

TOBACCO USE IN A TRI-ETHNIC POPULATION OF OLDER WOMEN IN SOUTHEASTERN NORTH CAROLINA

Objective: While many studies have evaluated the epidemiology of tobacco use nationally and among specific populations, less is known about the epidemiology of tobacco use among elderly women. We examined the epidemiology of tobacco use among a tri-racial population of elderly women in southeastern North Carolina.

Design: Survey

Setting: Senior centers, community events, and communal meal settings in Robeson County, North Carolina.

Participants: Two hundred forty (240) women aged 60 and older, with approximately 80 women recruited from each ethnic group: Native American, African-American, and White.

Main Outcome Measures: Demographic information, health history, and use of alcohol, cigarettes, and smokeless tobacco (ST).

Results: Of the total sample of 240 women, 38 (16%) were current ST users. In logistic regression analysis, current ST use was inversely associated with age and education, but positively associated with Native American or African-American ethnicity. Sixteen (17%) of the total sample were current smokers. In logistic regression, younger age and any alcohol use in the past year were associated with current smoking.

Conclusions: In a tri-ethnic, community-based sample of older women, rates of current ST use were greater than national rates found among women of all ages in each ethnic group. On the other hand, rates of current smoking among these older women were lower than the national prevalence for women among all ages in these 3 respective ethnic groups. The distinctly different epidemiology of ST use vs cigarette smoking among these women highlights the need to tailor tobacco interventions to each specific product. (*Ethn Dis.* 2003;13: 226-232)

Key Words: Tobacco Use, Smokeless Tobacco, Women, Native American, African American

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INTRODUCTION

Cigarette smoking and smokeless tobacco (ST) use are addictive habits associated with numerous adverse health consequences, including cancer, cardiovascular disease, perinatal morbidity (eg, low birth weight, prematurity), and gastrointestinal disorders.¹⁻⁷ While a number of studies have addressed the epidemiology of ST use and cigarette smoking nationally⁸⁻¹⁰ and in specific populations,¹¹⁻¹⁹ few studies have evaluated the tobacco habits of elderly women.^{13-17,20} Although older women have lower rates of tobacco use than younger women nationally,^{8,9} certain segments of the elderly female population, notably older women in rural areas,¹³⁻¹⁷ have high rates of tobacco use, especially ST use.

Given the potential for tobacco use to induce cardiovascular disease and cancer,¹⁻⁷ as well as other detrimental conditions such as osteoporosis and fractures,²¹⁻²⁴ examining the epidemiology of tobacco use among elderly women may have important national public health implications. Uncovering epidemiologic clues among older women could assist researchers in designing future tobacco-cessation interventions among this population. As part of a larger study examining bone mineral density and tobacco use in a rural, tri-ethnic population of older women in

North Carolina, this study examines characteristics of these women associated with tobacco use.

METHODS

Study Population

The current study was part of the Robeson Osteoporosis Screening Study conducted from May through November 2000, in Robeson County, in southeastern North Carolina (2000 population: 123,339).²⁵ This population is largely rural (79%), has substantial ethnic diversity (34% White, 26% African American, and 39% Native American), and has a high rate of poverty (24% of individuals living below the poverty level in 1990 compared to 13% in North Carolina overall).²⁵ Women aged 60 and older were recruited as they attended various community events across the county. Events were chosen to recruit a cross-section of women (by age, ethnicity, socioeconomic status) from the community. Seventeen sites and recruitment events were utilized, including health fairs, health screenings, and senior congregate meal programs.

Eligibility for the study included: being at least 60 years of age; being a resident of Robeson County; being a member of one of the 3 ethnic groups (African-American, European American, Native American); living in the community; and being able and willing to answer interviewer-administered questions, and to stand without assistance while having height and weight measurements performed.

