RESEARCH PAPER

Smokeless tobacco use 1992–2002: trends and measurement in the Current Population Survey-Tobacco Use Supplements

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Background: As smoking prevalence declines in the United States, it is important to understand if smokeless tobacco (SLT) use is also changing and if so, among what groups.

Methods: We examine the prevalence of SLT use and smoking, 1992–2002, using the Current Population Survey-Tobacco Use Supplements (CPS-TUS), which used US nationally representative samples based on stratified clusters of households.

Results: Consistent with declines in smoking, the prevalence of current SLT use declined over the period 1992–2002 for males and females ages 18 and older. The overall separate declines in SLT use and in smoking are mirrored by a decline in concurrent use of SLT and cigarettes. SLT use is becoming more associated with white males, but use is declining faster among the youngest males.

Conclusions: The findings indicate that relative reductions in smoking prevalence are exceeded by relative reductions in SLT use, with sizeable reductions in concurrent use. These results suggest that the stricter cigarette policies of recent years may not only reduce cigarette use, but also the use of alternative tobacco products. In light of potential policy implications of SLT use as a potential reduced exposure product (PREP), current survey methods require more careful measurement of SLT use in terms of initiation, duration, quantity, and cessation.

Efforts to reduce the prevalence and health impact of smoking in the United States have involved an array of tobacco control policies and cessation strategies in the 1990s and the early part of this millennium. Policies such as excise taxes, clean air laws, youth access laws, health insurance coverage and expanded access to treatment, and media campaigns, with variable effects, have been shown to reduce smoking rates.^{1–2} At the same time, increasing numbers of potential reduced exposure products (PREPs) have been introduced and are being assessed in response to the enduring public health problem of smoking and smoking-related disease.³ Smokeless tobacco (SLT), while not a new product category, is one of the PREPs being assessed. Although risks remain,⁴ SLT products, particularly the low nitrosamine varieties,^{5–6} are generally believed to convey a lower risk of disease than cigarettes.

Specific PREPs may act as complements to smoking, either through deterring smoking cessation or inducing initiation. PREPs may instead serve as substitutes for smoking; individuals may use SLT to facilitate smoking cessation or in place of initiation. In particular, tobacco control policies aimed at cigarettes may lead users to substitute other tobacco products for cigarettes. Some evidence^{7–8} indicates that higher cigarette prices predict increased SLT use. Mumford *et al*⁹ did not find evidence of direct substitution related to tax policy among concurrent users in recent years but did find suggestions of substitution related to home smoking bans. Chaloupka *et al*¹⁰ found that restricting cigarette access for youth predicts reduced SLT use.

Reviewing recent trends in SLT and cigarette use in the United States over the past decade may provide further clues about the potential patterns of alternative product use. Studies examining these trends have focused on specific populations distinguished by region,^{11–13} occupation,^{14–16} or youth.^{17–21} Reviews of SLT use trends^{22–26} need to be updated and related to trends in smoking. In this study, we examine US trends from 1993 to 2002 in SLT use and smoking behaviour. Further,

we develop a method for analysing SLT trends, which suggests appropriate measures for future analysis.

METHODS

Data

This study uses data from five waves of the Current Population Survey-Tobacco Use Supplements (CPS-TUS), a time series of nationally representative cross-sectional samples: 1992/93, 1995/96, 1998/99, 2000, and 2001/02. The CPS-TUS, sponsored by the National Cancer Institute and implemented by the US Census Bureau, is designed to ask extensive questions on tobacco use, attitudes toward laws, and the presence of home and work smoking bans. The probability sample is based on stratified clusters of households drawn from an initial sampling frame that covers the civilian non-institutionalised population ages 15 and older. Primary data collection was conducted by telephone but about 30% of interviews were conducted in-person in the household. We limit the sample to respondents ages 18 and older. Depending on the survey wave, the samples of self-respondents ages 18 and older consist of 125 000 to 239 000 individuals. The 1992/93, 1995/96 and 1998/99 survey waves consist of samples collected in September, January, and May. The 2000 CPS-TUS data were collected in January and May and the 2001/02 data were collected in June, November, and February.

