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Association of smokeless tobacco use and smoking in adolescents in the US: Youth Risk Behavior Survey, 2011

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Abstract

Background—Using smokeless tobacco and smoking are risk behaviors for oral cancer, soft tissue lesions, caries, periodontal disease and other oral conditions. The purpose of this study was to examine adolescent smokeless tobacco use and smoking.

Methods—The study was a cross-sectional analysis of participants with complete data on smoking, smokeless tobacco use, and other variables of interest in the 2011 Youth Risk Behavior Survey (n=9655). Descriptive analysis and multivariable logistic regression analyses were performed.

Results—The unadjusted odds ratio for smokeless tobacco use and smoking was 9.68 (95% CI: 7.72, 12.13, p<.0001); the adjusted odds ratio was 3.92 (95%CI: 2.89, 5.31, p<.0001). Adolescents using smokeless tobacco were more likely to be male, to smoke, and to have engaged in binge drinking.

Conclusions—Adolescents who are using smokeless tobacco are more likely to also be engaging in concomitant smoking and are participating in other risk-taking behaviors.

Practice implications—Dentists are involved in helping patients in tobacco cessation. The strong association of smoking with smokeless tobacco needs to be considered in designing cessation programs for adolescents.

Keywords

tobacco; smoking; smokeless tobacco; adolescence; Youth Risk Behavior Survey

Introduction

Unlike the declining market trends for cigarettes, the sale of smokeless tobacco has been increasing over the last decade in the United States.[1, 2] The upward trend has been described as a reaction to smoking bans. Smokeless tobacco is being marketed as a way to use tobacco in smoke-free environments such as on airplanes, in restaurants, and at work places.[3, 4] Smokeless tobacco is a risk factor of cancer of the oral tissues and pharynx, oral soft tissue lesions (such as leukoplakia), periodontal disease, gingivitis, caries, halitosis, tooth loss, tooth stains, and nicotine addiction.[5] Smokeless tobacco has also been associated with low birth weight babies[5] and pancreatic cancer.[3]

Smokeless tobacco has many forms. Fine cut dipping tobacco, also known as moist snuff, is placed and held between the lower lip and gingiva. It causes excess salivation which is expectorated. In contrast, chewing tobacco, which is chewed rather than being held in place, is produced in long strands, twists, bits, or plugs. The excess saliva is also expectorated. The tobacco used in manufacturing dipping tobacco and chewing tobacco is dried, allowed to ferment, and is often treated with additives such as sugars (sucrose, fructose, sorbitol, molasses, dried fruit), water, sodium chloride, ammonium chloride, licorice, menthol, and other flavorings, paraffin oil, and glycerol.[5] Swedish snus has recently been introduced into the United States as a pasteurized, unfermented form of moist, (often refrigerated) smokeless tobacco that does not contain sugar and does not require spitting. It is often sold in discrete teabag-like or small mesh packets which are placed under the upper lip and are easy to remove and easy to dispose after use. Swedish snus is regulated as a food product in Sweden and contents are labeled on the container. American snus products are not regulated as food products in the United States and therefore are not required to label contents. American snus is often refrigerated before sale, as is Swedish snus. American snus generally is not sold in as moist of a condition as Swedish snus, and often has flavorings and sugar added (although exact ingredients are not available). Dissolvable, fine-milled tobacco, combined with food-grade binders and candy flavors have been processed as pellets (shaped like candy mints) (Camel Orbs®), or processed like toothpicks (Sticks®), or processed as films (Strips®). The pellets and sticks are held between the gingiva and lips, similar to Snus; the films are placed on the tongue to dissolve.[6] There is no associated expectorating with the pellets, sticks, or films.[6]

Adolescent cigarette smoking has decreased since 2002, but there has not been a decrease in their use of other tobacco products.[7] From the National Youth Tobacco Survey, it has been estimated that the number of non-smoking adolescents ages 14–17 years who used other tobacco products increased 5.9% per year from 2004–2009.[8]

Dual use of smoking and smokeless tobacco in male adolescents was evaluated using Monitoring the Future Survey data from 2005 and 2006; and the National Youth Tobacco Survey, in which the authors state that the results may be considered as a baseline measure of the extent of dual use before the major cigarette companies began to encourage increased smokeless tobacco use with the expansion of product lines.[9] Eighth grade males who were daily users of smokeless tobacco, had a 10% higher prevalence of smoking one-half pack of cigarettes than the eighth graders who did not use smokeless tobacco, and 27.7% of male middle school students who smoked daily during the previous 30 days were dual users of smokeless tobacco compared with 1.6% of male middle school students who had not smoked during the previous 30 days.[9] With the increasing sales of smokeless tobacco, and the promotion of smokeless tobacco as a means to substitute for cigarettes in situations where smoking is disallowed, the dual use pattern adolescent tobacco use may be changing.

