

Alternative Tobacco Product Use and Smoking Cessation: A National Study

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Smoking rates in the United States have been driven down by health concerns, increasing regulations, higher prices, and changing social norms. Cigarette companies have recognized that smokeless tobacco may be a way to retain profits and customers,¹ and since 2006, the promotion of novel and alternative tobacco products has escalated. However, traditional smokeless tobacco products, such as loose leaf chewing tobacco and moist snuff (Figure 1), continue to dominate the smokeless market.⁸ Although the market share of loose leaf chewing tobacco is decreasing,⁸ moist snuff has the largest share of the US market (75% in 2009),⁹ and its use has steadily increased since the 1980s.⁸

In addition, since about 2006, various alternative tobacco products, such as snus, dissolvables, and electronic cigarettes (e-cigarettes), have been promoted in the United States (Figure 1). Although snus has been used in Sweden since the early 19th century,¹⁰ in 2006, the major US cigarette manufacturers acquired smokeless tobacco companies and began selling snus bearing cigarette brand names (e.g., Marlboro Snus, Camel Snus).¹¹ E-cigarettes were first marketed in China in 2004¹² but have been aggressively promoted on the Internet in the United States since 2007.¹³ In addition, between 2009 and 2011, dissolvable tobacco products with cigarette brand names (e.g., Camel Orbs, Sticks, and Strips; Marlboro Sticks) were introduced in the United States.¹⁴

Surveillance data on novel tobacco products are limited, but the rates of use of novel smokeless tobacco products and e-cigarettes appear to be growing. A recent study that used data from the 2009 ConsumerStyles survey reported that 5.4% of US adults tried snus in their lifetime, and 1.8% used snus in the past month.¹⁵ In addition, the percentage of Americans trying e-cigarettes increased from 0.6% in 2009 to 2.7% in 2010, with 1.2% of adults reporting current use.¹⁶

Objectives. We investigated the frequency of alternative tobacco product use (loose leaf, moist snuff, snus, dissolvables, electronic cigarettes [e-cigarettes]) among smokers and the association with quit attempts and intentions.

Methods. A nationally representative probability-based cross-sectional survey of 1836 current or recently former adult smokers was completed in November 2011. Multivariate logistic regressions evaluated associations between alternative tobacco product use and smoking cessation behaviors.

Results. Of the smokers, 38% had tried an alternative tobacco product, most frequently e-cigarettes. Alternative tobacco product use was associated with having made a quit attempt, and those intending to quit were significantly more likely to have tried and to currently use the products than were smokers with no intentions to quit. Use was not associated with successful quit attempts. Interest in future use of alternative tobacco products was low, except for e-cigarettes.

Conclusions. Alternative tobacco products are attractive to smokers who want to quit smoking, but these data did not indicate that alternative tobacco products promote cessation. Unsubstantiated overt and implied claims that alternative tobacco products aid smoking cessation should be prohibited. (*Am J Public Health.* 2013;103:923–930. doi:10.2105/AJPH.2012.301070)

Some claim that the health risks posed by smokeless tobacco use are significantly lower than the health risks caused by cigarette smoking, and promoting smokeless tobacco has been proposed as a method of harm reduction.^{17,18} However, smokeless tobacco is addictive, and its use has been associated with an increased risk of oral, esophageal, and pancreatic cancer¹⁹; myocardial infarction and stroke²⁰; oral disease²¹; and reproductive problems.²² In addition, smokeless tobacco can serve as a gateway for smoking initiation among youths.²³ Although studies have not examined this prospectively over extended periods, dual use of alternative tobacco products and cigarettes may make it more difficult to quit tobacco use.²⁴

The newer tobacco product marketing includes messages that these smokeless tobacco products may facilitate reduction or cessation of cigarette use (Figure 2) or that they should be used in smoke-free environments, such as smoke-free bars, workplaces, or airplanes.¹¹ This messaging may encourage dual use of smokeless tobacco and cigarettes among smokers, which raises significant health

concerns. Dual use is associated with several negative health outcomes, such as increased rates of cardiovascular disease^{25–27} and pancreatic and esophageal cancers^{21,28} and greater risk of inflammatory bowel disease.²⁹

Although some companies make anecdotal claims that smokeless tobacco can be used to aid smoking cessation and some researchers put forth correlational evidence from Scandinavian countries,³⁰ 2 controlled clinical trials found no long-term benefit of using smokeless tobacco (such as snus) to aid in smoking cessation.^{31,32} Also, no long-term controlled clinical trials have established the efficacy of e-cigarettes for smoking cessation, and these products are not approved for this purpose.

