cigarettes, menthol cigarettes, e-cigarettes or hookah were about twice as likely or greater to indicate, if they would not substitute products, that they would continue to use unflavoured cigarillos than discontinue cigarillo use, and for those who would substitute with other products, that they would substitute with flavoured products only rather than unflavoured products.

Adjusting for nicotine dependence and current product use, the odds of individuals reporting they would discontinue cigarillo use if flavours unavailable were 1.6 times higher among

Table 1 Demographic characteristics and other tobacco use behaviours by strength of cigarillo flavour preference among US young adult cigarillo users

	Full sample n=531		Any tobacco preference n=54		Weak flavour preference n=162		Strong flavour preference n=315		
	n	%	%	95% CI	%	95% CI	%	95% CI	P value*
Gender identity									0.14
Male identifying	205	39.5	51.9	38.1 to 65.6	37.2	29.5 to 44.8	38.5	33.1 to 44.0	
Female identifying	314	60.5	48.1	34.4 to 61.9	62.8	55.2 to 70.5	61.5	56.0 to 66.9	
Racial identity									0.74
White	208	40.3	39.6	46.8 to 74.0	38.0	30.3 to 45.6	41.6	36.1 to 47.2	
Non-white	308	59.7	60.4	26.0 to 53.2	62.0	54.4 to 69.7	58.4	52.8 to 63.9	
Ethnic identity									0.01
Non-Hispanic	413	80.0	94.1	87.4 to 100	80.6	74.4 to 86.9	77.4	72.7 to 82.1	
Hispanic	103	20.0	5.9	0 to 12.6	19.4	13.1 to 25.6	22.6	17.9 to 27.3	
Non-menthol cigarettes									
Ever	372	70.2	74.1	62.0 to 86.1	72.2	65.3 to 79.2	68.5	63.3 to 73.6	0.56
Current	217	58.3	55.0	38.9 to 71.1	62.4	53.5 to 71.3	56.7	50.1 to 63.4	0.49
Menthol cigarettes									
Ever	406	76.6	83.3	73.1 to 93.6	78.4	72.0 to 84.8	75.5	69.7 to 79.4	0.33
Current	246	61.5	55.6	40.5 to 70.7	66.9	58.5 to 75.3	59.7	53.4 to 66.1	0.28
E-cigarettes or vape									
Ever	349	65.7	63.0	49.7 to 76.3	61.7	54.2 to 69.3	68.3	63.1 to 73.4	0.33
Current	234	67.6	52.9	35.3 to 70.6	65.3	55.7 to 74.9	71.0	64.9 to 77.2	0.09
Smokeless tobacco									
Ever	138	26.0	29.6	17.0 to 42.2	31.5	24.3 to 38.7	22.6	18.0 to 27.3	0.09
Current	62	45.9	37.5	10.9 to 64.1	61.2	47.1 to 75.4	37.1	25.5 to 48.7	0.03
Hookah or waterpipe									
Ever	352	66.3	75.9	64.1 to 87.7	61.7	54.2 to 69.3	67.0	61.8 to 72.2	0.18
Current	140	40.0	24.4	10.7 to 38.1	44.9	34.9 to 54.9	40.8	34.1 to 47.4	0.07

*P value based on χ^2 tests. X^2 tests for ever and current use of tobacco products are compared with never and not current use.

those with a strong flavour preference than those with a weak flavour preference compared with those who prefer tobacco (table 4). Higher nicotine dependence scores were associated with a reduced odds of intention to discontinue cigarillos. In examining those who would substitute with another tobacco product, only those with a strong flavour preference had significantly greater odds of substitution compared with those with a tobacco preference. Nicotine dependence and current other

Table 2 Anticipated responses of young adult cigarillo users to a hypothetical ban on flavoured cigarillos by strength of cigarillo flavour preference in the USA