Smokeless tobacco use measures

Analyses are conducted using aggregates of the monthly samples for each survey wave.²⁷ The notable exception is the September 1998 sample, due to a change in the wording of

Abbreviations: CPS-TUS, Current Population Survey-Tobacco Use Supplements; ERS, Economic Research Service; MSA, Metropolitan Statistical Area; NHANES, National Health and Nutrition Examination Survey; NHIS, National Health Interview Survey; NSDUH, National Survey on Drug Use & Health; PREP, potential reduced exposure product; SLT, smokeless tobacco; USDA, United States Department of Agriculture

SLT (measured separately as snuff and chewing tobacco but aggregated in this study) use questions. (The appendix summarises across survey waves the survey questions and resulting measures used for this study. To view appendix visit the *Tobacco Control* website—<http://www.tobaccocontrol.com>.) In the 1992/93, 1995/96 and January and May 1999 samples, respondents were asked whether they had “ever used [product] on a regular basis”. The September 1998 sample differs from the January and May 1999 samples. In the September 1998 and the 2000 samples, the measure dropped the reference to regular use, asking only “Have you ever used [product]?” with follow-up questions clarifying frequency of current use. In the 2001/02 wave of (three) samples, the question was further qualified to distinguish ever-use “even one time”.

In the 1992/93 and 1995/96 surveys, respondents answering yes to questions about ever use were asked whether they currently used an SLT product. In survey waves beginning with 1998/99, following the ever-use screen, respondents were asked whether they currently used everyday, some days, or not at all, and then asked on how many of the past 30 days they used the SLT product.

Because the screening questions regarding ever use changed over time, the population of respondents asked about their current use is not consistent. The “ever regular use” screen may omit someone who would have answered yes to “ever use”. To balance this change, measures of current use may be defined more restrictively to reflect regular use. By selecting a minimum number of days out of the past 30 days that a respondent reports SLT use, the current prevalence measure can be made more likely to correspond to estimates from the “ever regular use” screen. However, there is no readily accepted measure of regular use. Focusing on the 1998/99 period of definition change, we map trends using consumption data from the Economic Research Service (ERS) of the United States Department of Agriculture (USDA),²⁸ focusing on the 1998–99 trend, as a reference to determine a minimum days of current use in the 1998 sample that corresponds to regular use in the 1999 samples.

Smoking measures

Smokers are screened by whether the individual had ever smoked at least 100 cigarettes in his/her life, a more restrictive measure than the ever use measure for SLT. Current smokers are those who smoke some day or everyday at the time of the survey. We distinguish these two groups as an indication of frequency of smoking.

Other respondent characteristics

Sufficient sample size permitted analysis of characteristics of males. We distinguish age categories 18–24, 25–44, 45–64, and 65 and older. Race/ethnicity, initially examined in five categories, was collapsed into a dichotomous variable marked White or Other due to low cell size counts in some categories. Education is measured in four categories: less than a high school degree, a high school degree or equivalent, some college education, and at least a four-year college degree. Residence reflects the CPS’s use of Metropolitan Statistical Areas (MSAs), which identify major metropolitan areas defined as a county or a group of counties with an urban centre populated by at least 50 000 persons. A small number of individuals marked “not identified” for MSA residential status were excluded.

Analysis

Analyses were conducted using STATA 7.0, applying weights (provided with the CPS data) adjusting for the sample design. Current prevalence estimates are presented for adult males (ages 18+) and adult females (ages 18+) over the period 1992/93 to 2001/02. We separately consider male ages 18–24 because they are an indicator of future trends. Trends in concurrent use of SLT and cigarettes are also examined for males. Further analyses of males ages 18 and older are presented regarding selected personal characteristics and smoking status. Because SLT use among females is rare (prevalence trends among adult females mirror that of adult males, on a much smaller scale), examining the distribution of female SLT use by personal characteristics yields unstable estimates.