We have examined rates of trial and current use of alternative tobacco products (including traditional smokeless tobacco, novel smokeless tobacco products, and e-cigarettes) among a nationally representative US sample of current and former smokers and the association between alternative tobacco product use and smoking cessation intentions and behavior.

Product	Description	Common Brands	Use
Loose leaf chewing tobacco 	Air cured tobacco usually treated with sugar and licorice. ²	Red Man, Levi Garrett	Requires spitting.
Moist snuff 	Ground tobacco with a high moisture and salt content. ³ Some moist snuff is sold in porous pouches (e.g., Skoal Bandits).	Copenhagen, Skoal, Grizzly	Requires spitting.
Snus 	Finely ground oral tobacco packaged in small porous pouches ⁴ ; placed between gum and lip. “Snus” name refers to a traditional Swedish product, which is produced with a different manufacturing process (including pasteurization and storage in refrigeration) that reduces tobacco-specific nitrosamines linked to oral cancer. ^{5,6}	Camel Marlboro	Tobacco-laden saliva is swallowed.
Dissolvable tobacco 	Dissolvable pellets, strips, or sticks either made fully from tobacco or consisting of wooden dowels coated with tobacco. Designed to be held and dissolved in the mouth for between 3 (strips) and 30 (sticks) minutes.	Camel	Tobacco-laden saliva is swallowed.
Electronic cigarettes 	A device comprising a battery, a heater, and a cartridge filled with a solution of nicotine, propylene glycol, and other chemicals. This solution is vaporized by the heater and inhaled. ⁷	blu, V2, Smokestik	Vapor is inhaled.

FIGURE 1—Description of alternative tobacco products.

METHODS

A nationally representative probability-based sample of 1836 current or recently former smokers completed an online cross-sectional survey in November 2011. Because e-cigarettes and novel smokeless tobacco products such as dissolvables were introduced to the market fairly recently, and because relapse rates for former smokers who were abstinent for more than 2 years are low,³³ we excluded former smokers who had quit more than 2 years before the study. Participants were part of a panel maintained by the research company Knowledge Networks, which randomly enlists participants through probability-based sampling using address-based sampling methods, and compensates them for taking surveys either with incentive points redeemable for cash or with hardware and free access to the Internet. Thus, the probability panel covered both online and offline populations in the United States, in contrast to Internet convenience panels. All participants were members of the Knowledge Networks panel, and all completed the surveys online and in English.

Of the 7776 sampled adult (older than 18 years) smokers (smoked 100 cigarettes in their lifetime) invited to participate, 4525 (58%) completed the screening, and 1836 (41%) qualified for participation based on the selection criteria: either currently smoking or having quit no longer than 2 years ago. All 1836 of the qualified participants completed the survey.

Measures

We measured ever and current use of alternative tobacco products for each of 5 alternative tobacco products in this study: loose leaf and moist snuff, which are “traditional smokeless tobacco products”; snus and dissolvables, which are “novel smokeless tobacco products”; and e-cigarettes. In this article, we use “alternative tobacco products” to refer to all or any of the 5 products and “smokeless tobacco” to refer to both traditional (loose leaf, moist snuff) and novel smokeless (snus, dissolvable) products. Participants viewed pictures of each of the 5 alternative tobacco products and reported whether they had ever used each product (ever use) or had used it at least once in the past 30 days (current use).

Participants also reported how open they were to trying each of the 4 products (snus, moist snuff, e-cigarette, and dissolvable tobacco) in the future on a 9-point Likert scale ranging from “not at all open” to “extremely open.” In addition, they reported willingness to use or switch to a smokeless tobacco product (1) in a situation when they could not smoke, (2) to reduce health risk, (3) to cut down on number of cigarettes smoked, and (4) to quit smoking on a 9-point Likert scale ranging from “definitely would not” to “definitely would.”

Participants reported having made a quit attempt of at least 1 day in the past year. We compared responses among “successful quitters” (participants who were not currently smoking and had quit smoking within the past 2 years), “unsuccessful quitters” (people who made a quit attempt in the past but were currently smoking), and those who never tried to quit smoking. Everyone but successful quitters were asked whether they intended to quit in the next month, in the next 6 months, in the future but not in the next 6 months, or never. All participants also reported whether they ever tried to quit smoking by switching to



Source. Advertisement for Camel Snus. November 7, 2011. Available at: <http://www.trinketsandtrash.org/detail.php?artifactid=7037&page=1>. Accessed April 3, 2012; Top Electronic Cigarettes Web site. Available at: <http://topelectroniccigarettes.com/reviews/332-v2-e-cigarettes-review-break-the-addiction-to-gain-better-health-and-lifestyle>. Accessed April 3, 2012

FIGURE 2—Advertisements for Camel Snus and electronic cigarettes promoting the use of alternative tobacco products for smoking cessation.

chewing tobacco, snuff, or snus, with answers being “Yes”; “I considered it, but never tried it”; and “No, I have never even considered it.”

