

Snus use and rejection in the USA

Lois Biener,¹ Anthony M Roman,¹ Scott A Mc Inerney,¹ Dragana Bolcic-Jankovic,¹ Dorothy K Hatsukami,² Alexandra Loukas,³ Richard J O'Connor,⁴ Laura Romito⁵

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/tobaccocontrol-2013-051342>).

¹Center for Survey Research, University of Massachusetts Boston, Boston, Massachusetts, USA

²Masonic Cancer Center, University of Minnesota, Minneapolis, Minnesota, USA

³Department of Kinesiology & Health Education, University of Texas at Austin, Austin, Texas, USA

⁴Department of Health Behavior, Roswell Park Cancer Institute, Buffalo, New York, USA

⁵Department of Oral Biology, Indiana University School of Dentistry, Indianapolis, Indiana, USA

Correspondence to

Dr Lois Biener, Center for Survey Research, University of Massachusetts Boston, 100 Morrissey Blvd., Boston, MA 02125, USA; Lois.biener@umb.edu

Received 10 September 2013
Revised 21 January 2014
Accepted 28 January 2014
Published Online First
25 February 2014



To cite: Biener L, Roman AM, Mc Inerney SA, et al. *Tob Control* 2016;**25**:386–392.

ABSTRACT

Objective To determine whether snus might become a strategy for reducing the harm associated with cigarette smoking in the USA as appears to be the case in Sweden, we examined receptivity to snus use in two cities with the greatest exposure to the major brands.

Methods A dual frame, telephone survey and a brief mail survey were conducted in 2011 and 2012 in Indianapolis, Indiana and Dallas/Fort Worth Texas. Over 5000 adults completed surveys. Trial, ever use, current use and reasons for using or quitting snus after trial were measured.

Results Among male smokers, 29.9% had ever tried snus (CI 22.7 to 38.1) and 4.2% were current users (CI 1.6 to 10.7). Among female smokers, 8.5% ever tried snus (CI 4.4 to 15.7) and current use was unknown. Current use was virtually absent among former smokers and never smokers. A major predictor of any level of snus use was current use of conventional smokeless tobacco. Those who tried and gave up snus cited curiosity (41.3%) and the fact that it was available at low or no cost (30%) as reasons for trial; reasons for not continuing included preferring another form of tobacco (75.1%) and disliking the mouth feel (34.6%). Almost all current snus users indicated that they were trying to cut down on cigarettes, but few (3.9%) were using it to quit smoking entirely.

Conclusions The low rate of adoption of snus suggests that neither the hopes nor the fears surrounding this new product are likely to be realised in the USA with the current marketing patterns.

The two largest US cigarette makers introduced low nitrosamine smokeless tobacco (LNSLT) products into several cities in 2006 and 2007, and by 2010 were marketing snus nationally under their major brand names, Camel and Marlboro.^{1–2} Two other cigarette companies launched snus products, but withdrew them from the market after a short time.³ Snus differs from most conventional smokeless tobacco (CSLT) in that it (A) has lower levels of tobacco specific nitrosamines, which are strong lung and oral carcinogens; (B) does not require spitting; and (C) is packaged in small sachets that can be unobtrusively placed under the lip. A panel of experts has estimated that using snus is 90% less harmful than smoking cigarettes.⁴ Most researchers agree that if smokers switched to snus, their health would improve. This is based on the Swedish experience, where the substantial reductions in lung and oral cancers have been attributed to the substitution of snus for smoking, particularly among men.^{5–6} Consequently, promotion of snus for smokers has been discussed as a potential tobacco harm reduction strategy.^{7–11}

Promoting snus for harm reduction has been controversial. Some are concerned that communicating

snus's lower risk relative to cigarettes will attract former smokers and non-smokers who would otherwise remain tobacco-free.^{12–15} Also, snus use might reduce smoking cessation rates by serving as a temporary source of nicotine when smoking is prohibited. Much of the advertising seems to promote dual use with cigarettes^{16–17} which might result in extended exposure to combustible tobacco and therefore cause increased morbidity and mortality. Furthermore, some question whether the Swedish experience with snus can be generalised to countries where smokeless tobacco has not been adopted with equal enthusiasm.¹⁸ Consequently, surveillance of the receptivity to snus and its impact on smoking in the USA, one of the few countries where its sale is permitted, is an important component of the empirical work that is needed to bring scientific evidence to bear on this controversy.

