Nicotine pouch awareness, use and perceptions among young adults from six metropolitan statistical areas in the United States

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ABSTRACT

INTRODUCTION Nicotine pouches, which emerged in the US in 2016 and are marketed as 'tobacco-free', may appeal to young adults. This study examined young adults' nicotine pouch awareness, use, use intentions, and related factors.

METHODS We analyzed Spring 2022 survey data from 942 young adults recruited via social media from six US cities (mean age=27.61 years, 34.3% men, 33.1% racial/ethnic minority) to characterize nicotine pouch awareness, ever use, use intentions, exposure, and perceptions.

RESULTS Nicotine pouch awareness and ever use were reported by 34.6% and 9.8%, respectively. Males (AOR=1.79; 95% CI: 1.33–2.38), non-White participants (vs White; AOR=1.64; 95% CI: 1.04–2.61), and those using cigarettes (AOR=2.67; 95% CI: 1.63–4.38), e-cigarettes (AOR=2.28; 95% CI: 1.57–3.31), and smokeless tobacco (SLT) (AOR=14.46; 95% CI: 1.81–115.61) had greater odds of awareness. Among those aware of nicotine pouches, males (AOR=2.27; 95% CI: 1.33–3.85), White participants (vs Asian; AOR=0.40; 95% CI: 0.17–0.94), and SLT users (AOR=4.90; 95% CI: 1.26–18.98) had greater odds of ever use; being male (B=0.39; 95% CI: -0.67 – -0.12) and using SLT (B=1.73; 95% CI: 1.10–2.36) predicted greater use intentions. Overall, 31.4% reported past-month advertising exposure, most often via tobacco retailers (67.3%). Ever users most commonly purchased them at gas stations (46.7%). The most frequently reported use motives were to quit combusted tobacco (16.8%) and reduce tobacco smell (15.4%). Nicotine pouches were perceived as less harmful and less addictive than cigarettes, e-cigarettes, and SLT, and more socially acceptable than cigarettes and SLT.

CONCLUSIONS Young adults were exposed to advertising, accessed nicotine pouches via various sources, and perceived these products favorably. Marketing and use surveillance is needed to monitor their impact on those likely to use them (e.g. males, SLT users).

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INTRODUCTION

Nicotine pouches, including brands such as 'on!', 'Velo', and 'Zyn', entered the US in 2016[1,2]. These products contain nicotine salts, which deliver higher levels of nicotine than the free-base nicotine in other smokeless tobacco (SLT) products[1,2]. Since their entrance into the US market, US nicotine pouch sales and advertising expenditures have increased dramatically[3-5].

Nicotine pouches may appeal to young adults, including non-users of nicotine/

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tobacco products. Research on nicotine pouches among US young adults in 2021 indicated that 37.3% were aware, 29.2% reported susceptibility to use, and 3.8% had ever used them[6]. Research in other countries has also shown that, despite low use prevalence among youth and young adults, awareness has increased in these groups[7-9].

Literature from the US and elsewhere has documented factors associated with nicotine pouch awareness and use, such as perceptions. For example, some research has found that young adults hold more favorable perceptions (e.g. less harmful) of nicotine pouches compared to tobacco-derived nicotine, and more favorable perceptions predicted ever using nicotine pouches[6,7]. A 2020 California-based study of young adults documented that half were uncertain about the harm of nicotine pouches relative to cigarettes or e-cigarettes, but willingness to use nicotine pouches was higher among those who used other tobacco products (i.e. other than nicotine pouches)[10]. Research in other countries has also shown that nicotine pouch use is associated with being male, younger age, and use of other tobacco products[7-9].

How nicotine pouches are marketed has implications for consumer perceptions. They are promoted via several channels, including social media, and are often marketed as 'tobacco-free', 'non-tobacco', 'synthetic nicotine', and as more discreet and convenient than cigarettes or e-cigarettes[3,11-13]. Nicotine pouches also have high nicotine content[4] and come in a variety of flavors, such as fruit flavors (e.g. black cherry, citrus), peppermint, and coffee[2,3]. These types of marketing strategies have been used by e-cigarette manufacturers to entice young people[14]. Moreover, young adults who are reluctant to use inhalable products, including e-cigarettes, may be open to trying nicotine pouches.

Nicotine pouches pose complex regulatory considerations. Although the US Food and Drug Administration (FDA) recently authorized modified risk claims in advertising for several snus products[15], nicotine pouches have not yet obtained such authorization. Some evidence indicates that nicotine pouches have a toxicity level lower than combustible tobacco, approaching levels comparable to nicotine replacement therapy products, and also lack exposure to toxins present in some e-cigarettes, such as metals[17]. Nonetheless, the relative health effects of using nicotine pouches compared to e-cigarettes and other non-combustible tobacco products (e.g. heated tobacco products, snus) are unknown[16], particularly pertaining to young adults, especially depending on their prior other tobacco product use.

