

Smokeless tobacco use among men in the United States, 2000 and 2005

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BACKGROUND: Compared with smoking, there is much less information about smokeless tobacco (ST) use in the United States. The purpose of this study is to characterize and compare ST use among American men in 2000 and 2005.

METHODS: We used US National Health Interview Surveys from 2000 and 2005 to estimate the prevalence of ST use, describe the demographic and socioeconomic profile of ST users and evaluate ST use according to product type and with respect to smoking.

RESULTS: The prevalence of ST use among American men was 4.4% in 2000 and 4.3% in 2005. Almost all ST users were white, about half were 25–44 years old and 80% lived in the South or Midwest, commonly in small metropolitan and rural areas. Educational and income levels of ST users were lower than those of never users of tobacco. One-third of ST users also smoked; cigarette consumption was lower among dual users than among exclusive smokers. In 2005, 1.3 million current ST users were former smokers but 3.2 million smokers were former ST users. ST users were evenly distributed between snuff (43%) and chewing tobacco (44%) in 2000 and 13% used both products. By 2005 snuff use was clearly dominant.

CONCLUSIONS: The prevalence of ST use among men is low but stable; dual use of cigarettes and ST is common, and snuff has become the dominant ST product.

J Oral Pathol Med (2009) 38: 545–550

Keywords: chewing tobacco; smokeless tobacco; smoking; snuff

Introduction

Nearly a decade into the twenty-first century, smoking remains the dominant form of tobacco use in US, and it garners the lion's share of attention when the federal government estimates prevalence of tobacco use. For

example, the Centers for Disease Control (CDC) and Prevention publish smoking prevalence estimates every year (1). The agency's primary source for this information is the National Health Interview Survey (NHIS), a large-scale annual survey of a representative sample of US households (1). Smoking-related information is collected via a core questionnaire that changes little from year to year.

Compared with the detailed and systematic collection of information on smoking, NHIS questionnaires less frequently ask questions about smokeless tobacco (ST) use; the most recent years are 2000 and 2005. Accordingly, the CDC only rarely issues prevalence estimates. A search of CDC publications revealed a single report devoted to ST prevalence in 1991 (2) and a cursory report in 2005 (3), although CDC staff contributed to a recent manuscript describing ST prevalence from 1987 to 2000 (4).

The purpose of this study was to use the 2000 and 2005 NHIS to describe and compare ST use among men in US in those years. Our study is limited to men because the prevalence of ST use among women was too low [0.3% in 2000 (4) and 0.2% in 2005] to provide reliable information.

Methods

We obtained the 2000 and 2005 NHIS Adult Sample and Cancer Control Module data files from the Inter-University Consortium for Political and Social Research (5). NHIS surveys employed a complex design involving stratification, clustering and multistage sampling. We used spss statistical software with Complex Samples (Version 15.0 for Windows; SPSS Inc., Chicago, IL, USA) to develop estimates of the number of current, former and never ST users and smokers and corresponding prevalence (expressed as percent with 95% confidence intervals). We calculated the 2005/2000 prevalence ratio for each tobacco use category; differences were evaluated by applying the test for the difference between two independent proportions (6) to the unweighted survey counts.

Assessment of ST use was based on one set of questions for chewing tobacco and one set for snuff,

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Accepted for publication March 10, 2009

both of which asked about lifetime and every-day or some-day use. Subjects who had used either chewing tobacco or snuff 20 times in their life and who used either tobacco product every day or some days were classified as current ST users. Subjects who had used either product 20 times in their life and who did not currently use ST were classified as former users (4). Because subjects answered separate sets of questions regarding chewing tobacco and snuff use, they were also classified as current or former users with respect to each product.

Subjects who had smoked ≥ 100 cigarettes in their lifetime and who smoked every day or some days at the time of the survey were classified as current smokers while subjects who had smoked ≥ 100 cigarettes in their lifetime and who did not currently smoke were classified as former smokers (1). Subjects who were both current ST users and current smokers were designated as dual users, and they were distinguished from exclusive smokers and exclusive ST users.

