
Smokeless Tobacco Use Among Native American School Children

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The opinions expressed in this paper are those of the author and do not necessarily reflect the view of the Indian Health Service.

Synopsis

Seven published and two unpublished surveys of Native American school children's use of smokeless tobacco (ST) are reviewed. The surveys represent school children in the States of South Dakota, Montana, Nebraska, Washington, Arizona, New Mexico,

and Alaska. This review describes and discusses the survey methods, prevalence, duration, and intensity of ST use, and ST health effects documented in these studies. Prevalence of regular ST use ranges from 18 percent in kindergartners through 6th graders to 55.9 percent among 9th and 10th graders. In two studies that surveyed kindergartners, regular use was reported at 13 percent in one study and 21 percent in the other. Comparisons to use by non-Native Americans, as reported in surveys, demonstrate the severity of the problem in Native American communities.

There appear to be three significant findings related to Native American ST use: (a) young age of onset of ST use, (b) similar prevalence of use among adolescent boys and girls, and (c) higher overall prevalence of ST use when compared to non-Native American populations. Acceptance of the habit, peer pressure, and addiction seem to be contributing to the high ST use in Native American communities.

THE PRODUCTION of smokeless tobacco (ST) in the United States increased 30 percent between 1981 and 1985 (1). The type of ST used most often by adolescents is moist snuff which is held between the gum and lip or cheek. The prevalence of ST use in the United States is currently estimated at 12 million users (2). The Office of Smoking and Health's 1986 Adult Use of Tobacco Survey reported that the prevalence of current use of ST among those 21 years and older was 5.2 percent for men and less than 1 percent for women (3). In the 1985 Current Population Survey of 114,342 persons, the prevalence of ST use was reported at 5.5 percent among males and less than 1 percent among females (4). Regional surveys indicate that 3–26 percent of adolescent males and less than 3 percent of adolescent females currently use ST (5). There are significant differences among current users by geographic regions, with prevalence lowest in the Northeast and highest in the South.

There are two published surveys of American Indian adult ST use (6). In 1986, 417 randomly selected members of the Cheyenne River Sioux tribe aged 18 and older completed the Centers for Disease Control (CDC) Behavioral Risk Factor Surveillance Survey. A total of 17 percent of the males and 3 percent of the females reported regular use of ST. In 1987, 241 randomly selected Blackfeet Reservation Indians from Montana were surveyed using the same survey instrument. A total of 32.8 percent of males and 4.3 percent of females reported regular use of ST.

When 222 randomly selected Montana urban Indians were surveyed as part of the same research project, prevalence of ST use among males was 9.4 percent and 0.9 percent among females. The difference in ST use between reservation-based Indians and urban Indians is not statistically significant ($P = .16$). Lack of statistical significance reflects, in part, sample sizes. In both studies, the highest prevalence of use was in the 18–24 age group with prevalence decreasing for each successive age group. One might be tempted to conclude that ST use is a habit of children that is given up in adulthood. Given the increase in sales of ST nationwide, however, it is possible that the use of ST by adolescents is a new pattern of use not previously seen. Sufficient historical evidence is not available.

The Report to the Surgeon General on ST (5) outlines the hazardous health effects of ST, including increased risk of cancer, development of leukoplakia (white patches on the oral cavity that may be precancerous), gingival recession, and nicotine addiction. A North Carolina case-control study compared 232 women with oral or pharyngeal cancer to 410 matched controls (7). White, nonsmoking women who used snuff had a relative risk of 4.8 for developing oral or pharyngeal cancer. Among those women with cancer of the cheek or gum, the relative excesses of cancer increased from 13-fold among those with less than 50 years of snuff use to 50-fold among those with 50 or more years of use. A more recent survey of 265 baseball players

Table 1. Survey methods in 7 surveys of smokeless tobacco use by Native Americans