	Any tobacco preference n=52			Weak flavour preference n=144			Strong flavour preference n=312			
	n	%	95% CI	n	%	95% CI	n	%	95% CI	P value*
Cigarillo continuation										<0.01
Would continue use	46	88.5	79.5 to 97.4	104	72.2	64.8 to 79.6	193	61.9	56.4 to 67.3	
Discontinue use	6	11.4	2.6 to 20.5	40	27.8	20.4 to 35.2	119	38.1	32.7 to 43.6	
Product substitution										<0.01
Would not switch to another product	42	80.8	69.7 to 91.8	92	65.7	57.8 to 73.7	175	56.8	51.3 to 62.4	
Would switch to another product	10	19.2	8.2 to 30.3	48	34.3	26.3 to 42.2	133	43.2	37.6 to 48.7	
Flavoured product substitution†										
Switch to a flavoured product	6	60.0	23.1 to 96.9	36	75.0	62.3 to 87.7	118	88.7	83.3 to 94.2	<0.01
Menthol cigarette	3	50.0	0 to 100	9	25.0	10.1 to 39.9	31	26.1	18.0 to 34.1	
Flavoured e-cigarette	1	16.7	0 to 59.5	24	66.7	50.5 to 82.8	78	65.5	56.9 to 74.2	
Other flavoured tobacco product	2	33.3	0 to 87.5	16	44.4	27.4 to 61.5	62	52.1	43.0 to 61.2	
Switch to an unflavoured product	7	70.0	35.4 to 100	19	39.6	25.2 to 53.9	42	31.6	23.6 to 39.6	<0.01
Non-menthol cigarette	3	42.9	0 to 92.3	9	45.0	21.1 to 68.9	17	40.5	25.0 to 56.0	
Unflavoured e-cigarette	0	0.0	–	9	45.0	21.1 to 68.9	15	35.7	20.6 to 50.8	
Other unflavoured tobacco product	4	57.1	7.7 to 100	8	40.0	16.5 to 63.5	30	47.6	31.9 to 63.4	

*P value based on χ^2 tests.
†Only among those who said they would switch to another tobacco product.

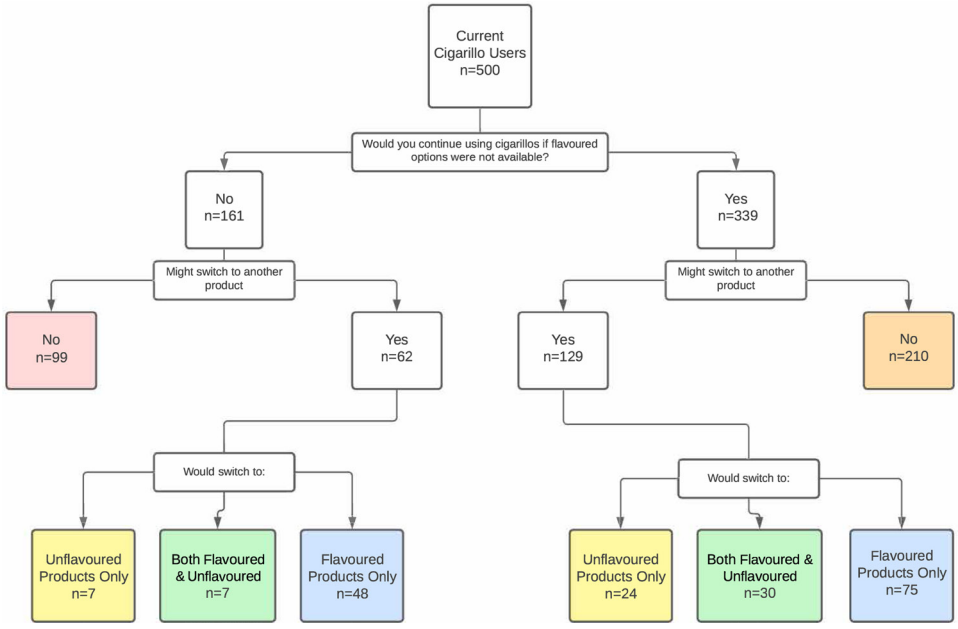

Figure 1 Pathways of response for young adult (21–28 years) cigarillo users when faced with a hypothetical ban on cigarillo flavours in the USA.

product use were also associated with higher odds of intention to switch to another tobacco product. Those with a strong flavour preference were 1.8 times as likely to only switch to a flavoured product than those with a weak flavour preference. Current use of another flavoured tobacco product also significantly increased these odds.