Several papers estimating snus trial in US test markets have been published. These have found that trial is most prevalent among male smokers,^{19–20} particularly those ages 18–24 years, 29% of whom reported trying snus in the past year.²⁰ Recently, national estimates of trial and current use have been reported.^{21–22} McMillen, Maduka and Winickoff (2012), reported that in 2010, 5.1% of the population (8% of men and 2% of women) had tried snus, and that trial among daily and non-daily smokers was 12.9% and 4.1%, respectively (or 11.4% of all smokers).¹ These investigators estimated that current use (ie, past month use) was less than 1%. King, Dube and Tynan (2012) estimated the prevalence of past month use to be 1.4% of the population—higher among men (2.5%) than women (0.4%). Their findings imply a substantially higher rate of current snus use among male smokers, perhaps approaching 9%. It is likely, however, that this is an overestimate of current use because the question used to measure snus use did not clearly distinguish it from CSLT. New tobacco products are frequently confused with others unless efforts are made to confirm that the product in question is, indeed, one of the novel brands available.²³ Both national studies were conducted very early (6–18 months) in the national marketing of snus, so that receptivity in other areas may not have had a chance to develop.

This study is an effort to estimate receptivity to snus use in the US locations where the two most highly advertised products have been available the longest: Dallas/Fort Worth, Texas and Indianapolis, Indiana. Our purpose was to establish benchmarks for the following: rates of awareness, trial, progression to regular use, motivations for trial, and

¹The rate in all smokers is estimated based on the finding that 75% of all smokers were daily smokers.

reasons for not continuing to use snus. We also examined the demographic characteristics of those taking up snus, and the associations between snus use, cigarette smoking history and intentions to quit.

METHODS

Sample design

Male smokers and young adults, those most likely to use snus, were oversampled.^{19 20} A dual-frame, address-based sample was used: a list frame and the US Postal Service Delivery Sequence File (DSF). The list frame consisted of addresses and telephone numbers of households believed to include a male smoker and/or an individual between the ages of 18 years and 25 years. For the sample of addresses selected from the DSF file, a phone matching service was able to provide phone numbers for 55.6% of the randomly selected households. Telephone numbers and addresses obtained for the DSF file were then unduplicated from the list sample. The telephone survey was supplemented by a brief mail survey of a sample of the DSF addresses for which no phone numbers could be obtained to address potential bias due to non-inclusion of such households. The mail survey included only a subset of questions (eg, demographics, smoking status, ever and current use of various forms of tobacco). However, all mail respondents were asked if they would be interested in completing a follow-up phone survey for which they would be paid \$25. All interested mail respondents who provided a phone number and reported being a smoker were telephoned and administered the entire phone survey. The combined list and DSF samples were representative of the population of the two areas. Data were weighted to account for the probability of selection and survey non-response, and were then poststratified to match the sample to the age, gender and smoking status of persons in the two geographical regions being sampled. Data were collected between February 2011 and June 2012.

Measures

Conventional tobacco use

Measures of tobacco use assessed ever and current use of cigarettes, and CSLT. Current cigarette smoking was defined as having smoked 100 cigarettes in one's lifetime, and currently smoking 'some days' or 'every day.' Current use of CSLT was defined as using 'chewing tobacco, dip or snuff' at least 20 times, and having used it in the past 30 days.

Snus awareness and use

Because snus is a relatively new product, and has been shown to be confused with conventional moist snuff,²³ efforts were made to ensure that respondents who reported using snus were, indeed, referring to the new LNSLT products. Confirmed awareness of snus was measured with the following questions on the phone survey only: "New smokeless tobacco products are now available that come in teabag-like pouches that are put in the mouth under the lip. They do not involve spitting or chewing. They are called snus (rhymes with goose) or snuhss (rhymes with bus). Have you ever heard of products like these?" Those who responded affirmatively were asked which pronunciation they favoured, and what brand names of snus products they had heard of. If they did not mention either Camel or Marlboro snus, they were asked whether they recognised either of those two brand names. Confirmed awareness was defined as having heard of the products and either naming a recognised LNSLT product or recognising the brand Marlboro or Camel snus. To measure trial, those who confirmed awareness were asked,

"Have you ever tried any snus products, even one time?" Those who responded affirmatively were asked, "What snus product have you tried?" Respondents who named a recognised LNSLT brand were considered snus triers. On the mail survey, trial was measured with a similar question, but respondents were simply asked to check the brand of snus they had tried from a list of snus brands (Camel, Marlboro, General, Taboka, other). On both surveys, a former user of snus was defined as a respondent who was a trier who reported having used at least 20 pouches of snus, but had not used it in the past 30 days. A current snus user was defined as a trier, who had used at least 20 pouches and reported use in the past 30 days. Some analyses combine former and current users, who are referred to as 'ever users'.