Research conducted in rural Ohio indicated that adolescents thought that dissolvable tobacco would be convenient to use during school.[10] A study of snus sales in Minnesota indicated that an underage buyer was successful in 12.9% of his or her purchase attempts, suggesting that the percent of purchases of snus appears to be higher/easier than the successful purchase attempts of cigarettes.[11] An internet study of YouTube videos of smokeless tobacco

indicated that there were no restrictions on youth creating or viewing the videos and that only 9.8% had public health messages and only 12.2% presented the effects of nicotine in the videos.[12] And, adolescents reported curiosity about new smokeless tobacco products, packaging and flavorings and a willingness to experiment with the products.[13]

Although advertisements are required by law to include bold warnings that all forms of tobacco can cause mouth cancer, the enticing advertisements, price discounts, flavorings, convenient packaging, and promotional allowances have been effective in generating large sales. A study of magazine advertisements indicated that the ads per issue increased from 0.24 in 1998–1999 to 0.49 in 2005–2006.[14] The ads appealed to both traditional smokeless tobacco users and all readers of general adult magazines.[14] Recent marketing campaigns may be directed to youth, particularly with promotions for flavored and discounted varieties of smokeless tobacco products.[1, 15]

Additionally, the models in advertisement are representative of young, sophisticated, upscale, urban consumers[3] in addition to the traditional outdoorsman, individualistic marketing target group.

Sixty percent of smokeless tobacco sales are to consumers below age 24 years, and a growing number of smokeless tobacco users are women.[3] In 1991, the prevalence was estimated to be 0.6% among women 18 years and older;[16] using 2010 Behavioral Risk Factor Surveillance Survey data, the prevalence for females 18–24 years was 0.63%.[17]

Smokeless tobacco products had often been provided as free samples at tractor pulls, spitting contests, and fishing events; however, more recently, the introduction of snus products has been at concerts, urban bars and nightclubs.[3] Snus products are advertised as smoke-free, spit-free, not-dip, novel, sophisticated products.[3] Some smokeless tobacco products are sold from a refrigerator case as a novel feature of the products' sophistication. Some are also sold in tins similar to tins of mints, or in packages the size and shape of cell phones for discretion.

The use of smokeless tobacco as a harm reduction strategy or alternative to smoking is controversial.[5] The strategy has been studied in Sweden, where there is a high prevalence of snus use. Tobacco users are encouraged to have single use of smokeless tobacco and totally replace combustible tobacco.[5] The effort in Sweden has resulted in Sweden having the lowest European smoking prevalence (17%).[5] However, single use of smokeless tobacco poses many concerns. Potential problems are that: smokeless tobacco products may be gateway products that may lead to smoking and the use of other combustible tobacco products (electronic nicotine delivery systems, hookahs, bidis, cigars, etc.); people who attempt to quit with these products may develop dual use of tobacco (smokeless tobacco use and smoking); people will equate "less harmful" with "safe;" the message of tobacco cessation will be diluted; and ethically there is a dilemma of the potential marketing of smokeless tobacco as a harm reduction agent for recalcitrant smokers when there are known health risks with smokeless tobacco as well as smoking.[5, 18] Adding to the dilemma are the results of studies, although with limited and sometimes weak evidence, that found no increased risk of cancer or heart disease from snus use.[19] Harm reduction through

substitution is a radical, controversial approach to decreased tobacco use.[20] (It should be noted that European Union countries have banned the sale of snus in all of its member countries, except Sweden which insisted on its exception.[19])

It is known that behaviors which are considered risk-taking are often established early in life, particularly during adolescence.[21] It is not known if the curiosity and engagement in smokeless tobacco use is associated with smoking in adolescents. It is important to determine if adolescent smokeless tobacco users are also smoking so that intervention cessation programs could be tailored to address an emerging problem.

The research hypothesis is that adolescents who are smokers are more likely to also use smokeless tobacco than adolescents who are not smokers.