RESULTS

Defining SLT prevalence over time in the CPS-TUS

Figure 1 shows the USDA consumption trend in pounds (of snuff and chewing tobacco) per capita as well as the estimated trend lines for different definitions of regular use. We apply cut-offs of 5, 10, 15, 20, and 25 days out of the past 30 days for inclusion in regular current SLT use in the total adult population (ages 18 and older) for the 1998, 2000, and 2001/02 CPS-TUS samples. To determine the appropriate cut-off, we seek the estimated trend in current SLT use that best corresponds with the trend in USDA consumption data between 1998 and 1999.

USDA data indicate no change in consumption between 1998 and 1999.²⁸ The restriction of “at least 10 of the past 30 days” for adults is the minimum frequency that closely mirrors the flat USDA trend and thus has been selected to define current prevalence for the 1998, 2000, and 2001/02 survey waves. Analyses of males ages 25 and older and males

Figure 1 Smokeless tobacco consumption per capita (1994–2002), and current prevalence based on ever regular (1992–1999) or number of days in past 30 (1998–2002), total population ages 18+. Current prevalence is estimated in response to the question about current use for 1992/93, 1995/96 and 1999 survey waves. Current prevalence is defined as a positive response to current use and reported at least “[x] days of the past 30 days” in response to a question about frequency of use. USDA, US Department of Agriculture.

ages 18–24 yielded the same frequency cut-off result. Of the different cut-offs, the “at least 10 of the past 30 days” restriction also yields the smoothest downward trend.

Trends in tobacco use

Smoking prevalence

As the constant backdrop in tobacco control, we examine the prevalence of smoking (in anticipation of SLT prevalence comparisons for this group). Trends in tobacco use for total adults (ages 18 and older), adult males, adult females, and males ages 18–24, are presented in table 1. In the total adult population, current smoking saw a relative decline of about 15% between 1992 and 2002. Male smoking fell 13% from 26.8% (26.5–27.1%) in 1992/93 to 23.3% (23.0–23.7%) in 2001/02. Female smoking over the same period declined nearly 17%, from 22.6% (22.3–22.8%) to 18.8% (18.5–19.1%). By contrast, the rate of current smoking among younger males (18–24) did not change over this period.

SLT use prevalence

Coinciding with declines in overall smoking, SLT use exhibits a clear fall over the period 1992–2002 (table 1). Reflecting the lower prevalence of SLT use overall, absolute declines in SLT rates are small but the relative declines exceeded that of smoking. In the total adult population, SLT use dropped by 37% from 2.3% (2.2–2.4%) in 1992/93 to 1.5% (1.4–1.5%) in 2001/02. Relative declines among adult females were slightly greater than among adult males. Female SLT use declined 63% from 0.43% (0.39–0.47%) to 0.16% (0.14–0.19%), while

adult male SLT use declined 40% from 4.8% (4.6–4.9%) to 2.9% (2.7–3.0%). Encouragingly, while smoking among young males (ages 18–24) did not decline over the period, SLT use in this group declined 60% from 7.4% (6.8–8.0%) in 1992/93 to 2.9% (2.5–3.4%) in 2001/02.

SLT use and smoking status

Declines in both smoking and SLT use contributed to declines in concurrent use of SLT and cigarettes overall. Concurrent use by adult males declined about 45% from 1.0% (0.94–0.11%) in 1992/93 to 0.56% (0.50–0.62%) in 2001/02, with a slightly higher rate (52%) of decline among males ages 18–24. The prevalence of concurrent use among females is so low that estimates are not stable.

Looking at other categories of smoking frequency, adult male SLT users were at least twice as likely to be someday smokers as everyday smokers. The 2001/02 rate of everyday smoking was 1.9% (1.6–2.2%). The rate of someday smoking among male SLT users in 2001/02 was 4.5% (3.8–5.3%). This ratio is relatively consistent with the 1992/93 ratio; the slight increase in the proportion of someday smokers (among current SLT users) relative to everyday smokers in 2001/02 compared to 1992/93 reflects the slightly greater decline in everyday smoking among current SLT users over the period.