DISCUSSION

This study is the first to conceptualise flavour as a specific dimension of consumer loyalty with respect to tobacco use, specifically to cigarillo products. Our research highlights a substantial prevalence of flavour use in general with strong flavour preferences among cigarillo users. While no difference was observed in ever and current polyproduct use, individuals with stronger flavour preferences were more likely to concurrently use other flavoured products, such as e-cigarettes and hookah. Research on consumer loyalty for cigarette users suggests strong consumer relationships likely facilitate product loyalty making individuals less likely to quit or switch to alternative products.[32–34] The high prevalence of individuals in reporting they would continue to use unflavoured cigarillos (67.8%), with or without substituting other products, suggests similar loyalty may exist among cigarillo product users. However, a substantial number of individuals indicated they would switch to another flavoured product

Table 3 Characteristics of different pathways of response for young adult cigarillo users in response to a hypothetical ban on cigarillo flavours in the USA

	Would not substitute				Would substitute				
	Discontinue cigarillo use n=99		Continue cigarillo use n=210		With unflavoured products* n=68		With flavoured products only* n=123		
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	P value†
Non-menthol cigarettes									
Ever	15.8	11.9 to 19.6	39.8	34.7 to 45	16.0	12.2 to 19.9	28.4	23.6 to 33.1	<0.01
Current	12.1	7.5 to 16.6	36.2	29.4 to 42.9	20.6	14.9 to 26.3	31.2	24.7 to 37.6	<0.01
Menthol cigarettes									
Ever	15.4	11.7 to 19	41.1	36.2 to 46.1	15.4	11.7 to 19	28.1	23.6 to 32.6	<0.01
Current	11.7	7.5 to 15.9	44.3	37.9 to 50.8	14.8	10.2 to 19.4	29.1	23.2 to 35	0.10
E-cigarettes or vape									
Ever	15.7	11.8 to 19.7	36.0	30.8 to 41.1	17.2	13.1 to 21.3	31.1	26.1 to 36.1	<0.01
Current	13.2	8.7 to 17.7	32.3	26 to 38.5	17.7	12.6 to 22.8	36.8	30.4 to 43.2	<0.01
Smokeless tobacco									
Ever	13.3	7.2 to 19.5	40.0	31.1 to 48.9	18.3	11.3 to 25.4	28.3	20.2 to 36.5	0.07
Current	14.6	4.2 to 24.9	37.5	23.3 to 51.7	18.8	7.3 to 30.2	29.2	15.8 to 42.5	0.97
Hookah or waterpipe									
Ever	17.6	13.5 to 21.7	40.2	34.9 to 45.4	15.8	11.9 to 19.7	26.4	21.7 to 31.1	0.03
Current	18.0	11.4 to 24.7	33.1	25 to 41.2	17.3	10.8 to 23.8	31.6	23.6 to 39.6	0.15

*The sample size of respondents who indicated they would only switch to unflavoured products was low so they were aggregated with those who said that they would switch to unflavoured and flavoured products which was mutually exclusive from those who responded that they would only switch to a flavoured product.
†P value based on χ^2 tests.

Table 4 Logistic regression predicting the likelihood of cigarillo discontinuation and product substitution among young adult cigarillo users in the USA in response to a hypothetical flavour ban