Statistical Analysis

We weighted percentages to the national population to adjust for any survey nonresponse, noncoverage, or undersampling or oversampling resulting from the study-specific sample design. We compared demographic groups by calculating weighted unadjusted odds ratios (ORs; $\alpha = 0.05$) via univariate logistic regression. We used multivariate logistic regression to examine associations between use of alternative tobacco products and quitting status and intentions. Separate regressions were run for the following dependent variables: ever use of each individual product, ever use of any of the alternative products, and current use of any of the alternative products. For each of these regressions, we analyzed (1) smoking status (successful quitters, unsuccessful quitters, and those who never tried to quit) as an independent categorical variable while we controlled for demographics (age, gender, race/ethnicity, income, and education) and (2) different quit intentions (intends to quit in the next month, in the next 6 months, in the future but not in the next 6 months, or never) as an

independent categorical variable while we controlled for demographics. The relation between having made a quit attempt, quitting intentions, and interest in e-cigarettes was assessed with analyses of variance (ANOVAs) because e-cigarettes were the only product for which the rates of use differed by history of quit attempts. We also used ANOVAs to assess the relations between past use of each of the alternative tobacco products (moist snuff, snus, and e-cigarettes) and interest in their future use.

RESULTS

The sample was almost equally split between men and women, the mean age was 42 years, and most participants were non-Hispanic White; the distribution of participants by income, education, and US region was diverse (Table 1). The majority (59.9%) tried quitting smoking in the past but went back to smoking; about a quarter of the sample were successful quitters (23.3%), and 16.8% had never tried quitting (Table 2). Of those still smoking, only 10.9% never expected to quit, and 60.7% reported intentions to quit in the future but not in the next 6 months (Table 2). Among current smokers, 70.1% were daily smokers, 23.7% were nondaily smokers, and 6.2% reported not

smoking in the past 30 days. Among those who successfully quit smoking, 19.6% had been abstinent for less than 1 month, 33.0% had been abstinent between 1 and 6 months, 20.0% had been abstinent between 6 and 12 months, and 27.4% had quit smoking between 1 and 2 years ago.

Prevalence of Use of Alternative Tobacco Products

Overall, 38% of smokers had tried an alternative tobacco product (Table 1). E-cigarettes had been tried most frequently; 20.1% of the respondents had ever used them, and 7.6% of all respondents reported past month use. Dissolvable tobacco products had been tried least frequently (2.9%).

The following differences in demographic characteristics of alternative tobacco users were statistically significant at the $P < .05$ level. Men used traditional smokeless tobacco products and snus significantly more frequently than did women; women used e-cigarettes more frequently than did men. Across all types of alternative tobacco products (except dissolvable tobacco), younger people were more likely to have ever used them compared with people older than 60 years. Non-Hispanic Black smokers were less likely than White

TABLE 1—Use of Alternative Tobacco Products Among 1836 US Current and Recent Smokers, November 2011