Frequency of SLT use

In the 1998/99, 2000 and 2001/02 survey waves, respondents who were current users of SLT (at least 10 of the past 30 days) reported a consistent level of use over the past month by

Table 1 Prevalence and patterns of tobacco use, 1992–2002

	1992/93	1995/96	1998	1999	2000	2001/02
Smoking prevalence						
Total population 18+	24.5% (24.3 to 24.7)	23.6% (23.3 to 23.8)	22.8% (22.4 to 23.2)	21.7% (21.4 to 22.0)	21.9% (21.6 to 22.1)	21.0% (20.7 to 21.2)
Male 18+	26.8% (26.5 to 27.1)	25.8% (25.5 to 26.2)	25.3% (25.7 to 25.9)	24.1% (23.7 to 24.6)	24.4% (23.9 to 24.8)	23.3% (23.0 to 23.7)
Female 18+	22.6% (22.3 to 22.8)	21.5% (21.2 to 21.7)	20.4% (20.0 to 20.9)	19.5% (19.1 to 19.8)	19.6% (19.2 to 19.9)	18.8% (18.5 to 19.1)
Male 18–24	27.7% (26.7 to 28.7)	28.2% (27.0 to 29.4)	30.0% (28.0 to 32.1)	28.1% (26.6 to 29.7)	29.5% (28.2 to 30.9)	28.1% (26.9 to 29.3)
SLT use prevalence*						
Total population 18+	2.3% (2.2 to 2.4)	2.0% (1.9 to 2.1)	1.8% (1.7 to 1.9)	1.7% (1.6 to 1.8)	1.6% (1.5 to 1.6)	1.5% (1.4 to 1.5)
Male 18+	4.8% (4.6 to 4.9)	3.9% (3.7 to 4.0)	3.5% (3.3 to 3.8)	3.4% (3.2 to 3.6)	3.0% (2.9 to 3.2)	2.9% (2.7 to 3.0)
Female 18+	0.43% (0.39 to 0.47)	0.28% (0.25 to 0.32)	0.24% (0.19 to 0.31)	0.21% (0.17 to 0.25)	0.21% (0.17 to 0.25)	0.16% (0.14 to 0.19)
Male 18–24	7.4% (6.8 to 8.0)	5.8% (5.2 to 6.4)	4.5% (3.6 to 5.4)	4.4% (3.8 to 5.1)	3.4% (2.9 to 4.0)	2.9% (2.5 to 3.4)
Concurrent SLT use and smoking†						
Total population 18+	0.49% (0.46 to 0.53)	0.45% (0.42 to 0.49)	0.36% (0.30 to 0.42)	0.40% (0.36 to 0.45)	0.32% (0.28 to 0.36)	0.28% (0.25 to 0.31)
Male 18+	1.01% (0.94 to 1.1)	0.90% (0.83 to 0.98)	0.71% (0.60 to 0.83)	0.81% (0.73 to 0.91)	0.65% (0.58 to 0.73)	0.56% (0.50 to 0.62)
Male 18–24	2.3% (2.0 to 2.6)	1.9% (1.6 to 2.3)	1.4% (1.0 to 2.1)	1.7% (1.3 to 2.1)	1.3% (1.0 to 1.7)	1.1% (0.86 to 1.4)
Frequency of SLT use‡						
Total population 18+	–	–	26.6 (26.1 to 27.1)	–	26.4 (26.0 to 26.7)	26.4 (26.1 to 26.7)
Male 18+	–	–	26.5 (26.1 to 27.0)	–	26.2 (25.9 to 26.6)	26.3 (26.0 to 26.7)
Female 18+	–	–	27.3 (25.8 to 28.8)	–	27.9 (26.9 to 28.9)	27.6 (26.6 to 28.6)
Male 18–24	–	–	26.0 (24.6 to 27.5)	–	24.6 (23.4 to 25.9)	24.5 (23.3 to 25.7)

95% confidence intervals presented in parentheses.

*Current smokeless tobacco (SLT) prevalence is estimated in response to the question about current use for 1992–93, 1995–96 and 1999 survey waves. Current prevalence in 1998, 2000 and 2001/02 is defined as a positive response to current use and a report of at least “10 days of the past 30 days” in response to a question about frequency of use.

†Concurrent use among females is rare and the data do not support stable estimates.

‡Frequency data were not collected in the 1992/93 or 1995/96 surveys, and we do not present the 1999 data in that the screening question is not comparable to the remaining waves.