Given the potential appeal of nicotine pouches to young adults, research examining young adults' product exposure, perceptions, awareness, use, and use intentions is critical to inform regulatory efforts aimed at reducing the negative impact of nicotine pouches on population health. However, research in this area is limited. Thus, this study examined nicotine pouch awareness, use, use intentions, information and product sources, and use perceptions/motives among young adults across six US metropolitan statistical areas (MSAs).

METHODS

This study analyzed cross-sectional data among young adults in a longitudinal study, the Vape shop Advertising, Place characteristics and Effects Surveillance (VAPES) study[17]. Participants were from six MSAs (Atlanta, Boston, Minneapolis, Oklahoma City, San Diego, and Seattle) with varied tobacco legislation[18]. Study details are given elsewhere[17], and only summarized here.

In Fall 2018, participants were recruited via ads on social media (Facebook, Reddit) targeting eligible individuals (i.e. those aged 18–34 years, residing in one of the six MSAs, and spoke English). After clicking ads, individuals were directed to an online consent form and eligibility screener. Eligible individuals were routed to complete the online baseline survey. Upon completion, participants were notified that, in 7 days, they would receive an email asking them to 'confirm' their enrollment, after which they were officially enrolled into the study and emailed their first incentive ($10 Amazon e-gift card). Purposive, quota-based sampling ensured the sample represented sufficient numbers of cigarette and e-cigarette users (roughly one-third each), roughly equal numbers of men and women, and 40% racial/ethnic minority (subgroup enrollment was capped by MSA).

Of the 10433 individuals who clicked on ads, 9847 consented, of which 2751 (27.9%) were not

allowed to advance because they were either: 1) ineligible (n=1472), and/or 2) excluded to reach subgroup target enrollment (n=1279). Of those who advanced, the proportion of completers versus partial completers was 48.8% (3460/7096) versus 51.2% (3636/7096). Partial completers were deemed ineligible for the remainder of the study; the majority of partial completers (n=2469; 67.9%) completed only the sociodemographic section of the survey. Of the 3460 who completed the W1 survey, 3006 (86.9%) confirmed participation 7 days later (additional information available elsewhere)[17].

The current study analyzed survey data collected in Spring 2022 among a subset of participants, selected based on their age (<30 years) as well as for representation across sexes, sexual identity, racial/ethnic backgrounds, and tobacco use to the extent possible. Of the 1147 participants targeted for this assessment, 942 (82.1%) provided complete data (and compensated with a $10 Amazon e-gift card).

Measures

We coded participants' MSA of residence (Atlanta, Boston, Minneapolis, Oklahoma City, San Diego, Seattle, or Other due to moving since W1), and assessed their age, gender, sexual identity, race, and ethnicity. Participants were also asked to report the number of days, in the past 30 days, during which they used cigarettes, e-cigarettes, and SLT.

We began by providing images of 'Zyn', 'Velo', and 'on!' and stated: 'The next few questions are about a new group of nicotine products – tobacco-free nicotine pouches. Many of these come in pouches and packages that look like snus or other smokeless tobacco, but they are white and do not contain any tobacco in them. They do contain nicotine. Some brands include Zyn, Velo, and on!'.

Primary outcomes: nicotine pouch awareness, ever use and use intentions

Awareness and ever use were assessed by asking:

'Have you ever heard of nicotine pouches?' and 'In your lifetime, have you ever tried nicotine pouches?'. Those reporting ever use were asked to report past 30-day use (i.e. current use).

To assess use intentions, participants were asked: 'How likely are you to try or continue to use nicotine pouches in the next year?' (1=not at all, to 7=extremely). To characterize participants' use intentions of other tobacco products, participants were also asked: 'How likely are you to try or continue to use cigarettes, e-cigarettes, and other SLT in the next year?' (1=not at all, to 7=extremely).

Information and product sources

To ascertain these, we asked: 'How did you first learn about nicotine pouches, products or advertisements (paid ads): in stores; advertisements on television; magazines/newspapers; internet/social media; social media; friends/family/co-workers; and use on television/movies?'. We also asked: 'In the last 30 days, have you noticed advertisements for nicotine pouches via: websites; social media; inside/outside tobacco retailers; television; radio; posters/billboards; newspapers/magazines; mail; or e-mail?'. Ever users were asked: 'Where have you bought nicotine pouches: gas station; convenience store; supermarket/grocery store; did not buy; other?'.

Use perceptions and motives

We administered 12 items assessing participant perceptions of harm, addictiveness, and social acceptability of nicotine pouches, cigarettes, e-cigarettes, and other SLT. Specifically, we asked: 'How harmful to your health/addictive/socially acceptable among your peers do you think the use of nicotine pouches/cigarettes/e-cigarettes /other SLT are?' (1=not at all, to 7=extremely).