Population	Date	Number respondents	Administered by—	Questionnaire
8 rural regions, Alaska (12).....	1986	4,965	IHS (more than 8 people)	9 questions, in classroom
3 reservations and 1 urban area, Washington (13)	1986	254	Trained university interviewers	anonymous questionnaire (place of administration is unknown)
Washington and Alaska (14).....	1987	144	Trained university	anonymous questionnaire (place of administration is unknown)
Navajo boarding school, New Mexico (15)....	1986	226	Trained NIH interviewers	In person interviews
Rosebud Reservation, South Dakota (6a)	3/86	1,581	Teachers	14 questions, inclassroom, K-2 modified
3 tribes, 15 schools, Washington (16).....	5/87	257	Trained teachers	28 questions, inclassroom
4 reservations and urban non-Indians, South Dakota and Minnesota (6a)	1987	1,056	Trained university interviewers	5 questions as part of larger survey, in classroom
2 reservations, South Dakota and Montana ¹ ..	1985	623	IHS dentists	4 questions, in classroom
Boarding school, South Dakota ²	1987	114	IHS dentist	4 questions, in classroom

¹ Unpublished data from personal communication with Terry Batliner, DDS, Area Director, Portland Area IHS, May 1988.

² Unpublished data from personal communication with John Foster, DDS, Aberdeen Area IHS, May 1988.

NOTE: IHS = Indian Health Service

reported 34 percent prevalence of ST use with 38 percent of the users reporting "sores, white patches, or gum problems" at the site where the tobacco was held in their mouths (8). A study of 1,119 high school students reported 117 ST users with 57 percent of the users demonstrating lesions of the teeth, periodontium, or mucosa (9).

The Surgeon General's report on nicotine addiction (10) establishes nicotine as an addictive substance. Studies have shown that use of ST produces plasma nicotine levels comparable to those achieved when smoking cigarettes (11).

This paper is a review of seven published (6a, 12-16) and two unpublished surveys of Native American school children's use of ST. Terry Batliner, DDS, Area Director, Portland (OR) Area Indian Health Service (IHS), supplied information in May 1988 on an unpublished survey of fourth to eighth graders on one reservation in Montana and on a second reservation in South Dakota. John Foster, DDS, Aberdeen (SD) Area IHS, in May 1988 supplied information on an unpublished survey of 7th to 12th graders at a boarding school in South Dakota. The methods used in the nine surveys are described and data on prevalence, duration, intensity, and health effects of ST use among school children are presented. Comparisons are made to non-Native survey data to demonstrate the severity of the problem in Native American communities.

Methods of the Surveys

The nine surveys were identified by reviewing the literature and through personal communications with

Indian Health Service research coordinators. All nine of the surveys were conducted in communities where a high prevalence of ST use was suspected. The suspected high prevalence was based on the observation of oral lesions by staff of Public Health Service dental clinics or observation of children using tobacco products in the local community.

The total population of school children in the target grades were surveyed in each study with the exception of two study groups (13, 14) that consisted of randomly selected students. Although some of the samples were small, in most instances they represented the total population that interested the researchers (that is, the total student population in a boarding school less those absent during data collection). In the studies of 11th and 12th graders, there were diminishing numbers of students in the higher grades due to dropouts. The effect that this decrease had on prevalence rates is unknown. The survey samples ranged from 114 (Foster, unpublished data), to 4,965 (12) school children. The total number of Native American children surveyed in these studies was 9,220 (table 1).

The survey instruments were self-administered questionnaires ranging from 4 to 28 questions in seven studies (6a, 12-14, 16 and two unpublished studies, Batliner and Foster). In one study (6a), there were 5 questions on ST use as part of a larger 100-question survey on health habits and attitudes. In another (15), school children were interviewed individually. Five studies defined regular ST users as those who "use now," and four studies (13-15 and Foster) defined regular use as "use weekly." Specific numbers of doses per day or week were not uniformly collected.

Table 2. Prevalence of smokeless tobacco use among American Indians and Alaska Natives, selected surveys