Methods

This study was approved by the West Virginia University Institutional Review Board. The methodology of the 2011 national Youth Risk Behavior Surveillance Survey (YRBSS) is presented in detail elsewhere.[22] In summary, the survey had a sampling frame of US schools from each state and Washington, DC, with students in at least one of the grades 9 through 12. Non-Hispanic black and Hispanic students were oversampled to allow for separate subgroup analyses on race/ethnicity. The survey was anonymous and voluntary. Parental permission was sought. The Centers for Disease Control and Prevention's Institutional Review Board approved the protocol. Missing data were not imputed. The response rate for schools was 81%, for students was 87%, and overall was 71%. There were 15,425 participants. This current study used data of participants who had complete survey responses to all of the variables of interest. The sample consisted of 9655 participants of the 15,425 participants in the YRBSS.

Outcome variable

The outcome variable was YRBSS's derived, and dichotomized variable for the use of smokeless tobacco during the past 30 days. The question was: During the past 30 days, on how many days did you use chewing tobacco, snuff, or dip, such as Redman,® Levi Garrett,® Beechnut,® Skoal,® Skoal Bandits,® or Copenhagen®?[23]

Variable of interest

Smoking was a YRBSS derived variable with a yes/no response based on the question: During the past 30 days, on how many days did you smoke cigarettes?[23] A zero response was a "no" response, and all other responses were categorized as a "yes" response.

Other variables

Demographic variables included sex, race/ethnicity, and education. *Sex* was determined by the female/male response to the posed question: What is your sex?[23] *Race/ethnicity* was identified as non-Hispanic white; non-Hispanic black; others non-Hispanic; and Hispanic derived from answers to: Are you Hispanic or Latino?[23] (yes/no) And What is your race?[23] (American Indian or Alaska Native, Asian, black or African American, Native Hawaiian or

other Pacific Islander, or white). *Education* was determined by the response to the posed question: What grade are you in?[23] The possible responses were 9th, 10th, 11th, 12th, and ungraded or other grade.

Lifestyle variables included sports, body mass index and soda use. Sports was included as previous research indicated smokeless tobacco was associated with participation in organized sports.[24] Soda (with the presence of caffeine) was included due to the potential of confounding as it has been reported that use of one drug is correlated with the use of another, although *dependence* of nicotine and caffeine were not correlated.[25] Body mass index was included as a relevant variable in a previous study on smoking in a previous study with a potential to be a confounder in this current study.[26]

Sports was a YRBSS derived variable with a yes/no response based on the question: During the past 12 months, on how many sports teams did you play?[23] (Count any teams run by your school or community groups). *Soda* was derived (with a yes/no response) based on the question: During the past 7 days, how many times did you drink a can, bottle, or glass of soda or pop, such as Coke,® Pepsi,® or Sprite®? (Do not count diet soda or diet pop).[23]

Overweight and obesity were calculated and presented in the YRBSS data set based on self-reported height and weight compared with sex/age specific Centers for Disease Control and Prevention growth chart reference data from 2000. Overweight was a body mass index at or above the 85th percentile and below the 95th percentile for the student's age and sex; and obesity was at or above the 95th percentile.

Risk taking behaviors were binge drinking, riding with a driver who had been drinking, use of marijuana, and sexual intercourse. *Binge drinking* was a YRBSS derived variable with a yes/no response to the question: Dung the past 30 days, on how may days did you have 5 or more drinks of alcohol in a row, that is, in a couple of hours?[23] *Riding with* a driver who had been drinking was a YRBSS derived variable with a yes/no response based on the question: During the past 30 days, how many times did you ride in a car or other vehicle driven by someone who had been drinking alcohol?[23] A zero response was a "no" response, and all other responses were categorized as a "yes" response. *Marijuana* was a YRBSS derived variable with a yes/no response to the question: During your lifetime, how many times did you use marijuana?[23] *Sexual intercourse* was a variable with a yes/no response to the question: Have you ever had sexual intercourse?[23]

The YRBSS had a complex survey design in which oversampling is conducted to adequately represent population subgroups. The survey provides weights to the data to use to determine a more accurate representation. Therefore analyses were conducted on weighted data. SAS 9.3 software was used. Descriptive data, chi square analyses, multivariable analyses, as well as sex and race/ethnicity subgroup analyses were computed. Statistical significance was set at a p-value of <0.05.

Results

Descriptive statistics are presented in Table 1. The sample was 51.4% female, primarily non-Hispanic white (62.2%), equally distributed from grades 9–12. Most participants did not

play sports (61.0%), and most (82.6%) had a normal body mass index for their age and sex. Smokeless tobacco use was reported at 6.2%. Approximately 1 in 5 reported smoking (17.8%), binge drinking (21.2%), or riding with a driver who had been drinking (22.7%). 38.6% reported ever using marijuana, and 45.9% reported ever engaging in sexual intercourse. Nearly ¾ (73.6%) reported drinking 1–3 sodas per week. All of the variables had significant chi square differences between those who did use smokeless tobacco and those who did not use smokeless tobacco.