The surveys asked every-day smokers how many cigarettes they smoked per day; some-day smokers were asked a similar question about cigarette consumption, on the days that they smoked. This information was used to compare average daily cigarette consumption among subgroups of smokers, with differences evaluated for statistical significance using the independent-samples *t*-test (6). Information on ST consumption was not available.

The surveys contained demographic and social information that is relevant to ST use, including age, race, region of residence, education, income and population density of residence. Conventional groupings for age (18–24, 25–44, 45–64 and 65+ years) and race (white, black and other) were employed. The surveys classified subjects into four groups with respect to region of residence: Northeast (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania); Midwest (Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas); South (Delaware, Maryland, Virginia, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas); West (Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, Hawaii).

The surveys had numerous categories describing subjects' education level, ranging from kindergarten to a doctoral degree. We condensed these to three categories: up to and including high school, undergraduate college education including an associate or bachelor's degree and postgraduate training, resulting in a master's, doctoral or professional degree. The surveys contained 14 categories describing the ratio of subjects' family income to the poverty level ranging from 0.5 to 5.0 or greater. We combined these ratios into four categories: less than 1.00, 1.00 to 2.99, 3.00 to 4.99 and 5.00 or greater. In the year 2000 survey subjects were classified as living in one of six metropolitan statistical

areas (MSAs) or in a non-MSA area. We classified the MSAs into four categories based on population size: under $\frac{1}{4}$ million, $\frac{1}{4}$ up to one million, 1 million up to 5 million and 5+ million. This variable was not available in 2005 survey.

For all demographic and social variables, we compared the distribution of ST users with that of never users of tobacco; differences were evaluated by applying the test for difference between two independent proportions (6) to the unweighted survey counts.

In the 2000 survey former smokers were asked: 'When you stopped smoking completely, which of these methods did you use?' Subjects were prompted to 'mark all [of the following methods] that apply': [1] stopped all at once (cold turkey), [2] gradually decreased the number of cigarettes smoked in a day, [3] instructions in a pamphlet or book, [4] one-on-one counselling, [5] stop-smoking clinic or program, [6] nicotine patch, [7] nicotine containing gum (such as Nicorette), [8] nicotine nasal spray, [9] nicotine inhaler, [10] Zyban/Bupropion/Wellbutrin medication (abbreviated bupropion here), [11] switched to chewing tobacco or snuff (ST here) and [12] any other method. A previous study evaluated the responses to this question by all former male smokers (7); in this study, the responses provided information on the quit-smoking methods used by former smokers who were current ST users.

Results

Table 1 shows the population estimates and corresponding prevalence of tobacco use among men in US in 2000 and 2005. There were 4.14 million current ST users in 2000 and 4.44 million in 2005; prevalence declined marginally from 4.4% to 4.3%. In contrast, the prevalence of smoking declined from 25.7% in 2000 to 23.8% in 2005, which was statistically significant. Overall, the prevalence of former ST users increased from 6.9% in 2000 to 7.7% in 2005, which was statistically significant. The prevalence of never users of tobacco increased from 45% to 48%, which was statistically significant.

Table 2 shows the distribution of current ST users compared with never users of tobacco, according to demographic and social characteristics, in 2005. The distributions of ST users in 2000 were very similar to those in 2005; the only notable exception was a shift in region of residence, which will be described below.

Compared with never users, ST users were more likely to be 25 to 44 years of age and white. ST users were more likely to live in the Midwest and South, although there were significant changes within these regions between 2000 and 2005. The proportion of all ST users living in the Midwest increased from 25% in 2000 to 35% in 2005, while the South's share of users declined from 54 to 45%. Compared with never users, ST users were more likely to live in non-MSA and small metropolitan areas.