To assess use motives, we asked: 'People have various reasons for considering or trying new tobacco or nicotine products. If you do not use nicotine pouches, indicate if you potentially would try nicotine pouches for each of the following reasons. If you tried or use nicotine pouches, indicate why (check all that apply.): To help quit combusted tobacco, like cigarettes or cigars; to help reduce combusted tobacco, like cigarettes or cigars; to help quit other tobacco products, like vaping products or e-cigarettes; to help reduce other tobacco products, like vaping products or e-cigarettes; nicotine pouches are less addictive than other tobacco products; nicotine pouches are less harmful to my health than other tobacco products; nicotine pouches are less harmful than cigarettes to the health of those around me; nicotine pouches are easy to use; using nicotine pouches is discreet

(easy to hide); does not cause me to smell like smoke/tobacco; I was curious about the flavors; I was curious about the "buzz"; you can use nicotine pouches in places where other tobacco products are not allowed; nicotine pouches are more acceptable to non-tobacco users; a friend offered it to me; other, please specify; none of the above'.

Statistical analysis

Participants were characterized using descriptive statistics. Next, bivariate analyses were conducted to examine the relationships between sociodemographics and current tobacco use (i.e. cigarette, e-cigarette, and SLT use) with nicotine pouch awareness and ever use. We then conducted adjusted multivariable regressions examining sociodemographic and current tobacco use factors in relation to nicotine pouch awareness (logistic regression), as well as ever use (logistic regression) and future use intentions (linear regression) among those who were aware of nicotine pouches. All analyses were conducted using SPSS v.26, and alpha was set at 0.05.

RESULTS

Nicotine pouch awareness, ever use and use intentions

Table 1 summarizes participant characteristics (mean age=27.61 years, 34.3% men, 33.1% racial/ethnic minority). Table 1 also characterizes participants by nicotine pouch awareness (34.6%, n=326), ever use (9.8%, n=92) and past-month use (2.2%, n=21) .

In multivariable logistic regression analyses (Table 2), males (AOR=1.79; 95% CI: 1.33–2.38), non-White participants (vs White; AOR=1.64; 95% CI: 1.04–2.61), and those using cigarettes (AOR=2.67; 95% CI: 1.63–4.38), e-cigarettes (AOR=2.28; 95% CI: 1.57–3.31), and SLT (AOR=14.46; 95% CI: 1.81–115.61) had greater odds of being aware of nicotine pouches. Males (AOR=2.27; 95% CI: 1.33–3.85), White participants (vs Asian; AOR=0.40; 95% CI: 0.17–0.94), and those using SLT (AOR=4.90; 95% CI: 1.26–18.98) had greater odds of ever use of nicotine pouches among those who reported being aware of nicotine pouches. In multivariable linear

Table 1. Participant characteristics and bivariate analyses examining differences between those aware† versus not aware of nicotine pouches, and those who have ever versus never used them, among young adults, US, 2022 (N=942)

Characteristics	All	Aware of nicotine pouches			Ever use of nicotine pouches		
		No	Yes		No	Yes	
	n (%)	n (%)	n (%)	p	n (%)	n (%)	p
Total	942 (100)	616 (65.4)	326 (34.6)		850 (90.2)	92 (9.8)	
Metropolitan statistical area (MSA)				**0.007**			0.132
Atlanta	145 (15.4)	85 (13.8)	60 (18.4)		128 (15.1)	17 (18.5)	
Boston	176 (18.7)	124 (20.1)	52 (29.5)		164 (19.3)	12 (13.0)	
Minneapolis	143 (15.2)	101 (16.4)	42 (12.9)		125 (14.7)	18 (19.6)	
Oklahoma City	83 (8.8)	57 (9.3)	26 (8.0)		78 (9.2)	5 (5.4)	
San Diego	112 (11.9)	77 (12.5)	35 (10.7)		103 (12.1)	9 (9.8)	
Seattle	128 (13.6)	67 (10.9)	61 (18.7)		109 (12.8)	19 (20.7)	
Other	155 (16.5)	105 (17.0)	50 (15.3)		143 (16.8)	12 (13.0)	
Age (years), mean ± SD	27.61 ± 4.61	27.70 ± 4.58	27.42 ± 4.64	0.375	27.59 ± 4.58	27.73 ± 4.84	0.789
Sex*				**<0.001**			**<0.001**
Male	320 (34.3)	183 (30.0)	137 (42.4)		267 (31.7)	53 (58.9)	
Female	612 (65.7)	426 (70.0)	186 (57.2)		575 (68.3)	37 (41.1)	
Sexual identity				0.591			**0.012**
Sexual minority	465 (49.4)	308 (50.0)	169 (51.8)		431 (50.7)	34 (37.0)	
Straight	477 (50.6)	308 (50.0)	157 (48.2)		419 (49.3)	58 (63.0)	