Data Collection and Analysis

A total of 240 women (about 80 from each ethnic group) agreed to par-

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Although older women have lower rates of tobacco use than younger women nationally,^{8,9} certain segments of the elderly female population, notably older women in rural areas,¹³⁻¹⁷ have high rates of tobacco use, especially ST use.

ticipate in the study. Only 10 women who were eligible for the study and approached by the research assistants refused to participate, for a response rate of 96%. After obtaining informed consent, trained research assistants who were residents of the study community obtained height and weight measurements using standard equipment. Information on demographics, health history, alcohol and tobacco use, dietary intake, and medication use were obtained by an interviewer-administered questionnaire.

Smokeless tobacco use was divided into never, former, current, and ever use, based on the response to the questions, "Have you ever used chewing tobacco or snuff?" and "Have you used chewing tobacco or snuff within the past 30 days?" Never users of ST were defined as those answering no to both questions. Former ST users were defined as those answering yes to having ever used ST, but no to use within the past 30 days. Current ST users were defined as those answering yes to both questions. Ever-users were defined as either current or former ST users. Similarly, cigarette smoking was divided into never, former, current, and ever categories, based on responses to the questions, "Have you smoked at least 100 cigarettes in your entire life?" and, "Do you smoke now?" Never smokers were defined as those who did not smoke 100

cigarettes in their entire life, while former smokers were defined as those who had smoked 100 cigarettes in their entire life but who did not smoke now. Current smokers were defined as those who had smoked 100 cigarettes in their entire life and who smoked now. Ever smokers were defined as either former or current users.

Amounts of tobacco used were calculated for current smokers and ST users. Current smokers were asked to estimate the number of packs of cigarettes (or fraction thereof) that they currently smoked per day. Additionally, current ST users were asked to estimate their number of ST uses per day, as well as the proportion of a chewing tobacco pouch or snuff tin used per day.

Duration of ST use and cigarette smoking was calculated for current ST users and current smokers based on the number of years passed since their reported age at initiation of tobacco use. This calculation assumes continuous use of the tobacco product over time.

Information on age, education, ethnicity, self-reported health status (excellent, very good, good, fair, and poor), and alcohol use in the past year was also obtained. Education was divided into <12 years, 12 years, and >12 years. Alcohol use was determined by asking the frequency of alcohol use during the past year, ranging from never, daily, weekly, monthly, or less often. Because of the low rate of any alcohol use, this variable was dichotomized into any use vs none during the past year.

Data were entered into EpiInfo (Centers for Disease Control and Prevention, Atlanta, Ga) and analyzed using the Statistical Package for Social Sciences (SPSS, Version 10, Chicago, Ill). Means and standard deviations were calculated for continuous variables, and frequencies and percentages were calculated for categorical variables. The primary analysis focused on assessing the relationships between the participant characteristics and tobacco use. Chi-square tests were used to assess the bi-

variate association of each categorical characteristic with current smoking and smokeless tobacco use. Fisher exact tests were used for tables with several small expected cell counts. Wilcoxon rank sum tests were used to assess the relationship between tobacco use and continuous variables such as age and body mass index. Logistic regression analysis was used to determine which factors were jointly predictive of current ST use and current smoking. Each of the variables mentioned above were included in the models, and models were run separately for current ST use and current smoking.

RESULTS

General characteristics of the 240 subjects are listed in Table 1. By design, the sample comprised approximately the same number of African Americans, Native Americans, and Whites. Ages ranged from 60 to 94 years old, with a median of 72 years. Participants were generally overweight, with a median BMI of 29 kg/m² (range 15 to 59 kg/m²). The majority of women (51%) did not complete high school, and only 65 women (27%) reported education beyond high school. Most women (68%) reported either good (41%) or fair (27%) health. Only 12% reported any alcohol use in the past year.