Compared with never users, ST users had lower educational status, although 41% had an undergraduate college degree. The income/poverty ratio was not

Table 1 Population estimates and prevalence of tobacco use among men in US, 2000 and 2005

Tobacco status		2000		2005		2005/2000 Prevalence ratio
ST use	Smoking	Number ^a	Prevalence (CI)	Number ^a	Prevalence (CI)	
Current	Never	1880	2.0% (1.7–2.2)	1739	1.7% (1.4–2.0)	0.85
Current	Former	1114	1.2 (1.0–1.4)	1280	1.2 (1.0–1.5)	1.00
Current	Current	1149	1.2 (1.0–1.5)	1424	1.4 (1.1–1.8)	1.17
All Current	–	4143	4.4 (4.0–4.7)	4443	4.3 (3.8–4.8)	0.98
Never	Current	20679	21.6 (20.8–22.5)	20097	19.4 (18.5–20.2)	0.90*
Former	Current	2744	2.9 (2.5–3.3)	3213	3.1 (2.8–3.5)	1.07
–	All Current	24572	25.7 (24.8–26.6)	24734	23.8 (22.9–24.8)	0.93*
Former	Former	2458	2.6 (2.3–2.9)	3243	3.1 (2.8–3.5)	1.19*
Never	Former	21031	22.0 (21.2–22.9)	21293	20.5 (19.8–21.3)	0.93*
Former	Never	1337	1.4 (1.2–1.7)	1606	1.5 (1.3–1.8)	1.07*
Never	Never	43161	45.2 (44.2–46.2)	49814	48.0 (46.9–49.2)	1.06*
All		95553	100	103709	100	

CI, 95% confidence interval; ST, smokeless tobacco.

^aIn thousands.* $P \leq 0.05$.**Table 2** Distribution (%) of male current ST users, compared with never users of tobacco, according to selected characteristics, in 2005

Percent distributed	Never users	Current users	Current/never ratio
Age (years)			
18–24	18	19	1.08
25–44	43	50	1.17*
45–64	29	21	0.72*
65+	11	10	0.94
Race			
White	81	94	1.16*
Black	13	4	0.31*
Other	6	2	0.33*
Region			
North-east	18	8	0.42*
Mid-west	23	35	1.54*
South	36	45	1.27*
West	24	12	0.52*
Education			
≤High school	38	56	1.47*
College to bachelor's	48	41	0.84*
Graduate/professional	13	3	0.26*
Income/Poverty ratio ^a			
Less than 1.00	9	8	0.97
1.00 to 2.99	31	37	1.20*
3.00 to 4.99	26	29	1.11
5+	34	25	0.74*
MSA size ^b			
5 million or more	11	2	0.20*
1 up to 5 million	39	23	0.59*
¼ up to 1 million	25	23	0.92
Under ¼ million	8	10	1.25*
Non-MSA	17	42	2.48*

ST, smokeless tobacco; MSA, statistical areas.

* $P \leq 0.05$.^aExcludes subjects for which the income/poverty ratio is unknown.^bFrom the 2000 survey.

available for 23% of never users and 17% of ST users. After these subjects were excluded, ST users were more likely to have lower income than never users.

We performed additional analyses on current ST users in order to determine if dual users and former smokers had any demographic or social characteristics that

Table 3 Cessation methods used by men who are former smokers and current ST users, 2000

Method	Number in thousands ^a (95% CI)
Stop all at once	900 (762–1038)
Switch to ST	120 (54–186)
Decrease cigarettes smoked	46 (8–84)
Nicotine patch	35 (4–65)
Other (unspecified) methods	32 (9–55)
Nicotine gum	27 (6–49)
Nicotine spray	0
Nicotine inhaler	0
Bupropion	0
Book/pamphlet	0
Clinic/program	0
One-on-one counselling	0

CI, confidence interval; ST, smokeless tobacco.

^aTotal number exceeds 1114000 because some subjects chose multiple methods.

distinguished them from never smokers. In 2005 a higher proportion of dual users were aged 18–24 years compared with never smokers (34% vs. 14%, $P \leq 0.05$). In contrast, a higher proportion of former smokers were aged 45+ years compared with never smokers (58% vs. 23%, $P \leq 0.05$). A higher proportion of former smokers had an educational level up to and including high school compared with never smokers (59% vs. 48%, $P \leq 0.05$). There were no other significant differences among either dual users or former smokers with respect to demographic or social characteristics.