Continued

Table 1. Continued

Characteristics	All	Aware of nicotine pouches			Ever use of nicotine pouches		
		No	Yes		No	Yes	
	n (%)	n (%)	n (%)	p	n (%)	n (%)	p
Race				0.100			0.217
White	689 (73.1)	464 (75.3)	225 (69.0)		617 (72.6)	72 (78.3)	
Black	43 (4.6)	27 (4.4)	16 (4.9)		42 (4.9)	1 (1.1)	
Asian	115 (12.2)	73 (11.9)	42 (12.9)		107 (12.6)	8 (8.7)	
Other	95 (10.1)	52 (8.4)	43 (13.2)		84 (9.9)	11 (12.0)	
Hispanic[#]	82 (8.8)	47 (7.7)	35 (10.9)	0.105	74 (8.8)	8 (8.8)	0.990
No	847 (91.2)	561 (92.3)	286 (89.1)		764 (91.2)	83 (91.2)	
Past 30-day use of tobacco and other substances							
Nicotine pouches	18 (1.9)	0 (0.0)	18 (1.9)	**<0.001**	(0.0)	18 (1.9)	**<0.001**
Cigarettes	93 (9.9)	34 (5.5)	59 (18.1)	**<0.001**	70 (8.2)	23 (25.0)	**<0.001**
E-cigarettes	172 (18.3)	75 (12.2)	97 (29.8)	**<0.001**	136 (16.0)	36 (39.1)	**<0.001**
Smokeless tobacco (e.g. chewing)	16 (1.7)	1 (0.2)	15 (4.6)	**<0.001**	4 (0.5)	12 (13.0)	**<0.001**
	Mean (SD)[§]	Mean (SD)[§]	Mean (SD)[§]		Mean (SD)[§]	Mean (SD)[§]	
Use intentions[a]							
Nicotine pouches	1.21 (0.81)	1.08 (0.45)	1.47 (1.20)	**<0.001**	1.14 (0.61)	1.84 (1.67)	**<0.001**
Cigarettes	1.48 (1.26)	1.30 (1.01)	1.82 (1.58)	**<0.001**	1.44 (1.19)	1.90 (1.74)	**<0.001**
E-cigarettes	1.86 (1.75)	1.63 (1.56)	2.31 (2.00)	**<0.001**	1.77 (1.67)	2.68 (2.21)	**<0.001**
Smokeless tobacco	1.09 (0.55)	1.01 (0.10)	1.25 (0.91)	**<0.001**	1.06 (0.42)	1.40 (1.19)	**<0.001**
Perceived harm to health[b]							
Nicotine pouches	5.09 (1.62)	5.21 (1.54)	4.88 (1.75)	**0.003**	5.15 (1.59)	4.53 (1.78)	<0.001
Cigarettes	6.52 (1.10)	6.58 (1.04)	6.34 (1.21)	**0.009**	6.52 (1.11)	6.50 (1.06)	0.884
E-cigarettes	5.45 (1.48)	5.57 (1.39)	5.23 (1.62)	**<0.001**	5.49 (1.45)	5.11 (1.69)	**0.019**
Smokeless tobacco	5.93 (1.29)	6.01 (1.23)	5.78 (1.40)	**0.009**	5.94 (1.30)	5.79 (1.25)	0.287
Perceived addictiveness[c]							
Nicotine pouches	5.95 (1.36)	6.04 (1.27)	5.74 (1.50)	**0.005**	5.96 (1.36)	5.89 (1.39)	0.668
Cigarettes	6.54 (0.98)	6.62 (0.88)	6.39 (1.14)	**<0.001**	6.54 (1.00)	6.52 (0.85)	0.883
E-cigarettes	6.26 (1.16)	6.33 (1.07)	6.14 (1.31)	**0.018**	6.26 (1.17)	6.26 (1.09)	0.976
Smokeless tobacco	6.08 (1.28)	6.16 (1.20)	5.94 (1.41)	**0.015**	6.09 (1.28)	6.07 (1.27)	0.877
Perceived social acceptability[d]							
Nicotine pouches	3.36 (1.74)	3.10 (1.62)	3.86 (1.84)	**<0.001**	3.26 (1.69)	4.28 (1.91)	**<0.001**
Cigarettes	3.09 (1.75)	2.82 (1.62)	3.62 (1.85)	**<0.001**	3.04 (1.72)	3.59 (1.97)	**0.004**
E-cigarettes	4.58 (1.85)	4.32 (1.85)	5.07 (1.76)	**<0.001**	4.34 (1.85)	5.09 (1.74)	**<0.001**
Smokeless tobacco	2.49 (1.57)	2.24 (1.41)	2.97 (1.75)	**<0.001**	2.42 (1.53)	3.11 (1.82)	**<0.001**

† Awareness: had heard of product. *10 preferred not to answer. # 13 preferred not to answer. § On a scale of: 1=not at all, to 7=extremely. In the overall sample, t-tests indicated that: a Use intentions for nicotine pouches were higher than for smokeless tobacco, but lower than for cigarettes and e-cigarettes (p<0.001). b Nicotine pouches were perceived as less harmful than cigarettes, e-cigarettes, and smokeless tobacco (p<0.001). c Nicotine pouches were perceived as less addictive than cigarettes, e-cigarettes, and smokeless tobacco (p<0.05). d Nicotine pouches were perceived as more socially acceptable than cigarettes and smokeless tobacco but less than e-cigarettes (p<0.001). SD: standard deviation.

regression analyses (Table 2), being male (B=0.39; 95% CI: -0.67 – -0.12) and using SLT (B=1.73; 95% CI: 1.10–2.36) were associated with greater intentions to use nicotine pouches among those who were aware of them.