Table 2 presents the overall unadjusted and multivariable adjusted analyses of smokeless tobacco use and risk behaviors with subgroup analysis by sex. The unadjusted odds ratio for smokeless tobacco and smoking was 9.68 (95% CI: 7.72, 12.13; p <.0001). In multivariable analysis, the adjusted odds ratio remained significant, but was diminished to 3.92 (95% CI: 2.89, 5.31, p<.0001). Smokeless tobacco users were also more likely to be non-Hispanic white, to be male, to be overweight, to ride with a driver who has taken a drink of alcohol, and to have engaged in binge drinking and sexual intercourse. They were less likely to drink 1–3 sodas a week and were less likely to be playing sports.

Female smokeless tobacco users had an adjusted odds ratio of 5.45 (95% CI: 2.16, 13.74, p=0.003) for smoking. Also, they were more likely to be non-Hispanic white, and to have engaged in binge drinking. Male smokeless tobacco users had an adjusted odds ratio of 3.73 (95% CI: 2.63, 5.30, p<.0001) for smoking and were also more likely to be non-Hispanic white, to ride with a driver who has taken a drink of alcohol, and to have engaged in binge drinking and sexual intercourse.

Table 3 describes race/ethnicity subgroup analysis. In race/ethnicity subgroup analysis, across all race/ethnicities, males and smokers were more likely to use smokeless tobacco. Compared with grade 9, there was no difference in grade for smokeless tobacco use. Additionally, non-Hispanic white smokeless tobacco users had a significant odds ratio for also riding with a rider who has taken a drink of alcohol, for being overweight, and for engaging in sexual intercourse and binge drinking. Hispanic smokeless tobacco users were likely to engage in binge drinking (Adjusted odds ratio: 3.28 [95% CI: 1.86, 5.78, p <.0001]. Non-Hispanic white smokeless tobacco users were less likely to drink 1–3 sodas per week. And Non-Hispanic white and Non-Hispanic black smokeless tobacco users were less likely to be on sports teams.

Discussion

The findings of this study indicate a strong association of smoking with smokeless tobacco use for adolescents in a nationally representative sample of adolescents. The associations attenuated in multivariable analyses, however the associations remained significant. Results also remained significant in sex and race/ethnicity subgroup analyses. Most students were non-smokers and did not use smokeless tobacco. The prevalence of smoking in this study was 17.8% while the prevalence of dual use was 3.9%. An analysis of all participants in the 2011 YRBSS indicated 18.1% smoked cigarettes on at least one day during the 30 days before the survey.[21] Results from this study for conjoint use were lower than the results of a study of the National Youth Tobacco Surveys 2002–2004 which indicated a smoking

prevalence of 16% and polytobacco use of 6.9%.[27] The current study's findings indicated that males, were more likely to use smokeless tobacco--results which are similar to the results of other studies.[2, 7, 27]

In multivariable analyses, other risk behaviors emerged as being associated with smokeless tobacco use including binge drinking, riding with a driver who has taken a drink of alcohol, and engaging in sexual intercourse. A study of youth tobacco use in West Virginia indicated that smoking and smokeless tobacco use were related to problem behaviors.[28] This study supports those results. An interesting result was that smokeless tobacco was associated with *not* playing sports—smokeless tobacco users were less likely to be playing sports.

The strengths of the study are that it is large, recent, and representative of US adolescents. It uses a complex study design, providing the ability to conduct sex and previously unexplored race/ethnicity subgroup analyses.

The limitations are that the responses were self-reports and not verified with clinical biomarkers. However, CDC, in conducting the surveys used test-retest reliability studies on the 1991 and 1999 questionnaires.[29] Additionally other studies were performed to test the validity of self-reported height and weight, the effect of altering the race/ethnicity question, working, and mode/setting of administering the survey.[29] Greater detail is available at the YRB website.

As a cross-sectional study, temporal associations and causality cannot be attributed.

The definitions of current smoking and smokeless tobacco use were based upon a 30 day recall and may be subject to recall bias and/or social desirability bias, however these should bias toward the null as all participants would be equally subject to increased recall following an uncommon event or responding in a socially desirable manner and associations would be weakened as a result.

And, it is not known if the adolescents in the study considered the other smokeless tobacco products, new to the market, as smokeless tobacco when responding to the question of smokeless tobacco use. Orbs®, Sticks®, Strips® and snus were products which were not specifically mentioned as examples in the YRBS, making the use of smokeless tobacco products possibly under reported.