	Unadjusted model		Adjusted model	
	OR	95% CI	OR	95% CI
Would discontinue cigarillos (n=508)				
Cigarillo flavour loyalty				
Any tobacco preference	Ref	Ref	Ref	Ref
Weak flavour preference	2.95	1.17 to 7.44	3.55	1.39 to 9.11
Strong flavour preference	4.72	2.00 to 11.40	5.8	2.36 to 14.23
Nicotine dependence	–	–	0.67	0.54 to 0.84
Current other tobacco product use*	–	–	0.75	0.48 to 1.15
Would substitute with another tobacco product (n=505)				
Cigarillo flavour loyalty				
Any tobacco preference	Ref	Ref	Ref	Ref
Weak flavour preference	2.24	1.04 to 4.84	2.1	0.95 to 4.64
Strong flavour preference	3.29	1.60 to 6.79	3.26	1.55 to 6.89
Nicotine dependence	–	–	1.32	1.06 to 1.65
Current other tobacco product use*	–	–	4.61	2.72 to 7.81
Would substitute with only a flavoured tobacco product (n=436)				
Cigarillo flavour loyalty				
Any tobacco preference	Ref	Ref	Ref	Ref
Weak flavour preference	4.42	1.28 to 15.31	4.17	1.19 to 14.67
Strong flavour preference	7.54	2.28 to 24.95	7.75	2.31 to 26.04
Nicotine dependence	–	–	1.1	0.86 to 1.41
Current other flavoured tobacco product use†	–	–	4.27	2.41 to 7.55

*Current other tobacco product use includes past 30-day use of non-menthol cigarettes, menthol cigarettes, e-cigarettes, smokeless tobacco and/or hookah.
†Current other flavoured tobacco product use includes past 30-day use of menthol cigarettes, flavoured e-cigarettes and/or usual/current use of flavoured smokeless tobacco and/or hookah.

(32.0%) with or without discontinuing cigarillo use, potentially masking the drivers of product preference.

This research is also the first to describe the specific intentions of current young adult cigarillo users in response to a hypothetical flavour ban. Behavioural intention has been demonstrated to correspond to behavioural change.[35] Our research supports the prior findings that flavour bans are not likely to altogether eliminate tobacco use among young people.[29] There is a substantial portion of young adult cigarillo users who will continue using unflavoured cigarillos, which is associated with higher nicotine dependence and tobacco flavour preference.

Individuals who preferred any flavour demonstrated higher levels of nicotine dependence compared with those with tobacco flavour preferences and were more likely to have a stronger reaction to a hypothetical flavour ban either discontinuing cigarillo use altogether or seeking out an alternative flavoured product. While a limitation of this study is that we are not able to assess the factors contributing to nicotine dependence among those with some degree of flavour loyalty, flavourants may be an addictive component reinforcing the bioavailability of nicotine in the brain.[36 37] Future research could benefit from studying the addictive potential and neurological impact of other tobacco and nicotine flavourants.[38]

Implications for tobacco regulatory policy

Concurrent use of flavoured e-cigarettes or electronic nicotine delivery systems (ENDS) is high among cigarillo users as is the frequency of those who said they would switch to them if they could no longer access flavoured cigarillos. It can be reasonably expected that prevalence in use of these products will increase following the implementation of any flavour policy that excludes them, including the FDA's proposed product standards. In the USA, the FDA can limit flavours in ENDS via authorisation decisions[39] but it is unlikely the proposed product standards will be extended to ENDS products in the same way it has been applied to combustible tobacco products.[40] Similarly, most flavour bans on a global scale cover flavours or additives used in combustible tobacco products while few include ENDS and, among those that do, policies are less comprehensive than those applied to combustible tobacco products.[41] The broader implications of this are difficult to ascertain in the short term as ENDS are considered an important tool for harm reduction for current combustible tobacco users[42] yet still pose a larger risk for the broader population, particularly adolescents and young adults.[43] Both perspectives are critical to consider for public health policy but result in competing priorities for public health practitioners and policy makers.[44]

This research relies on an individual's own definition of what would be considered a flavour. Cigarillo users increasingly report being unsure whether they use flavoured products[8] and users may disagree how and whether particular cigarillos are flavoured,[45] possibly corresponding with the growing number of cigarillos available with non-characterising or concept flavours—those with names not explicitly indicating the product's flavour, such as 'Silver', 'Casino' or 'Wild Rush'.[46] Furthermore, chemical analysis of cigarillos shows variation in the level of high-intensity sweeteners present within unflavoured products[47] as well as the presence of similar flavour additives in concept and explicitly flavoured cigarillos.[48] Individuals who said they would continue using unflavoured cigarillos may still be exposed to the same flavour additives and sweeteners. This presents a challenge in measurement for this research as well as others seeking to classify flavoured cigar products. Future research assessing the presence of flavour additives in cigarillos marketed as unflavoured

or concept flavoured, as well as an examination of users' perceptions as to whether these products are flavoured, can help inform more comprehensive flavour policies. These policies may then focus on product constituents and their potential addictive properties, rather than product names and descriptions, to deter initiation and support cessation of combustible tobacco products.