Table 2 Prevalence of current smokeless tobacco use* among males ages 18+, by selected characteristics

	1992/93 n = 85375		1995/96 n = 78650		1998 n = 26348		1999 n = 49038		2000 n = 54306		2001/02 n = 80618	
	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Age groups												
18–24	7.4	(6.8 to 8.0)	5.8	(5.2 to 6.4)	4.5	(3.6 to 5.4)	4.4	(3.8 to 5.1)	3.4	(2.9 to 4.0)	2.9	(2.5 to 3.4)
25–44	4.7	(4.5 to 4.9)	4.5	(4.3 to 4.8)	4.4	(4.0 to 4.9)	4.4	(4.1 to 4.7)	3.9	(3.6 to 4.2)	3.9	(3.6 to 4.1)
45–64	3.7	(3.4 to 3.9)	2.6	(2.4 to 2.9)	2.4	(2.0 to 2.8)	2.2	(2.0 to 2.4)	1.9	(1.7 to 2.1)	1.9	(1.7 to 2.1)
65+	4.4	(4.0 to 4.8)	2.7	(2.4 to 3.0)	2.1	(1.7 to 2.7)	2.1	(1.8 to 2.5)	2.3	(2.0 to 2.7)	1.9	(1.7 to 2.2)
Race/ethnicity												
White	5.6	(5.4 to 5.8)	4.7	(4.5 to 4.9)	4.4	(4.1 to 4.7)	4.2	(4.0 to 4.4)	3.8	(3.6 to 4.0)	3.7	(3.5 to 3.8)
Other	1.8	(1.6 to 2.1)	1.4	(1.2 to 1.6)	1.0	(0.73 to 1.4)	1.0	(0.83 to 1.2)	0.8	(0.68 to 1.0)	0.7	(0.53 to 0.78)
Education												
<12 years	6.6	(6.2 to 7.0)	4.8	(4.4 to 5.3)	4.0	(3.4 to 4.7)	4.1	(3.6 to 4.6)	3.5	(3.1 to 3.9)	3.0	(2.7 to 3.4)
HS degree	5.6	(5.4 to 6.0)	4.9	(4.6 to 5.2)	4.6	(4.1 to 5.2)	4.5	(4.2 to 4.9)	3.8	(3.5 to 4.2)	3.8	(3.5 to 4.1)
Some college	4.7	(4.3 to 5.0)	3.9	(3.6 to 4.2)	3.6	(3.1 to 4.2)	3.4	(3.1 to 3.8)	3.2	(2.8 to 3.5)	2.9	(2.6 to 3.1)
College degree +	2.2	(2.0 to 2.5)	2.0	(1.8 to 2.2)	1.8	(1.5 to 2.2)	1.7	(1.5 to 2.0)	1.6	(1.4 to 1.9)	1.7	(1.5 to 1.9)
Residence												
MSA	3.3	(3.2 to 3.5)	2.8	(2.6 to 3.0)	2.5	(2.3 to 2.7)	2.5	(2.3 to 2.6)	2.1	(1.9 to 2.2)	2.0	(1.9 to 2.2)
Non-MSA	9.8	(9.3 to 10.2)	8.5	(8.0 to 9.0)	7.9	(7.2 to 8.8)	7.4	(6.9 to 8.0)	7.0	(6.5 to 7.3)	6.5	(6.1 to 6.9)
Smoking status among current SLT users												
Current	4.3	(4.0 to 4.6)	3.5	(3.3 to 3.8)	2.8	(2.4 to 3.3)	3.4	(3.1 to 3.8)	2.7	(2.4 to 3.0)	2.4	(2.2 to 2.7)
Current, someday	7.7	(6.8 to 8.6)	7.1	(6.2 to 8.1)	5.8	(4.6 to 7.4)	5.2	(4.3 to 6.4)	5.2	(4.3 to 6.2)	4.5	(3.8 to 5.3)
Current, everyday	3.6	(3.3 to 3.9)	2.7	(2.5 to 3.0)	2.1	(1.7 to 2.6)	3.0	(2.6 to 3.4)	2.0	(1.7 to 2.4)	1.9	(1.6 to 2.2)

95% confidence intervals presented in parentheses.