Tobacco use status is also listed in Table 1. Among 240 women, 16 (7%) were current smokers, 53 (22%) were former smokers, and 171 (71%) had never smoked. Thirty-eight women (16%) reported current ST use, 24 women (10%) reported former ST use, and 178 women (74%) had never used ST. One hundred thirty-one women (55%) had never used either tobacco product, and only one woman (0.4%) reported currently using both products. The rate of current ST use was higher among never (16%) and former (19%) smokers than among current smokers (6%). Similarly, the rate of current

Table 1. Characteristics of a rural tri-ethnic population of older women in south-eastern North Carolina

Characteristics	Total Population (N=240)*		
Age, years; median (range)	72 (60–94)		
Body mass index; median (range)	29 (15–59)		
Age group (years)			
60–69	93 (38.8)		
70–79	108 (45.0)		
80–89	35 (14.6)		
≥90	4 (1.7)		
Education†			
<High school	121 (50.6)		
High school	53 (22.2)		
>High School	65 (27.2)		
Ethnicity			
African American	79 (32.9)		
Native American	80 (33.3)		
White	81 (33.8)		
General Health			
Excellent	21 (8.8)		
Very good	31 (12.9)		
Good	98 (40.8)		
Fair	64 (26.7)		
Poor	26 (10.8)		
Alcohol use in past year†			
Yes	28 (11.7)		
No	211 (88.3)		
	Smokeless Tobacco	Cigarette Smoking	
Tobacco use status	Never	Never	131 (54.6)
		Former	34 (14.2)
		Current	13 (5.4)
	Former	Never	13 (5.4)
		Former	9 (3.8)
		Current	2 (0.8)
	Current	Never	27 (11.2)
		Former	10 (4.2)
		Current	1 (0.4)

* Numbers in column represent: number of individuals (percent) except where noted.

† Missing data for one individual.

smoking was higher among never (7%) and former (8%) smokeless tobacco users than among current ST users.

Table 2 lists associations between participant characteristics and tobacco use status of the sample. ST use was not associated with either age or BMI (data not shown). Both African-American and Native American women reported higher rates of current ST use (20.3% and 25%, respectively) than did White

women (2.5%). Also, a higher percentage of participants who reported completing less than high school reported current ST use (26% for <high school vs 9.4% for high school and 3.1% for >high school). Similarly, more women who reported poor health also reported current ST use (27%), compared with other self-rated health categories. A lower percentage of participants who reported any alcohol use in the past year

also reported current ST use (3.6%), compared with those reporting no alcohol use in the past year (17.5%), but this difference was only of borderline significance ($P=.058$). Although age and BMI were not statistically significantly related to ST use, current ST users tended to be younger; and current and former ST users tended to have a higher BMI than those who had never used ST.

Median age of onset of ST use among current and former ST users was 12 years (range 3–60 years old), with one fourth of users reporting beginning before age 8. Among current ST users only, median age of onset of ST use was 10 years old (range 3–60 years old). The mean \pm SD number of chewing tobacco or snuff uses per day among current ST users was 3.1 ± 1.7 with a range of 0.07 to 8.0 uses per day. Current ST users reported mean \pm SD duration of ST use of 56.4 ± 14 years (range 6–77 years). Among current ST users, education level was associated with duration of ST use ($P=.0115$) At the 95% confidence level, women with lower educational levels reported using ST 3.7 to 27.1 years longer, on average, than women with higher education levels.

The characteristics of women who smoked are also listed in Table 2. Current and former smokers were significantly younger (about 69 and 70 years of age, respectively) than never smokers (about 74 years old). There were no statistically significant differences among women by ethnicity, education, or self-reported health, and smoking status. However, in direct contrast to ST use, a significantly higher percentage of women who reported any alcohol use in the past year currently smoked (17.9%), compared with those not reporting alcohol use in the past year (5.2%). Median age of onset of cigarette smoking among current and former smokers was 21 years old (range 7–75 years old). Among current cigarette smokers only, median age of onset was 19 years (range 8–75 years). Looking only at ever users

Table 2. Associations between tobacco use status and participant characteristics among rural older women (N=240) in southeastern North Carolina