Limitations

This study is limited by the number of participants who use unflavoured or tobacco-flavoured cigarillos. The distribution of flavour use found in this study is not altogether surprising as the majority of US cigarillo sales are flavoured products[49] and approximately half of current cigarillo users across age groups report flavoured product use.[8] The high prevalence of flavour use presents an opportunity for future research into flavour as a component of nicotine dependence among cigarillo users[50] since the limited available research on the role of flavour in tobacco product addiction, other than menthol, has primarily focused on ENDS.[51 52] Lastly, due to the variation in local and state-level policy content and implementation strategies, this research does not account for jurisdictions with pre-existing policies restricting flavour in any tobacco product, including cigarillos or ENDS, nor differences in tobacco taxation.

CONCLUSION

Young adult cigarillo users who display strong flavour preferences are more likely to discontinue use or seek out alternative flavoured products following a hypothetical ban on flavoured cigarillos. This is likely to contribute to increases in prevalence of other flavoured tobacco or nicotine product use, particularly ENDS. This has substantial implications for policy makers across the globe seeking to implement flavour restrictions for tobacco and nicotine products.

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REFERENCES

1 Cullen KA, Liu ST, Bernat JK, *et al*. Flavored tobacco product use among middle and high school students - United States, 2014-2018. *MMWR Morb Mortal Wkly Rep* 2019;68:839.
2 Ambrose BK, Day HR, Rostron B, *et al*. Flavored tobacco product use among US youth aged 12-17 years, 2013-2014. *JAMA* 2015;314:1871–3.
3 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;53:139–51.
4 Edwards KC, Sharma E, Halenar MJ, *et al*. Longitudinal pathways of exclusive and polytobacco cigar use among youth, young adults and adults in the USA: findings from the PATH study waves 1-3 (2013-2016). *Tob Control* 2020;29:s163–9.
5 Loukas A, Batanova M, Fernandez A, *et al*. Changes in use of cigarettes and non-cigarette alternative products among college students. *Addict Behav* 2015;49:46–51.
6 Sterling KL, Fryer CS, Pagano I, *et al*. Little cigars and cigarillos use among young adult cigarette smokers in the United States: understanding risk of concomitant use subtypes. *Nicotine Tob Res* 2016;18:2234–42.
7 Kong G, Bold KW, Simon P, *et al*. Reasons for cigarillo initiation and cigarillo manipulation methods among adolescents. *Tob Regul Sci* 2017;3:48–58.
8 Rostron BL, Cheng Y-C, Gardner LD, *et al*. 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;44:76–81.
9 Sterling KL, Fryer CS, Nix M, *et al*. Appeal and impact of characterizing flavors on young adult small cigar use. *Tob Regul Sci* 2015;1:42–53.