*Current SLT prevalence is estimated in response to the question about current use for 1992–93, 1995–96 and 1999 survey waves. Current prevalence in 1998, 2000 and 2001/02 is defined as a positive response to current use and a report of at least “10 days of the past 30 days” in response to a question about frequency of use.

HS, High School; MSA, Metropolitan Statistical Area.

demographic group (table 2). Males ages 18 and older reported approximately 26.5 days of use in the past month over the three survey waves. Confidence intervals for younger males (18–24) and females ages 18 and older are wider, likely reflecting inconsistent and rare use, respectively. Males ages 18–24 reported a slightly lower average frequency than older males, while females ages 18 and older reported slightly higher frequency per month. Thus, the frequency of use as a daily measure has been fairly consistent over the 1998–2002 period.

Demographic characteristics of adult male SLT users

Parallel to trends in SLT use among adult males overall, SLT use among different subgroups of adult males consistently declined between 1992 and 2002.

By age, this decline was greatest among the youngest and older respondents, dropping by 56% and 48% for males ages 65 and older and males ages 45–64 respectively, and by 60% for males 18–24, but by only 18% for males ages 25–44. As a result, while prevalence among the youngest males was reportedly over 50% higher than among males ages 25–44 in 1992/93, by 2001/02 this pattern had reversed. In 2001/02, SLT use among males 25–44 was 33% greater than males ages 18–24. The 2001/02 prevalence of SLT use among males ages 25–44 was twice as high at 3.9% (3.6–4.1%) as prevalence among respondents ages 45 and older (1.9%; 1.7–2.2%).

In 1992/93, white males ages 18 and older used SLT at an estimated rate of 5.6% (5.4–5.8%), declining by 35% to 3.7% (3.5–3.8%) in 2001/02. The corresponding rate among non-white respondents overall was 1.8% (1.6–2.1%) in 1992/93, falling over 60% to 0.65% (0.53–0.78%) in 2001/02. The greater decline among non-whites over the period led to a wider gap in usage by race/ethnicity. In 1992/93, the rate of SLT use among whites was about three times the rate among non-whites. By 2001/02, that ratio had grown to a factor over five.

Analysis by educational attainment is confounded by respondent age. Males ages 18 and older may not yet have completed high school, let alone entered college or further. Examining the male population ages 18 and older, the greatest relative decline in SLT use was found among respondents with less than 12 years of education. The prevalence rate in this

group fell 54% from 6.6% (6.2–7.0%) in 1992/93 to 3.0% (2.7–3.4%) in 2001/02. The smallest decline was found for those who reported having earned at least a four-year college degree, with a relative decline of 24% from 2.2% (2.0–2.5%) in 1992/93 to 1.7% (1.5–1.9%) in 2001/02. Looking at a slightly older population of males ages 25 and older (data not shown), the relative patterns by level of education are the same, but the overall relative declines are slightly smaller, reflecting the much greater decline in SLT use among the youngest males (ages 18–24) over the period 1992–2002.

The general pattern of lower educational attainment associated with higher rates of SLT use in 1992/93 shifted slightly by 2001/02, such that in 2001/02 respondents with less than a high school education reported lower use rates than those with a high school degree. Still, some college education or having at least a college degree was associated with significantly reduced rates of SLT use.

SLT prevalence in more urban areas has consistently been about a third of the prevalence rate in more rural areas, but the decline in SLT use appears regardless of the relative population density of respondents. Among respondents living in areas of 50 000 residents or more, the estimated rate of use in 1992/93 was 3.3% (3.2–3.5%), falling by a third to 2.0% (1.9–2.2%) in 2001/02. In areas of lower population density, SLT use fell from 9.8% (9.3–10.2%) in 1992/93 to 6.5% (6.1–6.9%) in 2001/02.

DISCUSSION

This study examines the prevalence of SLT use and smoking over a 10-year period using five cross-sectional, nationally representative samples. The prevalence of current SLT use declined the most over the period 1992–2002 for males ages 18–24, by an estimated 4.5 percentage points, and by 1.5 percentage points for males ages 25 and older. A cohort analysis would be useful to confirm whether the cohort of 18–24 year olds in the early 1990s represents a swell in SLT use that is passing with the aging of the cohort. The relative decline of about 60% among females ages 18 and older was similar to that among younger males, but the small absolute decline of 0.3% reflects the rarity of SLT use among females.