Potential predictors of snus use

In the population as a whole, the following predictors of snus use were assessed: age, gender, education, racial/ethnic minority status, smoking and CSLT status. Separate analyses were carried out for male smokers that examined number of cigarettes per day; having tried to quit smoking in the past 2 years; expectations of quitting smoking in the coming year; CSLT status; being a recipient of tobacco promotional mailings; and exposure to up to three smoking bans (at home, work and local restaurants).

Reasons for trying and for giving up snus

Snus triers and former users were asked to provide up to three reasons for trial. These open-ended responses were coded into categories endorsed by multiple respondents using thematic analysis.²⁴ Five reasons were most prevalent: curiosity; could be obtained for free or reduced cost; to use where smoking wasn't permitted; to cut down on or quit smoking cigarettes; and to substitute for CSLT. Two coders independently read each comment and decided whether it fit into any of the five categories. Disagreements were rare and were resolved by the first author. Respondents were given a dichotomous score indicating mention or no mention of each category. A close-ended strategy was used to assess reason for not continuing to use snus. Snus triers and former users were presented with 10 possible reasons for not continuing to use snus and asked to rate each as very, somewhat or not important. These ranged from its taste and feel to concerns about how others viewed it.

Current snus users who were also smokers were asked to indicate whether they did or did not use snus for each of the following reasons: (1) where smoking is not permitted, (2) when others prefer they do not smoke, (3) to avoid exposing others to tobacco smoke, (4) to avoid smelling like smoke, and (5) to help reduce or (6) to quit smoking.

Analysis plan

Cross tabulations and logistic regression analyses examined rates and predictors of snus use using IBM SPSS V.20, complex sample procedures. Descriptive statistics were calculated to report on reasons for trying and using snus, and reasons for not continuing to use snus.

RESULTS

The response rates for the various data collection modes were as follows: original telephone sample—27.5%; mail sample—32%; phone follow-up of mail respondents—54.7%. The cooperation rate for the original phone sample (ie, the proportion of eligible contacted households that yielded a completed survey) was 57.3%. Table 1 shows the size and characteristics of the phone and mail samples. A corresponding table showing the unweighted characteristics of the sample is available online as supplementary

Table 1 Sample characteristics

	Dallas/Fort Worth			Indianapolis			Total		
	Phone sample (n=1438) %	Mail sample (n=819)%	Total sample (n=2257)%	Phone sample (n=2026)%	Mail sample (n=872)%	Total sample (n=2898)%	Phone sample (n=3464)%	Mail sample (n=1691)%	Total sample (n=5155) %
Gender									
Male (n=2665)	49.6	49.2	49.4	49.5	48.2	49.0	49.6	49.1	49.3
Female (n=2485)	50.4	50.8	50.6	50.5	51.8	51.0	50.4	50.9	50.7
Age group, years									
18–30 (n=1044)	31.0	33.5	32.3	16.3	30.2	21.4	27.3	33.0	29.9
31–49 (n=1670)	37.7	40.3	39.0	53.1	38.9	47.9	41.6	40.1	40.9
50–65 (n=2400)	31.3	26.1	28.8	30.6	31.0	30.8	31.1	27.0	29.2
Education									
High school or less (n=1381)	23.2	24.3	23.8	17.1	27.7	21.1	21.7	24.9	23.2
Some college (n=1667)	19.2	34.9	26.9	35.0	29.6	33.0	23.1	34.0	28.2
BA or more (n=2087)	57.5	40.8	49.3	48.0	42.7	46.0	55.2	41.1	48.6
Race/ethnicity									
White/non-Hispanic (n=4045)	69.7	60.8	65.3	82.8	79.1	81.4	73.0	63.9	68.8
Minority (n=1081)	30.3	39.2	34.7	17.2	20.9	18.6	27.0	36.1	31.2
Smoking status									
Current smoker (n=1938)	17.1	15.0	16.1	22.8	19.2	21.4	18.5	15.7	17.2
Former/non-smoker (n=3217)	82.9	85.0	83.9	77.2	80.8	78.6	81.5	84.3	82.8
Snus trial									
Ever tried (n=460)	6.1	6.5	6.3	4.5	6.9	5.5	5.7	6.6	6.1
Never tried (n=4695)	93.9	93.5	93.7	95.5	93.1	94.5	94.3	93.4	93.9
Snus use									
Used at least 20 times (n=145)	3.7	2.0	2.8	0.6	1.6	1.0	2.9	1.9	2.4
Has not used 20 times (n=5010)	96.3	98.0	97.2	99.4	98.4	99.0	97.1	98.1	97.6

Ns are unweighted; percentages are weighted.
BA, Bachelor's degree.