Population inclusive	School grade or age	Numbers		"Ever used" (percent)	"Used regularly" (percent)
		Sex	Number		
Alaska (12)	K-12	Total	4,965	...	30.6
		Boys . . .	2,511	45.0	33.7
		Girls . . .	2,454	43.0	27.5
Washington (13)	13.8 (mean age)	Total	254	43.7	24.0
		Boys . . .	119	...	20.2
		Girls . . .	135	...	27.4
Washington-Alaska (14)	12.3 (mean age)	Total	144	...	38.8
		Boys . . .	80	...	42.6
		Girls . . .	64	...	34.0
New Mexico (15)	9-10	Total	226	64.2	55.9
		Boys . . .	130	75.4	...
		Girls . . .	96	49.0	...
South Dakota (6a)	K-6	Total	1,010	29.0	18.1
		Total	571	45.0	37.0
	7-12	Boys . . .	263	...	39.2
		Girls . . .	308	...	35.1
Washington (16)	6,9,11	Total	257	34.2	29.2
		Boys . . .	137	37.0	34.0
		Girls . . .	120	39.0	24.0
South Dakota (6a)	7-12	Total	1,056	61.1	34.2
		Boys . . .	505	...	36.2
		Girls . . .	551	...	32.4
South Dakota and Montana ¹	4-8	Total	623	...	46.1
		Boys . . .	319	...	47.0
		Girls . . .	304	...	45.0
South Dakota ²	7-12	Total	114	82.0	37.4
		Boys . . .	47	...	38.0
		Girls . . .	67	...	37.0

¹Unpublished data from personal communication with Terry Battiner, DDS, Area Director, Portland Area Indian Health Service (IHS), May 1988.

²Unpublished data from personal communication with John Foster, DDS, Aberdeen Area IHS, May 1988.

Table 3. Prevalence of smokeless tobacco use among non-Native Americans

Population	Grade	Numbers		"Ever used" (percent)	"Used regularly" (percent)
		Sex	Number		
South Dakota (6a)	K-12	Total	195	36.9	14.0
		Boys . . .	103	...	18.4
		Girls . . .	92	...	8.7
Washington (16)	6,8,11	Total	853	27.2	12.2
		Boys . . .	438	34.0	20.0
		Girls . . .	415	20.0	4.0
Metro Minneapolis (6a)	7-12	Total	23,693	17.1	4.0
		Boys . . .	12,155	30.0	7.8
		Girls . . .	11,538	3.4	0.0
Greater Minnesota(6a)	7-12	Total	12,590	19.5	3.4
		Boys . . .	6,308	35.3	6.8
		Girls . . .	6,282	3.6	0.0
South Dakota, Montana, and Nebraska ¹	4-8	Total	527	41.9	8.3
		Boys . . .	274	55.8	14.6
		Girls . . .	253	26.9	1.6

¹Unpublished data from personal communication with Terry Battiner, DDS, Area Director, Portland Area Indian Health Service (IHS), May 1988.

The surveys were carried out at the nine sites by IHS dental staff (12, and Foster), teachers (6a, 16 and Batliner), and trained research assistants (6a, 13–15.). The surveys were conducted in different combinations of grades kindergarten (K) through 12, primarily in the school setting, during the years 1985–87.

At five of the sites, the staff administering the questionnaires were trained to avoid forcing answers and other biases (6a, 13–16). At one site (Foster), one person administered all of the questionnaires to avoid biases of multiple styles of presenting the questions. At the remaining sites (6a, 12, and Batliner), it is not clear how many people administered the surveys or whether they were given training for the process.

Validity is a concern in self-administered surveys of children. In one survey (Batliner) in which the teachers estimated the prevalence of ST and then administered the surveys, the estimated prevalence was within 5 percentage points of the survey results. No other surveys reported ancillary information pertaining to the validity of the data.

Children in K–3 were surveyed in two studies (6a, 12). In both instances, the survey instrument was modified to increase comprehension; fewer questions were asked about intensity or duration of use, and correlates for use were not determined. The survey questions were read aloud in the classroom and children circled their answers.

The average percentage of nonresponse was generally equal to the rate of absence at each school. One study documented a 2 percent refusal rate (13), while another documented a 3 percent refusal rate and a 13 percent absentee rate (6a). It is not known if nonresponders were significantly different from responders.

Findings

Prevalence of ST use. In the nine studies of Native Americans, prevalence of regular ST use ranged from 18 percent in K–6th graders (6a) to 55.9 percent in 9th and 10th graders (15) (table 2). ST use increases with grade and age. On the reservation where 18 percent of the K–6th graders used ST, use among 7th–12th graders was 37 percent. In the two studies that included kindergartners, regular use was reported at 13 percent in one study (12) and 21 percent in the other (6a). The percent of school children reporting “ever used” or “experimented” ranged from 29 to 82 percent.