Information and product sources

Among those aware of nicotine pouches, first exposure was commonly friends, family, or co-workers (30.4%), products/ads in stores (28.5%), and advertisements (11.3%). Additionally, 31.4% of those aware of nicotine pouches reported past-month advertising exposure, often via tobacco retailers (67.3%), social media (24.6%), other websites (21.0%), posters/billboards (17.8%), newspapers/magazines (8.4%), television (8.4%), direct mail (4.5%), and email (4.5%). Those reporting ever use, bought them at gas stations (46.7%), convenience stores (19.6%), vape shops (6.5%), other tobacco specialty shops (6.5%), pharmacies (5.4%), and supermarkets/grocery stores (4.3%); nearly half (46.7%) reported not buying them.

Use perceptions and motives

Intentions to use were significantly higher among those aware of nicotine pouches and those reporting ever use of them (vs not), and were significantly higher than for SLT (but lower than cigarettes and e-cigarettes) (Table 1). Nicotine pouches were perceived as significantly less addictive and harmful than cigarettes, e-cigarettes, and SLT, as well as more socially acceptable than cigarettes and SLT (Table 1, Figure 1). Those who were aware of nicotine pouches perceived them to be less harmful and less addictive and more socially acceptable, compared to those who were not aware. Those who reported ever use perceived nicotine pouches to be less harmful and more socially acceptable, relative to those who reported never use.

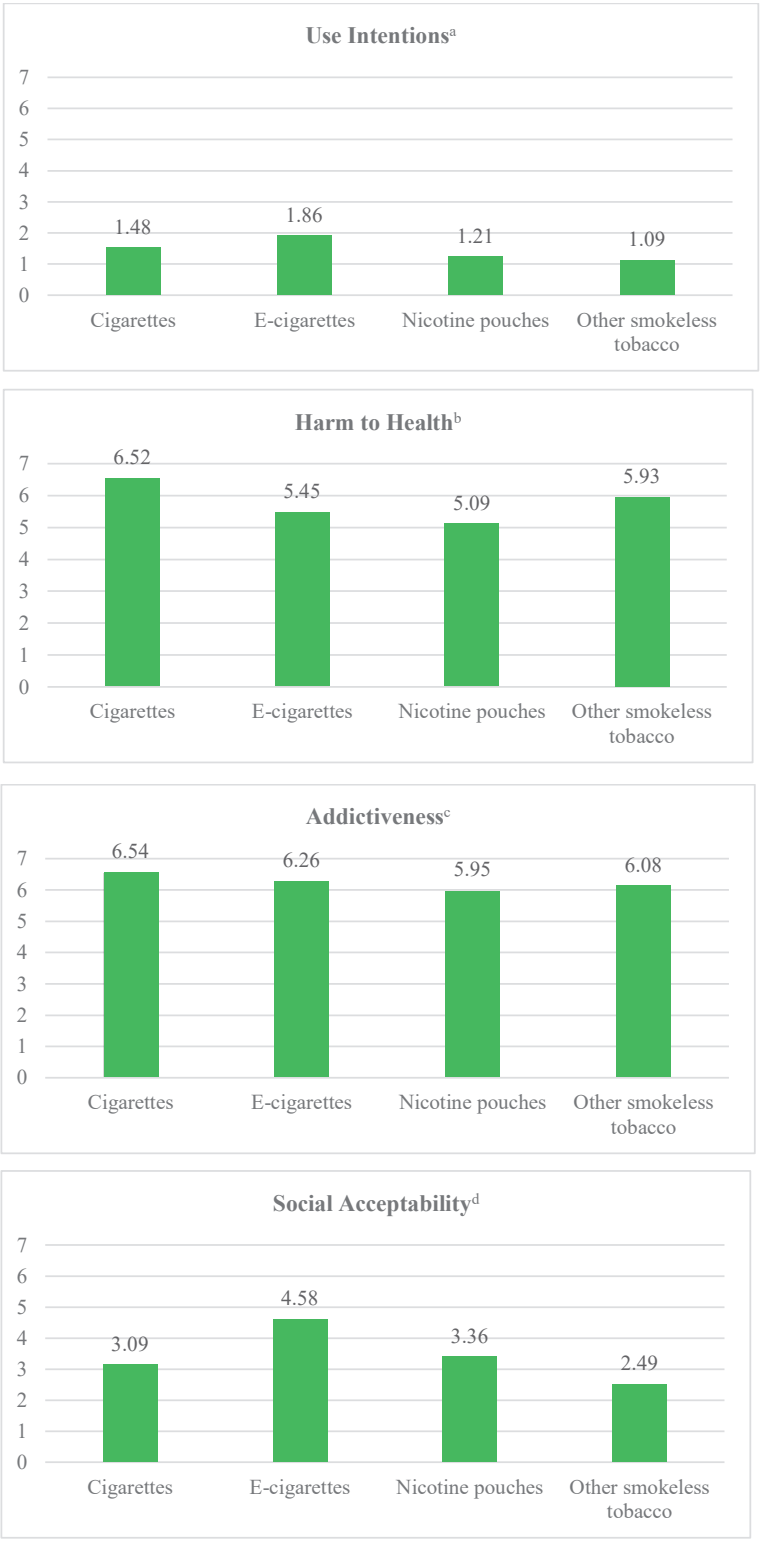
Among never users and ever users, the frequently reported use motives (or potential motives) were to quit combusted tobacco (16.5% and 19.6%, respectively), to quit other tobacco (11.2%, 17.4%), no smell (14.2%, 26.1%), curious about the 'buzz' (11.4%, 28.3%), friends offered them (8.6%, 33.7%), and discreet use (8.6%, 29.3%). Those reporting ever use also indicated motives including curiosity about flavors (26.1%), use where other tobacco products are prohibited (26.1%), and ease of use (25.0%) (Table 3).