	No. (%)	Loose Leaf Chewing Tobacco (Ever)		Moist Snuff (Ever)		Snus (Ever)		Dissolvable Tobacco (Ever)		Electronic Cigarettes (Ever)		Any Alternative Tobacco Product Use (Ever)		Any Alternative Tobacco Product Use (Past 30 Days)	
		%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)
Gender															
Men	939 (51.1)	20.6	3.26* (2.42, 4.38)	24.6	5.17* (3.77, 7.07)	19.0	3.04* (2.25, 4.11)	2.2	0.62 (0.36, 1.09)	18.3	0.79* (0.63, 0.99)	46.9	2.18* (1.79, 2.64)	16.0	1.53* (1.17, 2.01)
Women (Ref)	898 (48.9)	7.4	1.00	5.9	1.00	7.2	1.00	3.5	1.00	22.1	1.00	28.8	1.00	11.0	1.00
Age, y															
18-29	483 (26.3)	18.6	2.74* (1.62, 4.63)	20.7	2.75* (1.67, 4.53)	22.4	3.98* (2.31, 6.88)	4.3	2.27 (0.82, 6.26)	31.5	2.32* (1.57, 3.42)	52.8	2.72* (1.96, 3.78)	19.4	1.42 (0.93, 2.17)
30-44	526 (28.7)	16.2	2.33* (1.37, 3.94)	16.9	2.15* (1.30, 3.55)	12.7	2.00* (1.14, 3.52)	2.1	1.04 (0.35, 3.11)	15.4	0.92 (0.61, 1.39)	38.2	1.51* (1.09, 2.09)	10.8	0.71 (0.45, 1.12)
45-59	585 (31.8)	11.3	1.54 (0.90, 2.64)	12.8	1.55 (0.93, 2.57)	8.9	1.35 (0.76, 2.40)	2.9	1.47 (0.52, 4.15)	16.4	0.99 (0.66, 1.48)	29.2	1.00 (0.72, 1.39)	10.9	0.73 (0.47, 1.13)
≥ 60 (Ref)	242 (13.2)	7.8	1.00	8.7	1.00	6.6	1.00	2.1	1.00	16.5	1.00	29.2	1.00	14.5	1.00
Race															
White, non-Hispanic (Ref)	1241 (67.6)	15.1	1.00	16.9	1.00	16.3	1.00	2.7	1.00	20.5	1.00	40.9	1.00	14.1	1.00
Black, non-Hispanic	242 (13.2)	8.7	0.53* (0.33, 0.86)	8.7	0.46* (0.29, 0.74)	7.4	0.42* (0.26, 0.70)	5.8	2.29* (1.22, 4.32)	20.2	0.99 (0.70, 1.39)	24.5	0.47* (0.35, 0.65)	12.0	0.82 (0.54, 1.25)
Hispanic	243 (13.2)	11.1	0.70 (0.46, 1.07)	13.6	0.78 (0.53, 1.16)	5.3	0.29* (0.16, 0.52)	1.6	0.55 (0.18, 1.63)	16.9	0.77 (0.54, 1.12)	37.4	0.87 (0.65, 1.15)	11.5	0.79 (0.51, 1.20)
American Indian or Alaska Native	33 (1.8)	12.1	0.86 (0.31, 2.38)	9.1	0.44 (0.13, 1.54)	3.0	0.18 (0.03, 1.20)	0.0	0 (0, 0)	12.1	0.59 (0.21, 1.63)	26.5	0.50 (0.23, 1.10)	15.2	1.04 (0.39, 2.76)
Asian	17 (0.9)	29.4	2.19 (0.74, 6.45)	23.5	1.46 (0.46, 4.62)	0.0	0 (0, 0)	0.0	0 (0, 0)	41.2	2.76* (1.03, 7.39)	70.6	3.34* (1.17, 9.57)	23.5	1.80 (0.57, 5.71)
Native Hawaiian/Pacific Islander	11 (0.6)	9.1	0.39 (0.03, 4.55)	0.0	0 (0, 0)	0.0	0 (0, 0)	0.0	0 (0, 0)	9.1	0.27 (0.02, 3.14)	9.1	0.10 (0.01, 1.17)	9.1	0.42 (0.04, 4.94)
≥ 2 races, non-Hispanic	25 (1.4)	16.0	1.13 (0.39, 3.26)	16.0	1.06 (0.37, 2.97)	11.5	0.57 (0.15, 2.12)	4.0	1.72 (0.26, 11.62)	24.0	1.24 (0.49, 3.42)	40.0	1.00 (0.45, 2.23)	4.0	0.28 (0.04, 1.89)