Declines in SLT use mirrored, and in fact exceeded, declines in smoking between 1992/93 and 2001/02. Declines in concurrent SLT use and smoking among males are similar to and reflect the larger declines in SLT use. A slight increase in the estimate of concurrent use among both younger and older males between 1998 and 1999 is not statistically significant. To the extent that this estimated increase reflects a true increase within the male population at that time, particularly in reference to concomitant increases in excise taxes on cigarettes, it is possible that some males initially reacted to price increases by substituting SLT use for smoking, perhaps as a transition to quitting. This intermediate pattern appears to have subsequently dissipated.

Trends in smoking and SLT use have not always coincided as observed over the 10-year period of this study. While smoking rates began to decline as of 1964, smokeless tobacco rates as of the early 1970s began to increase at a rate of 10–11% per year until the 1986 Surgeon General's report warning regarding the risks associated with SLT use itself¹⁰ and remained higher in 1991 than in 1970.²⁹ Further, among males, the distribution shifted such that prevalence among white males overtook the once higher rates among black males by the 1990s.²⁹

This analysis of CPS-TUS data shows that in 2001/02, white adult males use SLT at five times the rate of non-white adult males. This gap has grown since 1992/93, with a far greater drop in use among non-white adult males. A much greater decline within the age group 18–24 compared to males 25–44 suggests a cohort effect, also not seen among males 45 and older. Thus, while the prevalence of white males as the primary users of SLT only intensified over the 1992–2002 period, should trends continue, use among youth may become less dominant. This interpretation is subject to limitations of the data, which provide insufficient insight into experimental use of SLT among younger adults. Regarding place of residence, while use in less dense areas still exceeds use in more urban areas by a factor of three, this ratio did not change over the period examined. Finally, current SLT use patterns shifted, such that the prevalence among males with the least education in 2001/02 was lower than use among males with a high school degree.

An important question is whether smokers might use SLT as a smoking cessation aid. These data do not allow for examination of which tobacco product an individual first used or even whether an individual ever used the products concurrently in the past or if there was a gap between periods of use of the products. SLT use declined over the 1992–2002 period to a greater degree than the decline in smoking, suggesting that smokers are not shifting over to SLT use. Longitudinal studies have found that concurrent users were less likely to quit tobacco use than single product users.^{11–30} Although the CPS-TUS does not contain cohort data to examine transitional behaviour, these data do provide nationally representative data for population-level inferences.

The availability of five CPS-TUS surveys over the course of 10 years, and in particular the return to the 1995/96 measure of “ever use” in 1999 and subsequent frequency of use measures, mitigates the problems that arise from the change in “ever use” measurement in 1998. With this paper, we have developed and applied a method to render estimates of current SLT prevalence comparable across the five survey waves, despite changes in screening questions. A potential weakness of our approach is that overall consumption could be composed of quantity changes, as well as prevalence changes—for example, quantity could have fallen by the same percentage as use increased so as to offset each other between 1998 and 1999. However, we found no detectable differences in the average number of days use between 1998 and 2000, the two years using the “ever use” screening question.

Changes in measurement and gaps in the types of SLT use data collected over time are weaknesses of the CPS-TUS survey instrument that could be addressed. There are

insufficient questions distinguishing the intensity of current SLT use, both within a category of regular users (carefully defined) and between some definition of regular users and recent SLT experimenters who may or may not ever move to regular use. This latter problem is likely to be greatest among young users (below 25 years of age), an important age group in gauging future trends.