Table 2. Multivariable logistic regression models examining predictors of awareness of nicotine pouches (N=942) and ever use and future use intentions among young adults who heard of them (N=326), US, 2022

Variable	Aware of nicotine pouches			Ever use of nicotine pouches			Future nicotine pouch use intentions		
	AOR	95% CI	p	AOR	95% CI	p	B[a]	95% CI	p
Age (years)	0.99	0.96–1.02	0.508	1.02	0.96–1.07	0.611	0.02	-0.01–0.05	0.173
Male (Ref. Female)	1.79	1.33–2.38	**<0.001**	2.27	1.33–3.85	**0.003**	-0.39	-0.67– -0.12	**0.004**
Sexual minority (Ref. Straight)	1.11	0.83–1.48	0.476	0.59	0.34–1.02	0.059	-0.21	-0.48–0.06	0.131
Race (Ref. White)									
Black	1.39	0.72–2.66	0.324	0.14	0.02–1.07	0.058	-0.27	-0.86–0.32	0.361
Asian	1.16	0.76–1.79	0.494	0.40	0.17–0.94	**0.034**	0.05	-0.34–0.44	0.797
Other	1.64	1.04–2.61	**0.035**	0.63	0.28–1.45	0.227	-0.16	-0.56–0.24	0.434
Hispanic (Ref. No)	1.34	0.83–2.16	0.235	0.65	0.26–1.61	0.351	0.34	-0.09–0.76	0.121
R^2		0.033[b]			0.122[b]			0.039[c]	
Past 30-day use									
Cigarettes	2.67	1.63–4.38	**<0.001**	1.64	0.82–3.29	0.162	0.01	-0.33–0.34	0.976
E-cigarettes	2.28	1.57–3.31	**<0.001**	1.30	0.72–2.35	0.383	0.23	-0.05–0.52	0.105
Smokeless tobacco	14.46	1.81–115.61	**0.012**	4.90	1.26–18.98	**0.022**	1.73	1.10–2.36	**<0.001**
R^2		0.129[b]			0.170[b]			0.129[c]	

AOR: adjusted odds ratios. a Adjusted unstandardized Beta co-efficient. b Nagelkerke R^2. c Adjusted R^2. In preliminary sensitivity analyses, MSA was included as a covariate, but did not contribute to the models, and no other findings changed.

Figure 1. Future use intentions and perceptions of nicotine pouches versus other tobacco products, among young adults, US, 2022 (N=942)*



*Future use intentions and perceptions assessed on a scale of: 1=not at all, to 7=extremely. In the overall sample, t-tests indicated that: a Use intentions for nicotine pouches were higher than for smokeless tobacco, but lower than for cigarettes and e-cigarettes (all $p<0.001$). b Nicotine pouches were perceived as less harmful than cigarettes, e-cigarettes, and smokeless tobacco (all $p<0.001$). c Nicotine pouches were perceived as less addictive than cigarettes, e-cigarettes, and smokeless tobacco (all $p<0.05$). d Nicotine pouches were perceived as more socially acceptable than cigarettes and smokeless tobacco but less than e-cigarettes (all $p<0.001$).

Table 3. Participant motives and bivariate analyses examining differences between those who ever versus never used nicotine pouches, among young adults, US, 2022 (N=942)