Other, non-Hispanic	25 (1.4)	40.0	3.59* (1.60, 8.10)	40.0	3.16* (1.40, 7.10)	26.9	1.83 (0.75, 4.48)	0.0	0 (0, 0)	26.9	1.37 (0.56, 3.35)	40.0	0.93 (0.42, 2.08)	26.9	2.15 (0.88, 5.29)
Education															
< high school	205 (11.2)	17.6	0.89 (0.56, 1.41)	18.5	0.97 (0.62, 1.53)	18.5	1.69* (1.03, 2.77)	3.9	4.39* (1.10, 17.56)	16.1	0.85 (0.53, 1.36)	38.0	0.74 (0.51, 1.06)	21.0	2.41 (1.46, 4.00)*
High school	769 (41.9)	9.1	0.42* (0.29, 0.61)	11.8	0.57* (0.40, 0.82)	10.5	0.87 (0.57, 1.32)	3.1	3.49 (0.99, 12.29)	20.0	1.10 (0.78, 1.54)	32.6	0.58* (0.44, 0.77)	11.6	1.19 (0.77, 1.84)
Some college	561 (30.6)	17.1	0.86 (0.60, 1.23)	17.5	0.89 (0.62, 1.28)	15.7	1.37 (0.90, 2.08)	3.2	3.64* (1.01, 13.09)	22.6	1.28 (0.90, 1.82)	41.4	0.85 (0.64, 1.13)	15.5	1.67* (1.07, 2.59)
≥ bachelor's degree (Ref)	301 (16.4)	19.3	1.00	19.2	1.00	12.0	1.00	1.0	1.00	18.6	1.00	45.5	1.00	10.0	1.00
Annual income, \$1000															
< 15	483 (26.3)	17.2	1.13 (0.80, 1.61)	16.4	0.84 (0.60, 1.18)	15.3	1.32 (0.90, 1.92)	3.9	2.18 (0.95, 4.98)	20.1	0.99 (0.72, 1.36)	37.5	0.92 (0.71, 1.20)	16.6	1.43 (0.99, 2.08)
15-24.9	236 (12.9)	16.1	1.05 (0.68, 1.61)	20.3	1.10 (0.74, 1.63)	18.6	1.66* (1.07, 2.56)	3.0	1.58 (0.57, 4.39)	19.0	0.91 (0.61, 1.36)	48.5	1.45* (1.06, 2.0)	17.8	1.56* (1.00, 2.41)
25-39.9	377 (20.5)	10.6	0.65* (0.43, 0.99)	7.4	0.35* (0.22, 0.54)	9.3	0.74 (0.47, 1.15)	1.9	0.94 (0.34, 2.64)	20.4	1.00 (0.71, 1.41)	31.6	0.71* (0.53, 0.95)	11.7	0.95 (0.62, 1.45)
40-59.9	300 (16.3)	10.3	0.62* (0.40, 0.98)	15.0	0.76 (0.51, 1.12)	12.3	1.03 (0.66, 1.62)	3.7	2.07 (0.84, 5.14)	20.7	1.02 (0.71, 1.47)	36.7	0.89 (0.66, 1.21)	9.7	0.76 (0.47, 1.22)
≥ 60 (Ref)	440 (24.0)	15.5	1.00	18.9	1.00	12.0	1.00	1.8	1.00	20.2	1.00	39.3	1.00	12.3	1.00
Region															
Northeast	305 (16.6)	9.8	0.55* (0.34, 0.87)	15.7	1.10 (0.72, 1.68)	10.2	0.68 (0.43, 1.09)	4.6	6.11* (1.71, 21.76)	22.2	1.15 (0.79, 1.67)	36.6	0.71* (0.52, 0.97)	12.4	0.96 (0.61, 1.52)
Midwest	419 (22.8)	12.2	0.70 (0.47, 1.04)	16.9	1.21 (0.82, 1.77)	20.7	1.56* (1.07, 2.27)	4.1	5.42* (1.56, 18.92)	20.3	1.03 (0.72, 1.46)	36.5	0.71* (0.53, 0.95)	13.4	1.04 (0.69, 1.58)
South	744 (40.5)	15.9	0.95 (0.68, 1.34)	15.1	1.05 (0.74, 1.49)	9.8	0.65* (0.45, 0.95)	2.4	3.11 (0.90, 10.80)	19.4	0.97 (0.71, 1.33)	36.2	0.70* (0.54, 0.90)	14.5	1.15 (0.80, 1.67)
West (Ref)	368 (20.0)	16.6	1.00	14.4	1.00	14.4	1.00	0.8	1.00	19.8	1.00	44.7	1.00	12.8	1.00
Overall	1836 (100.0)	14.1		15.5		13.2		2.9		20.1		38.0		13.6	