Boys and girls varied in prevalence of use; girls used ST at higher rates than in non-Native populations. Regular use among boys ranged from 20 to 75 percent and among girls, from 23 to 45 percent. In eight studies (6a, 12–14, 16, Batliner, Foster), the rates of regular use were reported by sex. Only the Alaska study (12)

‘In the two studies that surveyed kindergartners, regular use was reported at 13 percent in one study and 21 percent in the other. The percent of school children reporting “ever used” or “experimented” ranged from 29 to 82 percent.’

showed significantly different rates for boys and girls ($P < .001$). The prevalence rates by sex were not significantly different at the .05 level in the other seven studies.

In those studies with data on the duration of ST use, the range was from 1.0 to 7.9 years, increasing with age (6a, 12, 15, 16). The average intensity of use was reported at 3.5 dips per day in one study (6a) and a range of 1 to 5 dips per day in another (15). The product of preference in the four studies that reported product choices was moist snuff (6a, 14–16). In the two studies that reported average number of minutes that each dip is held in the mouth, both reported a mean time of 30 minutes (6a, 15). In one study (15), 38.6 percent of the regular users reported holding a quid of ST in the mouth while sleeping.

In the study of northwest Indians, a series of questions was asked about the reasons for initiating and continuing the use of ST (16). When asked why they tried ST, the Indian users stated, “I’d rather chew than smoke” (60.3 percent), “My friends were doing it” (46.2 percent), and “I did it for fun” (44.9 percent) as the 3 most popular of 14 listed responses. The main reasons that users listed for continuing to use ST were enjoyment and taste.

Four of the studies reported results for non-Native subjects included in the surveys (6a, 16, and Batliner) (table 3). The IHS requested that a survey developed by the University of Minnesota and administered to 23,693 adolescents from Metro Minneapolis and 12,590 adolescents from Greater Minnesota also be administered to 1,056 Indian adolescents in South Dakota (6a). The South Dakota adolescents had an overall prevalence of regular ST use of 34.2 percent, while only 4.0 percent of Metro Minnesota adolescents and 3.4 percent of Greater Minnesota adolescents reported regular use of ST, and no girls in the non-Native groups reported regular use. The Indian versus non-Indian use difference is statistically significant ($P < .001$). The identical survey instrument and methods were used in the three surveys. In the Rosebud Reservation survey (6a), 195 non-Indian children who attended the reservation schools were participants. Even though it might be presumed

that these children are exposed to the same environment as the Indian children, the prevalence of regular use was only 14 percent compared with more than 30 percent of the Indian school children ($P = .001$). A similar finding was documented in the study of Washington school children (16); 12.2 percent of non-Indians were regular users, and Indians in the same communities had a prevalence of 29.2 percent ($P < .001$). In the South Dakota, Montana, and Nebraska survey (Batliner), the non-Indian children had a prevalence of regular use of 8.7 percent and the Indians 46.1 percent ($P < .001$). Prevalence of ST use was significantly higher among boys than girls in the non-Native samples (P values were all $< .01$).

Three studies presented data on smoking. In the Navajo survey of 226 school children (15), more than half (54.0 percent) of the subjects said they smoked. ST users and nonusers appeared to smoke to an equal extent, and for a similar duration. In the Washington study (16), 40 percent of the ST users smoked cigarettes, while only 8 percent of the nonusers reported smoking ($P < .001$). In the South Dakota and Minnesota study, ST use differed significantly ($P < .001$) between Indian and non-Indian adolescents, but smoking did not ($P = .713$). These findings suggest wide variation in the relationship between cigarette smoking and ST use.

Health effects. Two of the Indian studies included oral clinical examinations in conjunction with the prevalence surveys (6a, 15). The Navajo study of 226 9th and 10th graders reported no consistent relationship between the use of ST and gingival bleeding, calculus, gingival recession, or attachment loss. ST use was, however, significantly related to the occurrence of leukoplakia. Leukoplakia was found in 37 ST users and 3 nonusers (odds ratio = 8.9, $P < 0.001$). The prevalence of leukoplakia increased as the years of exposure and the number of days used per week increased.