Table 2 Rates of snus awareness and receptivity as a function of smoking status and gender

	All		Male		Female	
	Per cent	CI	Per cent	CI	Per cent	CI
Aware of snus						
Total	27.0	(19.7 to 35.9%)	34.8	(23.2 to 48.6%)	19.4	(10.7 to 32.5%)
Smoker	59.9	(50.7 to 68.4%)	62.3	(50.9 to 72.4%)	56.0	(41.0 to 70.0%)
Former smoker	41.5	(23.4 to 62.2%)	55.3	(31.2 to 77.1%)	18.0	(7.2 to 38.3%)
Never smoker	18.0	(10.3 to 29.6%)	23.7	(11.9 to 41.8%)	13.2	(4.7 to 31.7%)
Tried snus						
Total	6.1	(4.4 to 8.5%)	10.9	(7.5 to 15.6%)	1.5	(0.8 to 2.7%)
Smoker	21.2	(16.3 to 27.1%)	29.9	(22.7 to 38.1%)	8.5	(4.4 to 15.7%)
Former smoker	6.2	(4.0 to 9.5%)	9.8	(6.0 to 15.5%)	1.7	(0.5 to 5.2%)
Never smoker	2.4	(0.9 to 6.3%)	5.0	(1.8 to 13.4%)	0.2	(0.0 to 1.1%)
Ever used snus*						
Total	2.4	(1.2 to 4.9%)	4.6	(2.2 to 9.6%)	0.3	(0.1 to 0.7%)
Smoker	5.7	(3.1 to 10.3%)	9.0	(4.7 to 16.4%)	0.9	(0.2 to 3.4%)
Former smoker	2.7	(1.4 to 5.1%)	3.8	(1.8 to 7.7%)	1.4	(0.4 to 5.3%)
Never smoker	1.6	(0.4 to 6.7%)	3.4	(0.8 to 14.0%)	–	–†
Currently use snus‡						
Total	0.5	(0.2 to 1.2%)	1.0	(0.4 to 2.4%)	0.1	(0.0 to 0.6%)
Smoker	2.5	(0.9 to 6.5%)	4.2	(1.6 to 10.7%)	0.0	(0.0 to 0.0%)
Former smoker	0.7	(0.2 to 2.6%)	0.6	(0.1 to 4.3%)	0.7	(0.1 to 4.7%)
Never smoker	0.0	(0.0 to 0.1%)	0.1	(0.0 to 0.2%)	–	–†

*Used at least 20 pouches.

†Estimates could not be made as no cases were found.

‡Used at least 20 pouches and used in the past 30 days.

material (see online supplementary table S1). The weighted analyses indicate no significant mode effects on snus trial and use.

Snus awareness and use

As table 2 shows, more than a quarter of the adult population was aware of the new snus products, but only 6% reported trying it at least once; 4.6% were ever users, and less than 1% of the population reported being a current user. Awareness was highest among smokers (59.9%) and lower among former (41.5%) and never smokers (18%) ($p < 0.001$). Trial was highest among smokers (21.2%) and much lower for former smokers (6.2%) and never smokers (2.4%) ($p < 0.001$). Snus trial was higher among male smokers (29.9%) than among female smokers (8.5%) ($p < 0.001$).

It is apparent that about a third of the male smokers who tried the new product, went on to become ever users (ie, to use it at least 20 times) and about 14% of those who tried it reported being current users (4.2% of all male smokers). Ever use of snus was very rare among female smokers (<1%). Among male former and never smokers, trial was reported by 9.8% and 5%, respectively, and ever use was 3.8% and 3.4%, respectively. However, current use was below 1% for current and former male smokers. Among female former and never smokers, trial and repeated use was low and current use was virtually absent. Because of the very low rate of current use of snus, regression models will yield unstable results.²⁵ Therefore, further multivariate analyses of snus use focused on ever users (ie, former and current users).