Note. CI = confidence interval; OR = odds ratio. Percentages may not add to 100% because of rounding.
*P < .05.

TABLE 2—Use of Alternative Tobacco Products by Quit Attempts and Intentions to Quit Smoking Among 1836 US Current and Recent Smokers, November 2011

Quit status	Loose Leaf Chewing Tobacco (Ever)		Moist Snuff (Ever)		Snus (Ever)		Dissolvable Tobacco (Ever)		Electronic Cigarettes (Ever)		Use of Snus, Dissolvables, Moist Snuff, or Electronic Cigarettes (Ever)		Use of Snus, Dissolvables, Moist Snuff, or Electronic Cigarettes (Past 30 Days)		
	No. (%)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)
Successful quitters	427 (23.3)	16.6	1.50 (0.95, 2.36)	15.9	0.97 (0.63, 1.50)	12.6	1.15 (0.71, 1.86)	2.1	0.92 (0.35, 2.42)	17.6	1.09 (0.72, 1.65)	34.9	1.50* (1.06, 2.12)	7.3	0.68 (0.40, 1.15)
Unsuccessful quitters	1100 (59.9)	13.6	1.14 (0.77, 1.71)	14.9	0.89 (0.62, 1.29)	13.7	1.31 (0.87, 1.97)	3.2	1.27 (0.58, 2.78)	22.5	1.78* (1.25, 2.53)	36.4	1.78* (1.32, 2.39)	13.8	1.32 (0.87, 1.99)
Never tried to quit (Ref)	309 (16.8)	12.3	1.00	17.2	1.00	12.3	1.00	2.6	1.00	15.2	1.00	26.9	1.00	10.7	1.00
Quit intentions (among current smokers, n = 1409)															
Will quit in the next month	98 (6.9)	9.2	0.76 (0.31, 1.83)	11.2	0.79 (0.35, 1.77)	6.1	0.62 (0.23, 1.75)	1.0	0.26 (0.02, 3.14)	12.2	0.55 (0.26, 1.18)	24.5	0.76 (0.42, 1.39)	11.2	1.62 (0.67, 3.92)
Will quit in the next 6 mo	297 (21.1)	10.4	0.83 (0.44, 1.57)	17.8	1.16 (0.65, 2.06)	19.5	2.26* (1.22, 4.21)	1.7	0.68 (0.18, 2.58)	24.2	1.30 (0.78, 2.18)	42.1	1.61* (1.03, 2.50)	17.5	2.48* (1.24, 4.95)
May quit in the future but not in the next 6 mo	845 (60.0)	15.2	1.40 (0.81, 2.42)	15.0	1.00 (0.60, 1.67)	12.8	1.34 (0.76, 2.38)	3.8	1.47 (0.50, 4.26)	21.7	1.18 (0.74, 1.87)	33.8	1.19 (0.80, 1.77)	13.0	1.71 (0.89, 3.27)
Never expect to quit (Ref)	151 (10.7)	13.2	1.00	17.2	1.00	11.9	1.00	2.6	1.00	18.4	1.00	31.1	1.00	7.9	1.00

Note. CI = confidence interval; OR = odds ratio. Results of multiple logistic regression that controlled for age, gender, education, income, and race. *P < .05.

smokers to use all types of alternative products except e-cigarettes and dissolvable tobacco. Asian smokers were more likely than White smokers to use e-cigarettes and to have tried any alternative product in the past (Table 1).

In general, smokers with lower levels of education were more likely to have tried novel smokeless tobacco products, as were some with lower income compared with the highest income group (Table 1). Novel tobacco products were more likely to have been tried in the northeastern and midwestern United States and less likely in the South, and smokers in the western United States were most likely to have tried any alternative tobacco product.

We observed similar patterns to ever users in the demographics of current users of alternative tobacco products (data not reported in Table 1). Smokers with less than a high-school education were significantly more likely to have used snus (OR = 3.92; 95% confidence interval [CI] = 1.11, 13.80) although unlike ever users, smokers with some college education were more likely to be current users of e-cigarettes (used e-cigarettes in the past 30 days, OR = 2.09; 95% CI = 1.13, 3.86) than were smokers with a bachelor's degree. Smokers with income less than \$15 000 also were more likely to have used e-cigarettes in the past 30 days (OR = 1.95; 95% CI = 1.17, 3.25) than were smokers with income exceeding \$60 000.

Use of Smokeless Tobacco and Quitting

When analyzing the association between alternative tobacco product use and cessation, we focused on those alternative tobacco products that have been promoted to smokers as alternatives to smoking,¹ with messages that may affect cessation (Figure 2)—specifically, snus, dissolvables, e-cigarettes, and moist snuff.

Overall, 7.8% of the respondents reported that they tried to quit smoking by switching to chewing tobacco, snuff, or snus; an additional 5.8% considered it but never tried, and most never considered it. Among those who tried any of the 4 alternative tobacco products in the past (n = 632), 21.0% said that they tried to quit smoking by switching to smokeless tobacco, and 9.9% of them considered it. Among people who made quit attempts in the past year (n = 1169), 8.9% said that they tried to quit by switching to smokeless tobacco. Among

former smokers ($n = 427$), 7.4% reported that they tried to quit smoking by switching to chewing tobacco, snuff, or snus, and an additional 4.6% considered but never tried this option for quitting.

Past use of any of the 4 alternative tobacco products differed significantly by quit attempt history: compared with those who never tried to quit, unsuccessful quitters and successful quitters were more likely to have tried alternative tobacco products in the past (Table 2). Unsuccessful quitters also were significantly more likely than those who never tried to quit to have tried e-cigarettes. Smokers who were planning on quitting in the next 6 months were the most likely to have tried snus, to have tried any of the 4 alternative tobacco products, and to have used these products in the past 30 days, compared with those who never expect to quit (see Table 2 for ORs).