Other national surveys that collect SLT use data—such as the National Health Interview Survey, the National Health and Nutrition Examination Survey, and the National Survey on Drug Use & Health—have limitations that constrain full characterisation of SLT use. The 2000 cancer supplement to the National Health Interview Survey (NHIS; <http://www.cdc.gov/nchs/nhis.htm>) set a minimum level of SLT use (ever used at least 20 times) that may exclude experimentation that did not lead to some regularity of use, but other waves of the NHIS have not surveyed smokeless tobacco use. Parallel to recent waves of the CPS-TUS, the National Survey on Drug Use & Health (NSDUH, formerly the NHSDA; <http://www.oas.samh-sa.gov/nhsda.htm>) measures “ever use (even once)”. While having a comparable measure of ever use from a different data source is an advantage for confirming trends across surveys, in neither survey is it satisfactory grouping respondents in a “used SLT at least once” category without detailed follow-on questions delineating different stages of experimentation, regular or daily use over time. Further, in addition to a minimum level of past use, the duration of past use would be informative. The NSDUH does establish age of first SLT use but, without data on regularity, the age of initiation is less helpful. The National Health and Nutrition Examination Survey (NHANES) measured greater detail of frequency and quantity, but with some gaps over time in measurement as well as an interim change in measurement in 1999/2000. NHANES III (1988–1994) and NHANES 2001/02 queried quantity of use per week and per day, respectively, in addition to questions regarding past regular use and duration (<http://www.cdc.gov/nchs/nhanes.htm>). NHANES 1999/2000 measured the number of days of use in the past five days. While some of these other national surveys contain wording that would strengthen SLT measurement items in the CPS-TUS, the TUS remains the largest nationally representative survey measuring tobacco use over time, especially important for low incidence behaviours like SLT use, and thus the strongest vehicle for tracking epidemiological trends. Going forward, similar to studies of smoking,^{31–33} trajectories of SLT use should be measured, including experimentation defined by a given level of use and time period, regular use defined by a given level of use and time period, daily use of different quantities, and former use by duration of abstinence.

We focus on current SLT use in this paper to avoid compounded errors of interpretation in estimating former SLT use, due to the change in screening question. However, analyses of CPS-TUS data from 1998 onward could allow for clearer inferences about trends. For example, examining trends in the ratio of former to ever SLT users would help to track the extent to which SLT users are quitting, as is commonly done with smoking rates.

This study does not examine trends for snuff and chewing tobacco separately, although CPS-TUS does collect separate product measures. Assessing concurrent patterns of other tobacco use behaviours, including cigar and pipe use (which CPS-TUS also collects) and other nicotine products, be they medicinal nicotine or tobacco products, would provide a deeper understanding of the complex matrix of alternative product use behaviour. This study focused on adult male behaviour. With finer detail identifying and segregating experimenters, examination of the youth population would be informative to the analysis of gateway behaviour. Should new products and marketing strategies encourage an increase in SLT use among

What this paper adds

Published studies report the sociodemographic correlates of smokeless tobacco (SLT) use, usually in selected populations, but an analysis of recent trends in SLT prevalence in the adult population and how that relates to cigarette use is absent from the literature. Particularly in the context of tobacco control efforts focused on smoking and the discussion of potential reduced exposure products, tracking patterns of SLT use over time and SLT use concurrent with smoking should inform the debate to reduce the harm from tobacco use.

As estimate using five waves of Current Population Survey (CPS) data, the pattern of smokeless tobacco prevalence among US adult males and females over the period 1992–2002 mirrors that of smoking in its decline. CPS data for tracking SLT prevalence in the context of smoking behaviour could be strengthened with the addition of some measurement items currently used in other major surveys.

females, subsequent research will need to sample large enough populations for reliable estimates of patterns in that population.

In conclusion, US tobacco control efforts are functioning without analysis of recent trends of SLT use and concurrent smoking measured in a consistent fashion. This paper provides a baseline trend analysis of SLT use for the period 1992–2002 and suggestions for collecting more reliable and informative measures of SLT use for the future. We found that SLT rates have fallen with smoking, particularly among males ages 18–24 between 1998 and 2002, when smoking rates fell most. These results suggest that SLT use is not a substitute for smoking. Indeed, while further exploration is needed, strong policies against smoking may also reduce SLT use. Nevertheless, policies might specifically target SLT use by males, especially those who are white, younger, non-urban, and less educated.

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To view online appendix visit the Tobacco Control website—<http://www.tobaccocontrol.com>

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