Characteristics	N	ST Status			P value	Smoking Status			P value
		Never Number (%)	Former Number (%)	Current Number (%)		Never Number (%)	Former Number (%)	Current Number (%)	
Age group (years)									
60–69	93	68 (73.1)	7 (7.5)	18 (19.4)	.6923	53 (57.0)	29 (31.2)	11 (11.8)	.0082
70–79	108	80 (74.1)	12 (11.1)	16 (14.8)		85 (78.7)	18 (16.7)	5 (4.6)	
80–89	35	27 (77.1)	4 (11.4)	4 (11.4)		29 (82.9)	6 (17.1)	0 (0)	
≥90	4	3 (75.0)	1 (25.0)	0 (0)		4 (100)	0 (0)	0 (0)	
Education*									
<High school	121	72 (59.5)	18 (14.9)	31 (25.6)	<.0001	89 (73.6)	24 (19.8)	8 (6.6)	.7514
High school	53	45 (84.9)	3 (5.7)	5 (9.4)		35 (66.0)	13 (24.5)	5 (9.4)	
>High school	65	61 (93.8)	2 (3.1)	2 (3.1)		46 (70.8)	16 (24.6)	3 (4.6)	
Ethnicity									
African Am.	79	55 (69.6)	8 (10.1)	16 (20.3)	<.0001	51 (64.6)	21 (26.6)	7 (8.9)	.2443
Native Am.	80	47 (58.8)	13 (16.2)	20 (25.0)		60 (75.0)	18 (22.5)	2 (2.5)	
White	81	76 (93.8)	3 (3.7)	2 (2.5)		60 (74.1)	14 (17.3)	7 (8.6)	
General Health									
Excellent	21	17 (81.0)	2 (9.5)	2 (9.5)	.0119	14 (66.7)	7 (33.3)	0 (0)	.5240
Very good	31	24 (77.4)	2 (6.5)	5 (16.1)		22 (71.0)	5 (16.1)	4 (12.9)	
Good	98	83 (84.7)	5 (5.1)	10 (10.2)		72 (73.5)	21 (21.4)	5 (5.1)	
Fair	64	41 (64.1)	9 (14.1)	14 (21.8)		47 (73.4)	12 (18.8)	5 (7.8)	
Poor	26	13 (50.0)	6 (23.1)	7 (26.9)		16 (61.5)	8 (30.8)	2 (7.7)	
Alcohol use in past year*									
Yes	28	26 (92.9)	1 (3.6)	1 (3.6)	.0506	20 (71.4)	3 (10.7)	5 (17.9)	.0204
No	211	151 (71.6)	23 (10.9)	37 (17.5)		150 (71.1)	50 (23.7)	11 (5.2)	

* Missing data for one individual.

of both tobacco products (ie, former or current smokers who were also former or current ST users, $N=22$), 14 individuals began ST use prior to cigarette smoking, 3 individuals began cigarette smoking and ST use at the same age, and 5 individuals began cigarette smoking prior to ST use. The mean \pm SD number of packs smoked per day among current smokers was 0.59 ± 0.34 (range 0.1–1.5 packs per day).

Logistic regression predictors of current ST use and current cigarette smoking are listed in Table 3. Significant predictors of current ST use included age, education, and ethnicity. The odds of ST use for women with less than a high school education were more than 12 times greater than odds for women with more than a high school education. Compared to White women, the odds of ST use were approximately 8.5 and 9.6 times greater for African-American

and Native American women, respectively. The odds of ST use decreased by 10% for each additional year of age. The only significant predictors of current smoking by logistic regression were age and alcohol use in the past year. The odds for current smoking among women who reported alcohol use increased by more than 6-fold. The odds of smoking decreased by 12% for each additional year of age.