Because e-cigarettes were the only product for which the rates of use differed by history of quit attempts, we examined separately the relation between being open to using e-cigarettes and different quit histories. Unsuccessful quitters were significantly more open to using e-cigarettes in the future than were those who never tried quitting, who were more open than successful quitters (mean openness to e-cigarettes = 4.0, 3.1, and 2.3, respectively, on a 9-point scale; $F_{2,1725} = 56.72$; $P < .001$). In addition, those who intended to quit within the next month, within the next 6 months, or in the future had higher interest in e-cigarettes than did those who did not ever plan on quitting (mean = 4.6, 4.1, and 3.9, respectively, vs mean = 2.7; $F_{3,1311} = 10.8$; $P < .001$).

Interest in Using Smokeless Tobacco in the Future

In general, most participants were not at all open to trying snus, moist snuff, or dissolvable tobacco in the future (on a 9-point scale, the mean score for interest in snus = 1.5 [SD = 1.4], the mean score for interest in moist snuff = 1.4 [SD = 1.4], and the mean score for interest in dissolvables = 1.3 [SD = 1.2]), with 86% to 89% of respondents choosing the “not at all open” option (rating 1 on the 1–9 scale). By contrast, participants were more open to trying e-cigarettes (mean = 3.5; SD = 2.9), and many fewer (47%) said they were “not at all open.” However, questions that listed specific reasons

for using or trying smokeless tobacco products elicited higher levels of interest: only 49% reported that they “definitely would not try” smokeless tobacco (either traditional or novel products) in a situation when they could not smoke (mean = 3.19; SD = 2.7), and only about 37% definitely would not try smokeless tobacco to reduce health risk (mean = 4.22; SD = 3.0), to cut down on number of cigarettes (mean = 4.22; SD = 3.0), or to quit smoking (mean = 4.29; SD = 3.1). Thus, although overall interest in smokeless tobacco was still low, smokers were more open to trying the product if the questions were framed as though the product helped reduce health risks or helped one to quit smoking.

Prior use of a particular alternative tobacco product was positively associated with interest in using that product in the future. Those who used moist snuff in the past were significantly more open to trying moist snuff in the future (mean used = 3.0 vs mean not used = 1.1; $F_{1,1713} = 485.3$; $P < .001$); smokers who tried snus were more open to using snus in the future (mean used = 2.9 vs mean not used = 1.3; $F_{1,1713} = 322.9$; $P < .001$), and those who tried e-cigarettes were more interested in using them again than were those who did not try them before (mean used = 5.4 vs mean not used = 3.0; $F_{1,1726} = 209.3$; $P < .001$).

DISCUSSION

Many US adult smokers sampled (38.0%) have tried an alternative tobacco product in the past, and 13.6% used one in the past 30 days. In addition, about 12% of smokers in our sample were current dual users (smoked cigarettes and used some other tobacco product) in the past 30 days. Men and younger people were most likely to have used any alternative tobacco products in the past (except dissolvables), and women and people of Asian descent were more likely to have tried e-cigarettes, although the sample size of Asian participants was small and may not be representative.

Among various alternative tobacco products, e-cigarettes were tried most frequently, and participants were most open to using them in the future. The 20.1% of smokers who tried e-cigarettes in our study is comparable to the 19.2% previously reported by Regan et al.,¹⁶ and the small increase we observed may be a

result of the growing popularity of e-cigarettes. Rates of use of loose leaf tobacco, moist snuff, and snus were about equal to one another, with 13% to 15% of smokers reporting having used one of those products. Our observation that interest in and trial of e-cigarettes is higher than that for all smokeless tobacco products is consistent with qualitative studies showing that smokers regard e-cigarettes as more appealing than smokeless tobacco.³⁴

Recently, some have endorsed smokeless tobacco as a means to reduce harm caused by smoking.^{17,18} It is argued that for those who cannot and will not quit smoking (e.g., “inveterate”¹⁸ smokers), it is better to switch to smokeless tobacco than to continue smoking.³⁵ However, our data showed that smokers who were not interested in quitting also were not interested in using alternative tobacco products. By contrast, smokers planning to quit in the next 6 months or unsuccessful quitters were the most interested in using alternative tobacco products. No data indicate that smokeless products aid cessation, and some studies suggest that dual users (smokers who also use smokeless tobacco) are less likely to quit using tobacco than are those who solely use either cigarettes or smokeless tobacco.³⁶ In addition, dual users try to quit more often than do those who only smoke cigarettes but have less success.³⁷ By encouraging smokers to use smokeless tobacco, rather than achieving abstinence from all tobacco products or complete switching to smokeless tobacco, dual use of cigarettes and smokeless tobacco may result.