10 Meernik C, Ranney LM, Lazard AJ, *et al*. The effect of cigarillo packaging elements on young adult perceptions of product flavor, taste, smell, and appeal. *PLoS One* 2018;13:e0196236.
11 United States Food and Drug Administration. FDA proposes rules prohibiting menthol cigarettes and flavored Cigars to prevent youth initiation, significantly reduce tobacco-related disease and death; 2022. https://www.fda.gov/news-events/press-announcements/fda-proposes-rules-prohibiting-menthol-cigarettes-and-flavored-cigars-prevent-youth-initiation [Accessed 31 May 2022].
12 Farley SM, Johns M. New York city flavoured tobacco product sales ban evaluation. *Tob Control* 2017;26:78–84.
13 Yang Y, Lindblom EN, Salloum RG, *et al*. The impact of a comprehensive tobacco product flavor ban in San Francisco among young adults. *Addict Behav Rep* 2020;11:100273.
14 Yang Y, Lindblom EN, Ward KD, *et al*. How smokers of menthol cigarettes and flavored cigars might respond to FDA's proposed bans. *Nicotine Tob Res* 2022;6.
15 Osibogun O, Taleb ZB, Bahelah R, *et al*. Correlates of poly-tobacco use among youth and young adults: findings from the population assessment of tobacco and health study, 2013-2014. *Drug Alcohol Depend* 2018;187:160–4.
16 Rubenstein D, Pacek LR, McClernon FJ. Multiple tobacco product use conceptual framework: a 2021 update on evidence. *Nicotine Tob Res* 2022. doi:10.1093/ntr/ntac032. [Epub ahead of print: 05 Feb 2022].
17 Nguyen N, McKelvey K, Halpern-Felsher B. Popular flavors used in alternative tobacco products among young adults. *J Adolesc Health* 2019;65:306–8.
18 Schneller LM, Li D, Tavárez ZQ, *et al*. Flavor inconsistencies between flavored tobacco products among US adults. *Am J Health Behav* 2020;44:617–30.
19 Moran MB, Heley K, Baldwin K, *et al*. Selling tobacco: a comprehensive analysis of the U.S. tobacco advertising landscape. *Addict Behav* 2019;96:100–9.
20 Krystallis A. Uncovering attribute-based determinants of loyalty in cigarette brands. *J Prod Brand Manag* 2013;22:104–17.
21 Centers for Disease Control and Prevention. Cigars. Available: https://www.cdc.gov/tobacco/data_statistics/fact_sheets/tobacco_industry/cigars/index.htm [Accessed 26 May 2022].
22 Ishler KJ, Flocke SA, Albert EL, *et al*. Cigarillo and multiple tobacco product use and nicotine dependence in adolescents and young adults. *Addict Behav* 2020;111:106537.
23 U.S. Food & Drug Administration. Research priorities, 2019. Available: https://www.fda.gov/tobacco-products/research/research-priorities [Accessed 26 May 2022].
24 Wheldon CW, Kaufman AR, Kasza KA, *et al*. Tobacco use among adults by sexual orientation: findings from the population assessment of tobacco and health study. *LGBT Health* 2018;5:33–44.
25 Heffner JL, Watson NL, Dahne J, *et al*. Recognizing and preventing participant deception in online nicotine and tobacco research studies: suggested tactics and a call to action. *Nicotine Tob Res* 2021;23:1810–2.