DISCUSSION

In a population of rural elderly women in southeastern North Carolina, we found exceptionally high rates of ST use, compared to national population rates. About 16% of this tri-ethnic population currently use ST: 20% of older African-American women, 25% of older Native American women, and 2.5% of

older White women. These rates are 7 times higher than national rates for African-American women of all ages, 8 times higher than national rates for White women of all ages, and 21 times higher than national rates for Native American women of all ages.⁸ Estimated average duration of ST use was more than 56 years. This high prevalence of current ST use is not a phenomenon unique to rural North Carolina. National and regional data^{8,17,18,26} underscore how common ST use is elsewhere in the southeastern United States, especially among older women. These relatively large populations of ST users traditionally lack access to tobacco cessation interventions.¹⁵ Due to the adverse health consequences of ST use,^{4–7} our findings highlight the need for increased provision of ST cessation interventions, as opposed to smoking cessation interven-

Table 3. Logistic regression predictors of current smokeless tobacco use and current cigarette smoking*

Predictors	Current Smokeless Tobacco		Current Smoking	
	AOR	95% CI	AOR	95% CI
Age (years)	0.90	0.84–0.97	0.88	0.79–0.97
Body mass index (kg/m ²)	0.94	0.88–1.01	0.95	0.87–1.05
Education (years)				
<12 years	12.0	2.42–59.2	2.56	0.51–13.0
12 years	2.98	0.50–17.6	2.01	0.38–10.7
>12 years	1.00	Referent	1.00	Referent
Ethnicity				
African Am.	8.53	1.77–41.2	1.10	0.31–3.85
Native Am.	9.55	1.98–46.0	0.25	0.04–1.40
White	1.00	Referent	1.00	Referent
Self-reported health				
Excellent	0.56	0.08–4.12	NA	NA
Very good	0.79	0.17–3.71	0.27	0.03–2.39
Good	0.68	0.20–2.36	0.20	0.03–1.53
Fair	0.94	0.30–2.97	0.70	0.11–4.32
Poor	1.00	Referent	1.00	Referent
Alcohol use in past year	0.39	0.04–3.42	6.28	1.43–27.6

* Models run separately for smokeless tobacco use and cigarette smoking using all variables listed in Table 1. AOR=adjusted odds ratio; CI=confidence interval.

tions only, among these populations of women.

The rates of current smoking among these elderly women are strikingly low compared to national rates, ranging from 8% to 40% of the prevalence among women of all ages in these 3 ethnic groups.⁸ This lower prevalence among older women is not unexpected, however, since it is known that the prevalence of smoking declines with age.⁸

Although we have previously reported high rates of current ST use and low rates of cigarette smoking among Lumbee Indian women (the Native American population represented in this study), this is the first study capable of simultaneously evaluating rates of tobacco use among a rural elderly population of women comprising 3 ethnic groups. One finding from this analysis is that the Native American women and African-American women in our study had much higher rates of ST use compared to the White women; nationally, African-American women have the highest

rates of ST use.⁸ Additionally, older women were less likely than younger women to be current ST users. Previous work^{13–16} with samples comprising fewer older women demonstrated a positive association between age and current ST use, but data from the present study seemed to indicate a negative association between age and current ST.

Among ever users of both tobacco products, ST use tended to precede cigarette smoking. This might indicate that ST acts as a gateway to nicotine addiction and cigarette smoking. This has been suggested by both cross-sectional and prospective data,^{17,27–29} but would require further study in this community to establish a clear temporal relationship.

Evidence suggests that ST use is more addictive than cigarette smoking.^{4–6} Lending support to this hypothesis is the fact that 38 out of 62 ever-users of ST (61%) were current users, whereas only 16 out of 69 ever-smokers (23%) were current smokers. Other explana-

tions for this finding include increased mortality among cigarette smokers compared to ST users, or increased awareness of the health risks associated with cigarette smoking compared to ST use. Indeed, other work has shown that one reason current ST users report using ST is that they think it is safer than smoking cigarettes.¹⁶ While some have argued from a harm reduction perspective that ST use may be a relatively “safe” way to quit smoking,³² ST use is still a risk factor for a number of adverse health effects, including cancer⁷ (especially oral cancer³⁰) and cardiovascular disease.³¹ Therefore, the higher prevalence of current ST use compared to cigarette smoking might indicate that increased health education regarding the dangers of ST use is warranted among high prevalence populations.