We observed that 51% of smokers expressed at least some interest in using smokeless tobacco in an environment where they could not smoke. Yet use of smokeless tobacco products in smoke-free environments may not be beneficial to public health. The introduction of clean indoor air laws in work and public places is connected to reductions in smoking rates.³⁸ Encouraging smokeless tobacco use in smoke-free workplaces might attenuate this effect on cessation (similar to when a smoking room is allowed in a smoke-free workplace),³⁸ which may have significant and detrimental health consequences.

Limitations

This study had several limitations. Because this was a cross-sectional study, we could not

determine whether use of alternative tobacco products resulted in cessation attempts or whether those who were trying to quit—for whatever reason—were using alternative tobacco products. We also could not determine whether use of these products is intended to facilitate quitting and whether use leads to successful quitting. Prospective longitudinal studies should examine whether smokers who use smokeless tobacco are actually more successful at quitting.

Although Knowledge Networks provided a probability-based prerecruited Internet-based panel, this approach still might have nonresponse bias, and people who were recruited to the panel (even though selected based on a probability sample) still might be different from those who refused. However, Knowledge Networks's methods of recruiting participants, such as contacting those chosen to be on the panel repeatedly (up to 14 times in 90 days) and maintaining extensive refusal conversion efforts, minimize these differences. By offering panel participation in exchange for free Internet access, the Knowledge Networks panel avoids many of the biases of other Internet panels, which tend to reflect the higher socioeconomic status and educational status of those with easy Internet access.

All tobacco product use in this study was self-reported by respondents and thus subject to recall or reporting bias. Our use of images of the alternative tobacco products on the survey was intended to improve recall of product use. Biochemical measures could validate the self-reported data in this study, but no validated biomarkers exist for use of the novel tobacco products, and studies have questioned the value of biochemical markers in population-based low-intensity trials.³⁹

Our study was limited to current and former smokers, so we were not able to address awareness of and interest in alternative tobacco products among nonsmokers. However, nonsmokers also have reported use of alternative tobacco products.¹⁶ Similar to previous research,⁴⁰ we found that younger adults (aged 18–29 years) were the most likely of all age groups to have tried all types of smokeless tobacco products and to be dual users. This could be the result of the heavy marketing of smokeless tobacco to younger people.^{41,42} Youth initiation of tobacco use is harmful to

health; even if individual products are safer than cigarettes, the products contain the addictive substance nicotine and may lead to continued tobacco use.^{23,43} Interest in and use of alternative tobacco products should be measured in youth surveillance studies, and longitudinal studies should examine the natural history of use of alternative tobacco products.

Conclusions

Although the perceptions of smokeless tobacco products were generally negative, smokers expressed more interest when presented with specific reasons for their use, such as in situations when they cannot smoke or when they are presented as products that help them quit or cut down on smoking. These are exactly the messages used to promote novel smokeless products (Figure 2). For example, Camel Snus advertisements urge smokers to use snus in smoke-free environments to “Boldly go anywhere” and proclaim snus to be “bar-friendly.” Snus also has been promoted as an alternative to smoking cessation in the Camel Snus “Smoke-Free Resolution” campaign, which encouraged smokers to switch to Camel Snus around the New Year, a time when many make a resolution to quit smoking.⁴⁴ This study suggests that these promotional messages may increase smokers' interest in and trial of alternative tobacco products.

Smokers (and particularly those who tried unsuccessfully to quit) are especially interested in using e-cigarettes. Those trying to quit smoking and younger smokers were most interested in alternative tobacco products, but use of these products was not associated with having made a successful quit attempt. This result calls into question whether these products aid cessation (as some claim) and whether the pattern of use is consistent with harm reduction (when one would expect use by inveterate smokers, not those interested in quitting). Prospective longitudinal studies tracking the effects of use of alternative tobacco products on cigarette use and quit attempts are warranted to inform regulation of the marketing and promotion of these products. Explicit or implied claims that alternative tobacco products are smoking cessation aids should be prohibited in the absence of a body of scientific evidence showing such an effect. ■

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Contributors

L. Popova led the writing of the article. P. M. Ling conceptualized and supervised the study. Both authors contributed to the development of the survey instrument; the analysis and interpretation of the data; and the review, revision, and approval of the final article.

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Human Participant Protection

The study was approved by the Committee on Human Research of the University of California, San Francisco.

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