Motives for nicotine pouch use	All	Ever use of nicotine pouches		
		No	Yes	
	n (%)	n (%)	n (%)	p
Total	942 (100)	850 (90.2)	92 (9.8)	
Help quit combusted tobacco (e.g. cigarettes, cigars)	158 (16.8)	140 (16.5)	18 (19.6)	0.450
They do not cause me to smell like smoke/tobacco	145 (15.4)	121 (14.2)	24 (26.1)	**0.003**
Curious about the 'buzz'	123 (13.1)	97 (11.4)	26 (28.3)	**<0.001**
Help quit other tobacco products (e.g. e-cigarettes)	111 (11.8)	95 (11.2)	16 (17.4)	0.079
A friend offered them to me	104 (11.0)	73 (8.6)	31 (33.7)	**<0.001**
Using them is discreet (easy to hide)	100 (10.6)	73 (8.6)	27 (29.3)	**<0.001**
Help reduce combusted tobacco (e.g. cigarettes, cigars)	89 (9.4)	77 (9.1)	12 (13.0)	0.215
Less harmful to my health than other tobacco products	86 (9.1)	72 (8.5)	14 (15.2)	**0.033**
Less harmful than cigarettes to others' health	84 (8.9)	71 (8.4)	13 (14.1)	0.065
Curious about the flavors	84 (8.9)	60 (7.1)	24 (26.1)	**<0.001**
Can use them where other tobacco products are not allowed	80 (8.5)	56 (6.6)	24 (26.1)	**<0.001**
Help reduce other tobacco products (e.g. e-cigarettes)	68 (7.2)	56 (6.6)	12 (13.0)	0.230
Easy to use	59 (6.3)	36 (4.2)	23 (25.0)	**<0.001**
More acceptable to non-tobacco users	43 (4.6)	31 (3.6)	12 (13.0)	**<0.001**
Less addictive than other tobacco products	31 (3.3)	24 (2.8)	7 (7.6)	0.150
None of the above	529 (56.2)	520 (61.2)	9 (9.8)	**<0.001**

DISCUSSION

Current findings indicate that, despite relatively low prevalence of nicotine pouch use among US young adults, there is a substantial proportion who are aware of them, and certain groups are at particular risk for use. In this sample of US young adults (which was purposively recruited to represent roughly one-third using cigarettes or e-cigarettes), one-third had heard of nicotine pouches, one-tenth reported lifetime use, and intentions to use were higher than for SLT (but lower than for cigarettes and e-cigarettes). Cigarette, e-cigarette, and SLT users were more likely aware of nicotine pouches, SLT users were more likely ever users, and e-cigarette and SLT users reported higher use intentions. These results reflect prior research examining rates of awareness and ever use of nicotine pouches[6-9]. Furthermore, 2021 findings indicated that one-third of young adults were aware of them, but ever use rates of nicotine pouches in the current sample were higher (9.8% vs 3.8% in 2021)[6], which may reflect nuances of the sample or increases in nicotine pouch marketing[5].

Prior research found that the greatest proportion of ad occurrences and expenditures for nicotine pouches were accounted for by radio and television, with only about 10% accounted for by digital media[11]. However, current findings suggest that advertising via digital media and at the point-of-sale are key strategies, potentially due to their reach and ability to influence real-time purchase decisions[19]. For example, in the current study, advertising exposure occurred via various channels, particularly tobacco retailers and online/social media, and first product exposure in this sample of young adults was commonly from friends, family, or coworkers or seeing products/ads in stores and media. Ever users commonly bought them at gas stations and convenience stores.

Results from this study also suggest the importance of marketing on shaping consumer perceptions. Nicotine pouches were perceived as less harmful and addictive than cigarettes, e-cigarettes, and SLT, as in prior research[6,7]. Additionally, use intentions for nicotine pouches were higher than for

SLT but lower than for cigarettes and e-cigarettes. Similarly, one study of young adults found that tobacco users were more likely to choose cigarettes over nicotine pouches[10]. Current results indicate that among the most common use motives were to help quit or reduce other tobacco use, suggesting that nicotine pouches are viewed as a smoking cessation tool. This is not surprising given that they have been marketed as 'tobacco-free' [3,11], which might imply harm reduction[20]. Aligning with marketing efforts promoting nicotine pouches by emphasizing 'freedom', their flavors, and the strength of the nicotine[3,11], other use motives included being able to use nicotine pouches where other tobacco products are prohibited, as well as curiosity about the various flavors of nicotine pouches or the potential 'buzz' that could result from using them.

Limitations

Limitations include generalizability to other young adults, the cross-sectional study design, self-reported data which are subject to recall/reporting errors, and limited power for subgroup analyses due to low rates of nicotine pouch awareness/use. Given the purposive sampling design used to achieve the parent study aims (i.e. recruitment of one-third cigarette and e-cigarette users), this study was not intended to be representative and is not a probability-based sample. Thus, rates of tobacco and nicotine pouch use may be higher in our sample and should not be interpreted as use prevalence rates.

CONCLUSIONS

The current findings raise concern about young adults' relatively positive perceptions of nicotine pouch harm and addiction, given the marketing of nicotine pouches without FDA authorization to be marketed as modified risk products. Additionally, those who were aware and had ever used nicotine pouches were exposed to advertising and accessed nicotine pouches via various sources. These findings underscore the importance of nicotine pouch retail and marketing surveillance in order to estimate population impact and inform regulatory efforts.