Predictors of snus awareness and use

Logistic regression assessed the demographic and tobacco use predictors of awareness and use of snus (table 3). Among the demographic predictors (gender, age group, race/ethnicity and

education), only education had a significant independent association with snus awareness with less educated individuals being more aware of snus. Tobacco use status was a significant predictor of awareness; current users of CSLT were almost six times as likely to be aware of snus as non-users. Current smokers were four times as likely to be aware as non-smokers.

Trial and ever use of snus was significantly more likely in men, younger people, and those with less than a college education. White, non-Hispanic respondents were more than twice as likely to report trying snus, but race/ethnicity was not significantly related to ever use. Current tobacco use was an important predictor of snus trial; smokers and CSLT users were six to eight times as likely to try snus as those not using tobacco in these forms. Current CSLT users were more than seven times as likely to become ever users as non-CSLT users, but controlling for CSLT status, smoking status was not significantly associated with snus use beyond trial.

Predictors of snus use among male smokers

Oversampling of male smokers permitted a closer look at the predictors of snus use in that group. Age was an important predictor of snus trial among male smokers, but was not of ever use (table 4). Neither race/ethnicity nor education predicted trial, but ever use was significantly more likely among white non-Hispanic respondents than among minorities. Respondents who were recipients of tobacco promotions were more likely to try snus, but not necessarily more likely to progress to ever use. Sixty-one per cent of male smokers tried to quit in the past 2 years. Quit attempts were not significantly associated with snus trial in bivariate analyses (67% vs 59%, $p = 0.53$); but quit attempts were almost universal among those who used snus 20 or more times (90% vs 58%, $p = 0.01$). These relationships held up in the multivariate analysis as well. However, compared with those who expected to quit smoking in the coming year,

Table 3 Adjusted ORs for snus awareness and receptivity

Dependent variable	Aware of snus† (n=3434) Adjusted OR (95% CI)	Tried snus (n=5,077) Adjusted OR (95% CI)	Ever used snus‡ (n=5077) Adjusted OR (95% CI)
Gender			
Male	2.18 (0.97 to 4.89)	6.88* (3.05 to 15.53)	12.27* (2.78 to 54.17)
Female	1.00	1.00	1.00
Age group (3 level), years			
18–30	0.84 (0.30 to 2.38)	11.01* (4.38 to 27.69)	7.21* (1.49 to 34.81)
31–49	1.02 (0.34 to 3.08)	4.34* (2.06 to 9.14)	2.93 (0.92 to 9.31)
50–65	1.00	1.00	1.00
Race/ethnicity			
White/non-Hispanic	1.41 (0.55 to 3.65)	2.37* (1.05 to 5.36)	4.70 (0.99 to 22.25)
Minority	1.00	1.00	1.00
Education (2 level)			
Less than BA	3.27* (1.35 to 7.92)	2.67* (1.20 to 5.97)	4.79* (1.31 to 17.53)
BA or more	1.00	1.00	1.00
Smoking status			
Current smoker	4.01* (1.84 to 8.71)	7.99* (4.02 to 15.87)	1.87 (0.60 to 5.88)
Former/non-smoker	1.00	1.00	1.00
CSLT status			
Current user	5.70* (1.77 to 18.40)	6.68* (3.02 to 14.80)	7.24* (2.02 to 25.99)
Not a current user	1.00	1.00	1.00

* $p < .05$.

†Includes values for phone respondents only.

‡Combines former users and current users.

CSLT, conventional smokeless tobacco.

smokers who believed that they would still be smoking in 12 months were significantly more likely to try and to continue using snus. Male smokers smoked an average of 16.9 cigarettes per day. Smoking rate was slightly lower among those who tried snus versus those who did not (14.7 vs 18.1, $p=0.11$), as well as among those who used snus at least 20 times versus those who did not (16.1 vs 17.0). Multivariate analysis demonstrated that number of cigarettes smoked per day was not independently associated with snus trial or ever use. Exposure to smoke-free environments was unrelated to snus use. Smokers who also used CSLT were much more likely to try snus and to progress to ever use.

Smokers' reasons for trying and then giving up snus

Of ever triers, most (54.4%) used snus only once or twice. Among smokers who did not become current snus users, the most frequently cited reasons for trying snus were the following: curiosity (41.3%; 95% CI 23.5 to 61.7); to take advantage of a free sample or a coupon (30.3%; 95% CI 14.2 to 53.4); to see whether it would help with quitting smoking or cutting down on cigarettes smoked (25.5%; 95% CI 11.7 to 47.0); and to use where smoking was not permitted (20.0%; 95% CI 8.7 to 39.6). There were several gender differences in the reasons for trying snus: Women were significantly more likely than men to report wanting to use snus in smoke-free areas (49.7% vs 12.3%, $p=0.04$) and significantly less likely than men to report wanting to use it to reduce or quit smoking (3.1% vs 22.4%, $p=0.03$).