The Rosebud Reservation study included 184 South Dakota junior-senior high school students who volunteered for an oral screening. All of the volunteers were regular ST users. Thirty-seven percent of the students had leukoplakia in the site where the ST was held. The average duration and intensity of use by those with no oral lesions was 2.5 years duration, 2.9 dips per day, with each dose being held in the mouth for 30 minutes. The average duration and intensity of use by students with oral lesions was 3.4 years duration, 6.6 dips per day with each dose being held in the mouth for 40 minutes. These data suggest a relationship between duration and intensity of use and occurrence of oral lesions.

It appears that Indian youth are already aware of the health risks involved with the use of ST. In one survey

(6a), 90.7 percent of the school children said they thought ST causes cancer of the mouth and, in another survey (12), 93 percent of the school children listed cancer as a possible health problem with the use of ST.

Two studies of Indian school children addressed addiction in their surveys. Among ST users, 47 percent of South Dakota adolescents (6a) and 69.6 percent of Washington adolescents (16) stated that they would like to quit if they could.

Discussion

The nine Native American studies reviewed in this paper vary widely in the methods that were employed and the accompanying reliability and validity of the surveys. This discussion is limited by the inability to secure a complete account of the methods used in each study. In at least a couple of the studies, those conducting the research designed their own surveys; they had little training in research methods, and there was no outside review. Yet the questions concerning ST experimentation and regular use all were phrased similarly and appear to have reasonable face validity, with only two variations on the definition of "current use."

There are methodological flaws in the studies that may have led to either under or overreporting of ST use among the school children. A major flaw in the majority of these studies was the lack of standard method of administering the survey by teachers or IHS staff. It is conceivable that individual teachers may have influenced the students' choices of answers to the surveys, leading to either an over or underestimation of ST prevalence depending on the teacher's attitude. In the survey that used trained interviewers to interview Navajo students (15), we might question whether the students' answers were honest because, although the interviews were considered "anonymous," the children had to "confess" their ST use to an adult. Yet, the reported prevalence of regular use of ST remained high at this site. The use of validation tests, such as salivary cotinine tests, would have greatly improved the studies.

In the surveys of kindergartners, a potential flaw in these data may be that such young children were confused about the questions or how to mark their answers. Also, the teachers played a larger role in explaining the questions to the children and may have "led" the answers, unknowingly creating bias in the results.

Two of the studies were conducted in Indian boarding schools (15, and Foster). It is possible that these children are different from other Indian children because they often represent the most disadvantaged children. Also, peer pressure may be greater in a setting where the children are together 24 hours a day. The two surveys conducted in boarding schools reported preva-

lence at the higher range of the scale; however, there were nonboarding school surveys with similar prevalence.

The surveys represent only communities where a ST problem was suspected. Consequently, the generalizability of the survey findings to other Indian communities is limited.

Regardless of the variation of the research methods used, the studies demonstrate similar patterns of use in several Native American communities across the country. Although the more sophisticated research methods employed in several of the studies add validity, it appears that simple survey methods are adequate to document the prevalence of ST use.

Use at an early age may lead to a higher incidence of oral and pharyngeal cancer (7). Although the available data suggest that the risk of oral carcinoma associated with the use of ST is quite small, the habit is so widespread among Native American adolescents that the long-term use of these products can be expected to result in serious mucosal pathology in a significant number of students. Furthermore, with children as young as 5 years using ST, a critical pattern of behavior (that is, using addictive substances) is being established at a young age.

Conclusions

This review of the nine studies leads to three significant findings related to Native American ST use: (a) young age of onset of ST use, (b) similar prevalence of use among adolescent boys and girls, and (c) higher overall prevalence of ST use when compared with non-Native American populations. Similar to the general U.S. population, ST use is higher among adolescents than adults.

ST use has been linked with oral cancer. Two of the nine studies included clinical examinations that documented leukoplakia with increased use of ST (6a, 16). The trend of ST use by children, however, involves patterns of use that make it difficult to project long-term health consequences. ST can produce nicotine addiction similar to cigarette smoking. Two of the studies (16, and Batliner) documented high percentages of children who say they want to quit but cannot, suggesting nicotine addiction as a factor in the continuation of the habit.

Acceptance of the habit, peer pressure, and addiction seem to be contributing to the high ST use. Smoking is not clearly correlated to ST use. More research is needed in this area. Resources must be identified to address this public health problem among Native Americans. IHS and tribal outreach activities should focus on educational and policy interventions.

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