26 American Association for Public Opinion Research. Standard definitions: final dispositions of case codes and outcome rates for surveys. encyclopedia of survey research methods; 2016. https://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf [Accessed 22 Feb 2022].
27 National Addiction & HIV Data Archive Program. Population Assessment of Tobacco and Health (PATH) study [United States] Public-Use Files (ICPSR 36498), 2021. Available: https://www.icpsr.umich.edu/web/NAHDAP/studies/36498 [Accessed 22 Feb 2022].
28 Flocke SA, Ishler K, Albert E, *et al*. Measuring nicotine dependence among adolescent and young adult cigarillo users. *Nicotine Tob Res* 2022. doi:10.1093/ntr/ntac117. [Epub ahead of print: 05 May 2022].
29 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;3:168–73.
30 O'Connor RJ, Bansal-Travers M, Carter LP, *et al*. What would menthol smokers do if menthol in cigarettes were banned? behavioral intentions and simulated demand. *Addiction* 2012;107:1330–8.
31 SAS Institute. SAS. version 9.4. Cary, NC
32 Lewis M, Wang Y, Cahn Z, *et al*. An exploratory analysis of cigarette price premium, market share and consumer Loyalty in relation to continued consumption versus cessation in a national us panel. *BMJ Open* 2015;5:e008796.
33 DeCicca P, Kenkel D, Liu F, *et al*. Quantifying brand loyalty: evidence from the cigarette market. *J Health Econ* 2021;79:102512.
34 Goldberg RL, Cataldo JK. Using an e-cigarette is like eating tofu when you really want meat. *Am J Health Behav* 2018;42:54–64.
35 Webb TL, Sheeran P. Does changing behavioral intentions engender behavior change? a meta-analysis of the experimental evidence. *Psychol Bull* 2006;132:249.
36 Palmatier MI, Smith AL, Odineal EM, *et al*. Nicotine self-administration with tobacco flavor additives in male rats. *Nicotine Tob Res* 2020;22:224–31.
37 Wickham RJ. How menthol alters tobacco-smoking behavior: a biological perspective. *Yale J Biol Med* 2015;88:279.
38 Kaur G, Muthumalage T, Rahman I. Mechanisms of toxicity and biomarkers of flavoring and flavor enhancing chemicals in emerging tobacco and non-tobacco products. *Toxicol Lett* 2018;288:143–55.
39 United States Food and Drug Administration. FDA denies marketing applications for about 55,000 flavored e-cigarette products for failing to provide evidence that they appropriately protect public health: actions market first marketing denial orders for e-cigarette products; products receiving such orders must be removed from the market or risk enforcement; more marketing decisions to follow; 2021. https://www.fda.gov/news-events/press-announcements/fda-denies-marketing-applications-about-55000-flavored-e-cigarette-products-failing-provide-evidences [Accessed 19 Apr 2022].
40 Chowdhury A, Gill N, Food and Drug Law Institute. Will FDA extend its proposed ban on menthol cigarettes and characterizing flavors in cigars to flavored ends products? 2021. Available: https://www.fdli.org/2021/08/will-fda-extend-its-proposed-ban-on-menthol-cigarettes-and-characterizing-flavors-in-cigars-to-flavored-ends-products/#:~:text=On%20April%2029%2C%202021%2C%20the,cigarillos%20within%20the%20next%20year [Accessed 21 Feb 2022].
41 Erinoso O, Clegg Smith K, Iacobelli M, *et al*. Global review of tobacco product flavour policies. *Tob Control* 2021;30:373–9.
42 Stratton KR, Kwan LY, Eaton DL. *Public health consequences of e-cigarettes*. Washington, DC: National Academies Press, 2018.
43 McNeill A, Brose LS, Calder R. *Evidence review of e-cigarettes and heated tobacco products 2018. A report commissioned by Public Health England*. London: Public Health England, 2018.
44 Fairchild AL, Bayer R, Lee JS. The e-cigarette debate: what counts as evidence? *Am J Public Health* 2019;109:1000–6.
45 Osborn CC, Suratkal JP, Pike Moore SN, *et al*. Dissonance in young adult Cigarillo users' categorization of concept flavored and Unflavored products. *Int J Environ Res Public Health* 2022;19:7219.
46 Gammon DG, Rogers T, Coats EM, *et al*. National and state patterns of concept-flavoured cigar sales, USA, 2012-2016. *Tob Control* 2019;28:394–400.
47 Erythropel HC, Kong G, deWinter TM, *et al*. Presence of high-intensity sweeteners in popular cigarillos of varying flavor profiles. *JAMA* 2018;320:1380–3.
48 Farley SM, Schroth KR, Grimshaw V, *et al*. Flavour chemicals in a sample of non-cigarette tobacco products without explicit flavour names sold in New York City in 2015. *Tob Control* 2018;27:170–6.
49 Delnevo CD, Giovenco DP, Miller Lo EJ. Changes in the mass-merchandise cigar market since the Tobacco Control Act. *Tob Regul Sci* 2017;3:8–16.
50 Odani S, Armour B, Agaku IT. Flavored tobacco product use and its association with indicators of tobacco dependence among US adults, 2014-2015. *Nicotine Tob Res* 2020;22:1004–15.
51 Leventhal A, Cho J, Barrington-Trimis J, *et al*. Sensory attributes of e-cigarette flavours and nicotine as mediators of interproduct differences in appeal among young adults. *Tob Control* 2020;29:679–86.
52 Hobkirk AL, Houser KR, Hoglen B, *et al*. Evidence from an fMRI study that dessert-flavored e-cigarettes engage taste-related, but not smoking-related, brain circuitry for female daily smokers. *Exp Clin Psychopharmacol* 2021. doi:10.1037/pha0000488. [Epub ahead of print: 10 Jun 2021].