When asked to rate 10 possible reasons for not continuing to use snus, the four most often endorsed as "very important" were: liking another form of tobacco better (75.1%; 95% CI 54.0 to 88.6), not liking the way it felt in the mouth (34.6%; 95% CI 19.0 to 54.4), disliking the taste (26.8%; 95% CI 13.5 to 46.3), and feeling sick when using it (21.5%; 95% CI 10.6 to 38.6). Men were less likely than women to fault the taste and mouth feel of snus, and women were significantly more likely than men to report that they thought it made them look bad to use snus. Detailed tables showing levels of endorsements for all reasons for trying and giving up snus are available online in supplementary tables S2 and S3.

Reasons for use among current snus users

Of smokers who reported using snus in the past month ($n=29$), only 3.9% (95% CI 1.5 to 9.6) indicated that they were using snus to try to quit smoking, but 98% (95% CI 95.1 to 99.3) said they were using snus to try to cut down on the number of cigarettes they smoked; 83% (95% CI 44.7 to 96.8) indicated that they wanted to avoid exposing others to secondhand smoke; 75.7% (95% CI 47.1 to 91.6) wanted to avoid smelling like tobacco smoke. Only 28% (95% CI 11.7 to 53.6) said they used snus when they were in no-smoking areas, and fewer still (4.3%; 95% CI 1.8 to 9.8) reported using it when others preferred that they not smoke. Almost all of the current snus users (96.7%; 95% CI 87.8 to 99.2) believed it was very or somewhat likely that they would be using snus in 12 months. Most of those who were current smokers expected to be smoking in 12 months (83.9%; 95% CI 48.3, to 96.7%). Virtually all who

Table 4 Adjusted ORs for snus receptivity among male smokers

Dependent variable	Tried snus† (n=945) Adjusted OR (95% CI)	Ever used‡ (n=945) Adjusted OR (95% CI)
Age group, years		
18–30	71.38* (10.80 to 471.83)	1.46 (0.14 to 15.19)
31–49	2.47 (0.61 to 9.94)	2.08 (0.30 to 14.49)
50–65	1.00	1.00
Race/ethnicity		
White/non-Hispanic	1.50 (0.24 to 9.49)	7.69* (1.14 to 51.86)
Minority	1.00	1.00
Education		
BA or more	0.36 (0.12 to 1.11)	0.49 (0.08 to 2.95)
Less than BA	1.00	1.00
Tried to quit in past 2 years		
Yes	0.80 (0.19 to 3.35)	14.63* (2.47 to 86.81)
No	1.00	1.00
Likely to be smoking in 12 months		
Yes	4.75* (1.69 to 13.35)	6.99* (1.10 to 44.62)
No	1.00	1.00
Received tobacco promotion in mail in past 12 months		
Yes	7.62* (2.12 to 27.44)	5.68 (0.55 to 58.78)
No	1.00	1.00
CSLT status		
Current user	13.69* (3.23 to 57.96)	70.60* (13.71 to 363.49)
Not a current user	1.00	1.00
Number of cigarettes smoked per day	0.98 (0.94 to 1.03)	1.01 (0.95 to 1.07)
Number of smoke-free environments	0.93 (0.51 to 1.69)	0.66 (0.27 to 1.66)

* $p<0.05$.

†Includes those who used snus one or more times.

‡Combines former and current users: Those who used snus at least 20 times. CSLT, conventional smokeless tobacco.

were also current CSLT users expected to still be using that form of tobacco in 12 months.

DISCUSSION

This study provides realistic estimates of the awareness, trial and continuing use of snus given availability and marketing strategies in the USA as of 2012. Our findings indicate that although most smokers (60%) are aware of snus, and 21% try it at least once, (almost twice the rate reported by McMillen *et al.*)²¹ very few go on to use it regularly. Past month use is estimated at about 1% of all men and 4.2% of male smokers, less than half of what can be estimated from King *et al.*²² Past month use is virtually absent among female smokers. In addition we confirm earlier findings that snus use is primarily a young male smoker phenomenon and that trial is a significant function of receiving tobacco promotions.^{19 20} What has been learned for the first time in this study is that experience with CSLT is one of the strongest predictors of snus trial and continued use. Although our sample included relatively few current users of CSLT ($n=155$), among male CSLT users 51% had tried snus and 29% were ever users; among male smokers *not* also using CSLT, only 25% tried snus and only 4.6% were ever users.