Table 3 lists the smoking cessation methods that had been used by men who were current ST users and former smokers in the 2000 NHIS. Only 6 of the 12 quit-smoking methods had been used. A large majority of these men (900000) had quit smoking all at once ('cold turkey'), while 120000 had switched to ST. Gradually decreasing the number of cigarettes smoked was the third most frequent method (46000). The nicotine patch and gum had been used by 35000 and 27000 former smokers respectively, while 32000 had used other unspecified methods. No current ST users who were

former smokers reported using nicotine spray, nicotine inhaler, bupropion, a book, clinic or one-on-one counselling to quit smoking.

We compared the number of cigarettes consumed daily by dual users with the number consumed by exclusive smokers, after first grouping both smokers and ST users as every-day or some-day users. In 2000, every-day smokers who also used ST every day consumed significantly fewer cigarettes on average than exclusive smokers (mean: 13 ± 8 cigarettes per day vs. 20 ± 14 cigarettes per day, $P \leq 0.05$), and this difference was also noted in 2005 (13 ± 7 cigarettes per day vs. 19 ± 14 cigarettes per day, $P \leq 0.05$). In both survey years there was no significant difference in cigarette consumption between every-day smokers who used ST on some days and exclusive smokers. In comparison, cigarette consumption among some-day smokers was very low in both survey years (7 ± 15), and no differences were seen between some-day smokers who used ST and exclusive some-day smokers.

Table 4 shows the distribution of current ST users in 2000 and 2005, according to the use of chewing tobacco and snuff. In 2000 ST users were evenly distributed between snuff use (43%) and chewing tobacco use (44%), with 13% using both products. By 2005 snuff use was clearly dominant (51% of all ST users), with the largest increases occurring among former chewing tobacco users. The proportion of chewing tobacco users declined to 33%, and the proportion using both products was 16%.

Discussion

The major finding in this study is that the prevalence of ST use among American men was 4.4% in 2000 and 4.3% in 2005, indicating an apparent plateau after a steady decline in the 1980s and 1990s (4). The stable prevalence is also notable when compared with declining smoking prevalence and cigarette consumption over the same period. Smoking prevalence declined 8% among men from 2000 to 2005, and prevalence among women declined by 14% (3, 8). Cigarette consumption also dropped by 13% over this period (9).

In both years almost all ST users were white, about half were 25–44 years old, and the majority had up to a

Table 4 Distribution (%) of Male ST Users in US according to type of ST product used, 2000 and 2005

ST product	2000	2005	2005/2000 Ratio
Only snuff			
Former chewing tobacco	14	21	1.48*
Never chewing tobacco	29	30	1.03
All	43	51	1.18*
Only chewing tobacco			
Former snuff	4	4	1.05
Never snuff	40	29	0.74*
All	44	33	0.77*
Snuff and chewing tobacco	13	16	1.17
All ST users	100	100	

ST, smokeless tobacco.

* $P \leq 0.05$.

high school education. Eight out of 10 ST users lived in the South or Mid-west US. Over 50% of ST users lived in small metropolitan and rural areas, while only 2% lived in metropolitan areas with populations of 5+ million. This demographic and socioeconomic profile of ST users is very similar to those from the 1980s and 1990s (4).

In 2000, 1.1 million current ST users were former smokers, the majority of whom had quit without using ST or other cessation aids (7). Only 120000 of the former smokers currently using ST had quit smoking by switching; the other 980000 had used other methods. However, at some point these former smokers apparently made the decision that they wanted to remain smoke-free without abstaining entirely from nicotine and tobacco, so they became ST users. In 2005 there were 1.4 million current ST users who were former smokers. Unfortunately, no information on switching to ST as a quit-smoking method is available in the 2005 NHIS, because that option was removed from the survey questionnaire (10).