REFERENCES

1. Gholap VV, Kosmider L, Golshahi L, Halquist MS. Nicotine forms: why and how do they matter in nicotine delivery from electronic cigarettes? Expert Opin Drug Deliv. 2020;17(12):1727-1736. doi:10.1080/17425247.2020.1814736
2. Robichaud MO, Seidenberg AB, Byron MJ. Tobacco companies introduce 'tobacco-free' nicotine pouches. Tob Control. 2020;29:e145-e146. doi:10.1136/tobaccocontrol-2019-055321
3. Marynak KL, Wang X, Borowiecki M, et al. Nicotine Pouch Unit Sales in the US, 2016-2020. JAMA. 2021;326(6):566-568. doi:10.1001/jama.2021.10366
4. Majmundar A, Okitondo C, Xue A, Asare S, Bandi P, Nargis N. Nicotine Pouch Sales Trends in the US by Volume and Nicotine Concentration Levels From 2019 to 2022. JAMA Netw Open. 2022;5(11):e2242235. doi:10.1001/jamanetworkopen.2022.42235
5. Emery SL, Binns S, Carter CC, Rose SW, Kostygina G. Characterising advertising strategies and expenditures for conventional and newer smokeless tobacco products. Tob Control. 2022:0:1-4. doi:10.1136/tobaccocontrol-2022-057282
6. Morean ME, Bold KW, Davis DR, Kong G, Krishnan-Sarin S, Camenga DR. "Tobacco-free" Nicotine Pouches: Risk Perceptions, Awareness, Susceptibility, and Use Among Young Adults in the United States. Nicotine Tob Res. 2022;25(1):143-150. doi:10.1093/ntr/ntac204
7. Havermans A, Pennings JLA, Hegger I, et al. Awareness, use and perceptions of cigarillos, heated tobacco products and nicotine pouches: A survey among Dutch adolescents and adults. Drug Alcohol Depend. 2021;229:109136. doi:10.1016/j.drugalcdep.2021.109136
8. Brose LS, McDermott MS, McNeill A. Heated Tobacco Products and Nicotine Pouches: A Survey of People with Experience of Smoking and/or Vaping in the UK. Int J Environ Res Public Health. 2021;18(16):8852. doi:10.3390/ijerph18168852
9. Tattan-Birch H, Jackson SE, Dockrell M, Brown J. Tobacco-free Nicotine Pouch Use in Great Britain: A Representative Population Survey 2020-2021. Nicotine Tob Res. 2022;24(9):1509-1512. doi:10.1093/ntr/ntac099
10. Vogel EA, Barrington-Trimis JL, Kechter A, et al. Differences in Young Adults' Perceptions of and Willingness to Use Nicotine Pouches by Tobacco Use Status. Int J Environ Res Public Health. 2022;19(5):2685. doi:10.3390/ijerph19052685
11. Duan Z, Henriksen L, Vallone D, et al. Nicotine pouch marketing strategies in the USA: an analysis of Zyn, On! and Velo. Tob Control. 2022. doi:10.1136/tc-2022-057360
12. Villanti AC, Johnson AL, Glasser AM, et al. Association of flavored tobacco use with tobacco initiation and subsequent use among US youth and adults, 2013-2015. JAMA Netw Open. 2019;2(10):e1913804-e1913804. doi:10.1001/jamanetworkopen.2019.13804
13. Kostygina G, Ling PM. Tobacco industry use of

flavourings to promote smokeless tobacco products. Tob Control. 2016;25(Suppl 2):ii40-ii49. doi:10.1136/tobaccocontrol-2016-053212
14. Jackler RK, Chau C, Getachew B, et al. JUUL Advertising Over its First Three Years on the Market. SRITA White Paper. 2019:1-48
15. FDA grants first-ever modified risk orders to eight smokeless tobacco products. U.S. Food and Drug Administration. October 22, 2019. Accessed October 3, 2020. www fda gov/news-events/press-announcements/fda-grants-first-ever-modified-risk-orders-eight-smokeless-tobacco-products
16. Azzopardi D, Liu C, Murphy J. Chemical characterization of tobacco-free "modern" oral nicotine pouches and their position on the toxicant and risk continuums. Drug Chem Toxicol. 2022;45(5):2246-2254. doi:10.1080/01480545.2021.1925691
17. Berg C, Duan X, Getachew B, et al. Young adult e-cigarette use and retail exposure in 6 US metropolitan areas. Tob Regul Sci. 2021;7(1):59-75. doi:10.18001/trs.7.1.5
18. Commercial Tobacco and Marijuana. Public Health Law Center. Accessed April 6, 2023. https://www.publichealthlawcenter.org/topics/commercial-tobacco-control/commercial-tobacco-and-marijuana
19. Watts C, Burton S, Freeman B. 'The last line of marketing': Covert tobacco marketing tactics as revealed by former tobacco industry employees. Glob Public Health. 2021;16(7):1000-1013. doi:10.1080/17441692.2020.1824005
20. Czaplicki L, Patel M, Rahman B, Yoon S, Schillo B, Rose SW. Oral nicotine marketing claims in direct-mail advertising. Tob Control. 2022;31(5):663-666. doi:10.1136/tobaccocontrol-2020-056446

CONFLICTS OF INTEREST
The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

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DATA AVAILABILITY
The data supporting this research are available from the authors on reasonable request.

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