There are study limitations that must be considered when interpreting the findings. The sampling strategy resulted in rather large design effects that tend to increase the CIs around some estimates, especially among subgroups that were not oversampled. Also, the low prevalence of regular snus use leads us to interpret findings based on that small group cautiously. Nevertheless, this study has many methodological advantages over previous work. It used a population-based sample in two geographical areas that served as early test markets for the major snus brands, so we can be confident that the products were available for a sufficient period of time to allow for meaningful estimates of population awareness, trial and progression to regular use. The survey required that respondents confirm reports of snus awareness and use by providing brand names; therefore estimates are unlikely to be inflated by confusion with conventional pouched smokeless tobacco.²³ Male smokers, the primary target of snus marketing, were oversampled ensuring a sufficient sample for relatively precise estimates of trial and continuing use. The fact that we were unable with available resources to oversample recent former smokers is a limitation of the current design. Consequently, although we saw that snus use is associated with quit attempts among current smokers, we did not have a sufficient number of cases to examine the extent to which snus use is associated with quitting smoking.

One concern that has been raised about snus is that it could lure former smokers back to tobacco use or even attract never smokers. Indeed, among the male respondents, almost 10% of former smokers tried snus, and almost 4% persist to use it more than 20 times. However, less than 1% became current users. A similar pattern of low levels of experimentation (5%) and ever use (3.4%) applies to male never-smokers. If current and former CSLT users are removed from the male analyses, the rate of trial by former male smokers drops from 10% to 4% and ever use from 3.4% to less than 1%. Snus trial and use among male never smokers who never used CSLT is even lower, and for former and never smokers who never used CSLT, current use of snus is non-existent.

Analysis of smokers who tried snus but did not continue using the product provides some insight into what sparked their initial interest. The most frequent reasons given were curiosity and the ability to obtain the product either for free or at a low price. Less often, these experimenters said they wanted to see if

it might be useful in quitting smoking or at least cutting down (these two reasons could not be untangled in coding). Although only two people mentioned that snus was probably less harmful to health than smoking, many who wanted to use it to cut down implied, in the words of one respondent, that they “wanted to give (their) lungs a break” from the smoke. Once they tried the product, however, they found it less desirable than their primary form of tobacco use, that is, cigarettes. Most endorsed the item, “prefer another form of tobacco” as an important reason for quitting snus; also noted were a dislike of the taste, mouth-feel and the fact that it made them feel sick.

It is interesting that among the few current snus users who are also smokers, the primary reason for using is not to get them through periods where they are not able to smoke, as has been feared, but rather “to cut down on smoking”. Like those who don’t continue with the product, they are trying to smoke less.

In conclusion, given the current snus design and marketing featuring strong health warnings, this study suggests that the hopes and the fears surrounding this new type of tobacco product are unlikely to materialise in the USA. Although a good proportion of the smokers, who are the target of marketing, have been willing to try the product at low or no cost, unless they also have some experience using CSLT, they are very unlikely to progress to regular use. They enjoy cigarettes too much and find the experience of putting tobacco pouches in their mouth quite unpleasant. Thus to date, the major public health benefit that has been hoped for, the reduction in smoking in favour of smokeless use, is unlikely to occur in the USA as it has among Swedish men. Concomitantly, there seems little reason for concern that substantial numbers of former or never-smokers, especially those without CSLT experience, will use snus regularly. The few individuals who do progress to regular snus use, however, do appear to be using it as an adjunct to their conventional tobacco use (cigarettes and CSLT). Therefore, the impact of this additional product on health bears monitoring.

What this paper adds

This study is the first to assess prevalence of snus awareness, trial and uptake in a population that has had over 3 years of exposure to snus marketing in a probability-based sample. Using very rigorous measures, we examine reasons for trial, reasons for rejecting regular use and motivations for continued use. We demonstrate the importance of experience with conventional smokeless tobacco as a predictor of snus uptake.

Contributors LB conceived of the study, AMR designed the sampling strategy and performed sample weighting, SAM and DB-J had a role in designing and evaluating the survey questions and supervising the data collection and helping with the analysis. DKH, RJOC, AL and LR helped in the selection of questions. AL and LR provided support to data collection at the two sites. All authors provided inputs into the writing and editing of the paper.

Funding This study was supported by a grant from the US National Cancer Institute, Grant #R01CA151384-03.