In general, the joint predictors of current ST use among these women corroborate earlier work.^{11–17} On the other hand, only younger age and alcohol use were predictors of current cigarette smoking. While alcohol use³³ and age⁸ are known to be associated with cigarette smoking, other studies^{8–20} have shown cigarette smoking to be associated with education and self-reported health status. Our data did not demonstrate these latter associations with current smoking, perhaps due to the small number of women who currently smoked.

Few data exist on daily patterns of ST use,²⁰ particularly among women. Although we did not ask which type of ST participants used on a daily basis (eg, snuff vs chewing tobacco), the average number of uses per day (3) among these women would correlate with 10.8 mg of nicotine exposure per day for those using snuff, and 13.5 mg of nicotine exposure per day for those using chewing tobacco.³⁴ These nicotine levels are approximately equivalent to amounts of nicotine obtained from smoking 10 cigarettes, or half a pack, per day.³⁴

National data exist on the number of cigarettes smoked per day by women

of different ethnic groups. In general, a majority of African-American women (66%) and Native American women (52%) of all ages smoke fewer than 15 cigarettes per day, while a majority of White women (68%) of all ages smoke more than 15 cigarettes per day.⁸ Among our elderly participants, however, African-American women smoked the most (0.64 packs per day, about 13 cigarettes), Native American women smoked the least (0.5 packs per day, or 10 cigarettes), and White women were intermediate (0.57 packs per day, about 11 cigarettes).

Although this study did not explore cultural aspects of tobacco use, other research has demonstrated that tobacco use is strongly tied to culture.^{14-19,35-38} Use of tobacco has been part of Native American culture, including medicinal uses such as treatment of gastrointestinal symptoms,³⁵ since before the arrival of Europeans.^{14,36,37} Among Eastern Band Cherokee women, for example, women who had ever consulted an Indian healer were nearly 3 times more likely to be current smokeless tobacco users, even after controlling for other factors.¹⁷ Among Lumbee Indians, tobacco use did not correlate with traditional Native American practices, but strongly correlated with church attendance and church views on tobacco.¹⁵ Among African-American women in eastern North Carolina, ethnographic data indicate that ST use is passed from mothers to children (especially daughters), and is used as a childhood treat, to calm children, or as a shared activity between mothers and daughters.³⁸ Finally, among all racial and ethnic groups, the prevalence of tobacco use is higher in communities with local economies dependent on tobacco-based agriculture.^{14,15,18,19}

These data are subject to a number of limitations. First is their cross-sectional nature, which prohibits inferences of causation among variables. In addition, asking elderly women to remember when they began using ST or cigarettes

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likely introduces some degree of recall bias. Finally, our study was designed to evaluate risk factors for osteoporosis, rather than to evaluate correlates of tobacco use, per se. Because of this, certain relationships may not have been uncovered in our analysis due to small numbers of women, especially the small number of women who were currently smoking ($N=16$).

Nonetheless, these data document higher rates of ST use and lower rates of cigarette smoking among these older women compared to national figures for women of all ages. These findings emphasize how common ST use is in this rural county, and the importance of asking about ST use, in addition to cigarette smoking, when inquiring about an individual's tobacco use. These data also give unique insights into patterns of tobacco use within a tri-ethnic population of rural elderly women. The educational and ethnic variations in ST use status would be especially important to keep in mind when designing any tobacco intervention carried out in this community, and may have implications for other rural populations of elderly women. For example, the lower educational levels of current ST users would need to be addressed in tobacco cessation interventions by using materials designed for low literacy populations. In addition, cultural correlates of tobacco use would be extremely important to explore, particularly among ethnic and minority populations. Finally, the distinctly different epidemiology of ST use com-

pared to cigarette smoking among these women highlights the need to tailor tobacco interventions to each specific product.