No product is completely safe, but ST users who are former smokers are consuming a much less hazardous form of tobacco. There is evidence that ST use is associated with far fewer health risks than smoking. Unlike smoking, ST use does not cause emphysema or lung cancer. A recent meta-analysis described ST use in western countries as conveying '...at most a minor increased risk of oral cancer' (11), which is much lower than the risk from smoking. ST use has been linked with pancreatic cancer, but the evidence is limited and weak (12). ST use has not been associated with cardiovascular diseases in studies from Sweden; the risk identified in two American studies has been described as 'substantially less than that from smoking' (13). Tobacco research experts have concluded that ST use confers only 0.1% to 10% of the risks of smoking (14–16), and two respected medical groups believe that ST may play a role in reducing smoking-attributable deaths. In 2007, Britain's Royal College of Physicians concluded '...that smokers smoke predominantly for nicotine, that nicotine itself is not especially hazardous, and that if nicotine could be provided in a form that is acceptable and effective as a cigarette substitute, millions of lives could be saved'. (17) In 2008, the American Association of Public Health Physicians became the first medical organization in US to formally adopt a policy of '...encouraging and enabling smokers to reduce their risk of tobacco-related illness and death by switching to less hazardous ST products' (18).

Most American smokers are not aware of the large difference in risk between ST use and smoking. For example, a 2003 survey found that while 80% of American smokers were aware of ST products, only 11% correctly believe that they are less hazardous than cigarettes (19). Another survey found that 82% of American smokers incorrectly believe that chewing tobacco is just as likely to cause cancer as is smoking cigarettes (20). A 2007 study of adult smokers in Australia, Canada, UK and US found that only 13%

correctly believed that ST is less hazardous than cigarettes (21).

The misunderstanding may have affected migration between ST and cigarettes. In both 2000 and 2005 there were about three million smokers who were former ST users compared with only a million ST users who were former smokers, a pattern also seen in the 1998 NHIS survey (22). This is in direct contrast to the situation in Sweden, where tobacco users are more knowledgeable about the difference in risks from smoking and ST use (23), and where ST users who formerly smoke far outnumber smokers who previously used ST (24, 25).

Better information would also have benefited the 1.4 million American men who were dual users of both cigarettes and ST products in 2005. These men consumed nicotine both from cigarettes and from ST, and the latter clearly resulted in lower consumption of the former in our study, which was also noted in the 1998 NHIS (22). If these dual users knew that ST products were only 1% as hazardous as cigarettes, it is possible that many would have chosen exclusive use of ST. In 2006 a panel of international tobacco research and policy experts concluded that the introduction of a low-nitrosamine ST product – under strict regulation but with relevant health claims – would result in a three percentage point decline in smoking prevalence among American men (26).

This study reveals that increased snuff use among men between 2000 and 2005 is due in large part to the decline in use of chewing tobacco, a long-term trend that has been apparent since the mid 1980s (4). The changes reported here for chewing tobacco and snuff are in line with a report from US Department of Agriculture Economic Research Service showing that consumption of chewing tobacco in US decreased from 49.4 million pounds in 2000 to 39.2 million pounds in 2005 (9), a decline of 20%. In contrast, moist snuff consumption increased 28% over the same period from 65.9 million to 84.5 million pounds.

In conclusion, cigarette smoking continues to decline among American men, but the prevalence of ST use is stable. This study provides demographic and socio-economic data about American ST users, and it reveals that a large proportion of ST users are concurrent or former smokers. Results from this study can serve to inform the growing discussion among health and policy experts about how ST can serve as a less hazardous cigarette substitute for inveterate smokers.

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Acknowledgements

This study was supported by unrestricted grants from ST manufacturers to the University of Louisville (US Smokeless Tobacco Company and Swedish Match AB) and to the University of Alabama at Birmingham (USST). The terms of the grants assure that the sponsors are unaware of this study, and thus had no scientific input or other influence with respect to its design, analysis, interpretation or preparation of the manuscript.

Conflict of interest statement

Neither author has any financial or other personal relationship with regard to the sponsors.