Competing interests DKH received funding from Nabi Pharmaceuticals to direct a nicotine immunotherapy trial at her institution.

Ethics approval The study protocol was reviewed and approved by the IRB at the University of Massachusetts, Boston.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement Data from this study will be available from the first author to interested researchers when all currently planned papers have been submitted.

REFERENCES

- 1 Staff. Altria Group to go national with smokeless Marlboro Snus. *Winston-Salem Journal* 2010.
- 2 Craver R. Reynolds is taking its snus national. *Winston-Salem Journal* 2008.
- 3 Staff. Lorillard CEO: No need to venture beyond cigs. *Winston-Salem Journal* 2011.
- 4 Levy DT, Mumford EA, Cummings KM, et al. The relative risks of a low-nitrosamine smokeless tobacco product compared with smoking cigarettes: estimates of a panel of experts. *Cancer Epidemiol Biomarkers Prev* 2004;13:2035–42.
- 5 Luo J, Ye W, Zendejdel K, et al. Oral use of Swedish moist snuff (snus) and risk for cancer of the mouth, lung, and pancreas in male construction workers: A retrospective cohort study. *Lancet* 2007;369:2015–20.
- 6 Foulds J, Ramström LM, Burke M, et al. Effect of smokeless tobacco (snus) on smoking and public health in Sweden. *Tob Control* 2003;12:349–59.
- 7 Gartner C, Hall W. Harm reduction policies for tobacco users. *Int J Drug Policy* 2010;21:129–30.
- 8 Savitz DA, Meyer RE, Tanzer JM, et al. Public health implications of smokeless tobacco use as a harm reduction strategy. *Am J Public Health* 2006;96:1934–9.
- 9 Gartner CE, Hall WD, Chapman S, et al. Should the health community promote smokeless tobacco (snus) as a harm reduction measure? *PLoS Med* 2007;4:1138–41.
- 10 McKee M, Gilmore A. Swedish snus for tobacco harm reduction. *Lancet* 2007;370:1206.
- 11 Lambe M. Swedish snus for tobacco harm reduction. *Lancet* 2007;370:1206.
- 12 Joseph AM, Hennrikus D, Thoele MJ, et al. Community tobacco control leaders' perceptions of harm reduction. *Tob Control* 2004;13:108–13.
- 13 Hatsukami DK, Lemmonds C, Tomar SL. Smokeless tobacco use: harm reduction or induction approach? *Prev Med* 2004;38:309–17.
- 14 Tomar S. Is use of smokeless tobacco a risk factor for cigarette smoking? The U.S. experience. *Nic Tob Res* 2003;5:561–9.
- 15 Stratton K, Shetty P, Wallace R, et al., eds. *Clearing the Smoke: Assessing the Science Base for Tobacco Harm Reduction*. Washington, DC: National Academy Press, 2001, 191–2.
- 16 Carpenter CM, Connolly G, Ayo-Yusuf O, et al. Developing smokeless tobacco products for smokers: An examination of tobacco industry documents. *Tob Control* 2009;18:54–9.
- 17 Gray N. Has Marlboro Hijacked Tobacco Harm Reduction? *Addiction* 2012;107:1029–30.
- 18 Hall W, Gartner C. Supping with the Devil? The role of law in promoting tobacco harm reduction using low nitrosamine smokeless tobacco products. *Public Health* 2009;123:287–91.
- 19 Biener L, Bogen K. Receptivity to Taboka and Camel Snus in a U.S. test market. *Nic Tob Res* 2009;11:1154–9.
- 20 Biener L, McCausland K, Curry L, et al. Prevalence of trial of snus products among adult smokers. *Am J Public Health* 2011;101:1074–6.
- 21 McMillen R, Maduka J, Winickoff J. Use of emerging tobacco products in the United States. *J Environ Public Health* 2012;2012:989474.
- 22 King BA, Dube SR, Tynan MA. Current tobacco use among adults in the United States: findings from the national adult tobacco survey. *Am J Public Health* 2012;102:e93–100.
- 23 Bogen K, Biener L, Garrett CA, et al. Surveillance indicators for potential reduced exposure products (PREPs): developing survey items to measure awareness. *Harm Reduct J* 2009;6:27.
- 24 Guest G, MacQueen KM, Namey EE. *Applied Thematic Analysis*. Thousand Oaks, CA: Sage Publications, Inc., 2012.
- 25 Winship C, Radbill L. Sampling weights and regression analysis. *Social Methods Res* 1994;23:230–57.