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REFERENCES

1. Mitchell BE, Sobel HL, Alexander MH. The adverse health effects of tobacco and tobacco-related products. *Prim Care*. 1999;26:463-498.
2. Spangler JG. Smoking and hormone related disorders. *Prim Care*. 1999;26:499-512.
3. CDC. Cigarette smoking-attributable mortality and years of potential life lost—United States, 1990. *MMWR*. 1993;42:465-499.
4. Spangler JG, Salisbury PL. Smokeless tobacco: epidemiology, health effects, and cessation strategies. *Am Fam Physician*. 1995;52:1421-1430.
5. Benowitz NL. Pharmacology of smokeless tobacco in nicotine addiction and nicotine-related health consequences. In: P. H. Department of Health and Human Services, ed. *Smokeless Tobacco and Health: An International Perspective*. Bethesda, Md: National Institutes of Health; 1993:219-228.
6. Severson HH. Smokeless tobacco: risks, epidemiology and cessation. In: Orleans CT, Slade J, eds. *Nicotine Addiction: Principles and Management*. New York, NY: Oxford University Press; 1995:262-278.
7. Winn DM. Epidemiology of cancer and other systemic effects associated with the use of smokeless tobacco. *Adv Dent Res*. 1997;11:313-321.
8. CDC. Surveillance for selected tobacco use behaviors—United States, 1900-1994. *MMWR*. 1994;43(SS):1-43.
9. US Department of Health and Human Services. *Tobacco Use Among US Racial/Ethnic Minority Groups—African Americans, American Indians and Alaska Natives, Asian Americans and Pacific Islanders and Hispanics: A Report of the Surgeon General*. Atlanta, Ga: US

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- Dept of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 1998.
- Centers for Disease Control and Prevention. Use of smokeless tobacco among adults, 1991. *MMWR*. 1993;42:263-266.
 - Ary DV, Lichtenstein E, Severson HH, Weismann W, Seely JR. An in depth analysis of male adolescent smokeless tobacco users: interviews with users and their fathers. *J Behav Med*. 1989;12:449-467.
 - Ary DV, Lichtenstein E, Severson HH. Smokeless tobacco use among male adolescents: patterns, correlates, predictors, and the use of other drugs. *Prev Med*. 1987;16:385-401.
 - Spangler JG, Bell RA, Dignan MB, Michielutte R. Prevalence and predictors of tobacco use among Lumbee Indian women in Robeson County, North Carolina. *J Community Health*. 1997;22:115-125.
 - Centers for Disease Control and Prevention. Smokeless tobacco use among American Indian women—Southeastern North Carolina, 1991. *MMWR*. 1995;44:113-117.
 - Spangler JG, Bell RA, Knick S, Michielutte R, Dignan MB, Summerson JH. Church-related correlates of tobacco use among Lumbee Indians in North Carolina. *Ethn Dis*. 1998;8:73-80.
 - Spangler JG, Bell RA, Knick S, Michielutte R, Dignan MB, Summerson JH. Epidemiology of tobacco use among Lumbee Indians in North Carolina. *J Cancer Educ*. 1999;14:34-40.
 - Spangler JG, Dignan MB, Michielutte R. Correlates to tobacco use among Native American women in western North Carolina. *Am J Public Health*. 1997;87:108-111.
 - Noland MP, Kryscio RJ, Riggs RS, Linville LH, Perritt LJ, Tucker TC. Use of snuff, chewing tobacco, and cigarettes among adolescents in a tobacco-producing area. *Addict Behav*. 1990;15:517-530.
 - Glover ED, O'Brien K, Holbert D. Prevalence of smokeless tobacco use in Pitt County, North Carolina. *Int J Addict*. 1987;22:557-565.
 - Spangler JG, Michielutte R, Bell RA, Knick S, Dignan MB, Summerson JH. Dual tobacco use among Native American adults in southeastern North Carolina. *Prev Med*. 2001;32:521-528.
 - Jensen J, Christiansen C. Effects of smoking on serum lipoproteins and bone mineral content during postmenopausal hormone replacement therapy. *Am J Obstet Gynecol*. 1988;159:820-825.
 - Jensen J, Christiansen C. Cigarette smoking, serum estrogens, and bone loss during hormone replacement therapy early after menopause. *N Engl J Med*. 1985;313:973-975.
 - Baron JA, Farahmand BY, Weiderpass E, et al. Cigarette smoking, alcohol consumption, and risk of hip fracture in women. *Arch Intern Med*. 2001;161:983-988.
 - Williams AR, Weiss NS, Ure CL, Ballard J, Daling JR. Effect of weight, smoking, and estrogen use on the risk of hip and forearm fractures in postmenopausal women. *Obstet Gynecol*. 1982;60:695-699.
 - US Census data. Available at: <http://www.factfinder.census.gov>. Accessed October 18, 2001.
 - Bell RA, Spangler JG, Quandt SA. Smokeless tobacco use among adults in the Southeast. *South Med J*. 2000;93:456-462.
 - Rouse BA. Epidemiology of smokeless tobacco use: a national study. *J Natl Cancer Inst Monogr*. 1989;8:29-34.
 - Sussman S, Holt L, Dent CW, et al. Activity involvement, risk taking, demographic variables and other drug use: predictors of trying smokeless tobacco. *J Natl Cancer Inst Monogr*. 1989;8:57-62.
 - Ary DV. Use of smokeless tobacco among male adolescents: concurrent and prospective relationships. *J Natl Cancer Inst Monogr*. 1989;8:49-56.
 - Winn DM, Blot WJ, Shy CM, Pickle CW, Toledo A, Fraumeni JF Jr. Snuff dipping and oral cancer among women in the southern United States. *N Engl J Med*. 1981;304:745-749.
 - Bolinder G, Alfredsson L, Englund A, de Faire U. Smokeless tobacco use and increased cardiovascular mortality among Swedish construction workers. *Am J Public Health*. 1994;84:399-404.
 - Fagerstrom K, Ramstrom L. Can smokeless tobacco rid use of tobacco smoke? *Am J Med*. 1998;104:501-503.
 - McIlvain HF, Bobo JK. Tobacco cessation with patients recovering from alcohol and other substance abuse. *Prim Care*. 1999;26:671-690.
 - Benowitz NL, Porchet H, Sheiner L, Jacob P III. Nicotine absorption and cardiovascular effects with smokeless tobacco use: comparison with cigarettes and nicotine gum. *Clin Pharmacol Ther*. 1988;44:23-28.
 - Vogel V. *American Indian Medicine*. Norman, Okla: University of Oklahoma Press; 1994.
 - Christen AG, Swanson BZ, Glover ED, Henderson AH. Smokeless tobacco: folklore and social history of snuffing, sneezing, dipping and chewing. *J Am Dent Assoc*. 1982;105:821-829.
 - Centers for Disease Control and Prevention. *Smoking and Health in the Americas: a 1992 Report of the Surgeon General, in Collaboration with the Pan American Health Organization*. Atlanta, Ga: US Dept of Health and Human Services, Public Health Service, CDC; 1992. DHHS Publication No. (CDC)92-8419.
 - Harrell JB, Joyner MW. *Smokeless Tobacco Use by Women in North Carolina* [masters thesis]. Chapel Hill, NC: University of North Carolina School of Nursing; May 2000.

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Design and concept of study: Spangler, Case, Bell

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Data analysis and interpretation: Spangler, Case, Bell, Quandt

Manuscript draft: Spangler, Bell, Quandt

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