The results add to the literature the strong association of smoking and smokeless tobacco across both genders, and non-Hispanic white, non-Hispanic black, and Hispanic race/ethnicities. Many previous studies were not large enough to conduct specific race/ethnicity studies, nor recent enough for the potential of capturing data concerning the recent introduction and promotion of snus and dissolvable tobacco products. Adolescents who were using smokeless tobacco in this study were more likely to also be participating in other risk-taking behaviors.

This study raises potential future research questions about conjoint smoking and smokeless tobacco use such as: Is smokeless tobacco being used as an aid to smoking cessation; as a means to decrease the number of cigarettes smoked; as a nicotine delivering system

alternative to smoking—or is smokeless tobacco an gateway to smoking and other alternative and emerging nicotine delivery systems? Should the controversial model of harm reduction be considered? Will adolescents who have a concomitant use of smokeless tobacco and cigarettes be more likely to continue the use into adulthood? Is there a need for more stringent restrictions on advertising and promotion of smokeless tobacco to youth?[5]

Tobacco cessation intervention programs need to address and counter the strong advertising campaigns. Tobacco companies use surveys, market researchers, focus groups, test markets, promotions and sponsorships. They invest millions of dollars to "teach" people how to use smokeless tobacco (particularly snus) and have tried to make the products appear popular, glamorous, adventurous, and trendy.[3] The adolescents with concurrent use of smoking and smokeless tobacco use, in particular, need to be targeted for cessation programs and healthcare providers need to be aware and pro-active in prevention and cessation activities. Dental healthcare providers have an opportunity to educate, intervene and provide tobacco cessation treatment in the normal course of dental care. Knowledge about associated behaviors in adolescents (not playing on a sports team, binge drinking, riding with someone who has been drinking, using of marijuana, being sexually active, drinking sodas in moderate amounts, and being of normal weight) may be helpful in targeting or strengthening messages to help specific at-risk adolescent dental patients.

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Table 1

Chi Square Analysis for smokeless tobacco, demographics, lifestyle/behavioral and specific risk taking behaviors Youth Risk Behavior Survey, 2011, n=9655

	Smokeless tobacco use		No smokeless use		
	N	**wt%**	**N**	**wt%**	**Sig***
DEMOGRAPHICS					
Sex					<.0001
Female	85	0.9	5061	50.53	
Male	433	5.3	4076	43.2	
Race/ethnicity					<.0001
Non-Hispanic White	365	4.9	4153	57.3	
Non-Hispanic Black	17	0.2	1434	11.0	
Hispanic	84	0.7	2614	17.3	
Other	52	0.5	936	8.2	
Education					.0043
9th grade	87	1.2	2173	25.6	
10th grade	123	1.5	2246	24.1	
11th grade	155	1.8	2434	22.3	
12th grade	153	1.8	2284	21.8	
LIFESTYLE/BEHAVIORAL FACTORS					
Sports					<.0001
More than 1 team	0		0		
1 team	330	1.9	3902	37.1	
No teams	351	4.4	5235	56.7	
BMI					.0409
Normal	411	4.9	7501	77.8	
Overweight	107	1.3	1636	16.0	
Obese	0		0		
Soda					
None	231	2.8	2339	23.6	
1–3/week	287	3.4	6798	70.1	

	Smokeless tobacco use		No smokeless use		
	N	**wt%**	**N**	**wt%**	**Sig***
RISK TAKING BEHAVIORS					
Within last 30 days, binge drinking					<.0001
Yes	331	3.9	1739	17.3	
No	187	2.3	7298	76.5	
Within last 30 days, rode with someone drinking					<.0001
Yes	251	2.9	2078	19.8	
No	267	3.3	7059	79.8	
Smoking					<.0001
Yes	330	2.9	1312	13.9	
No	188	2.4	7825	79.8	
Marijuana use					<.0001
Yes	398	4.7	3505	34.0	
No	120	1.6	5631	60.0	
Sexual intercourse					<.0001
Yes	412	4.9	4326	41.0	
No	106	1.3	4811	52.7	

Weighted percentage. Weighted percentages were obtained to control for complex sample design, therefore division of individual cell sizes by the total sample will not reflect weighted percentages.

Significant group differences were tested by Chi-square statistics (*Rao-Scott Chi-Square values) N-number of participants

518 used smokeless tobacco (wt%=6.2); 9137 did not use smokeless tobacco (wt%=93.8)

Table 2

Association between smoking and smokeless tobacco use
Youth Risk Behavior Survey 2011

Unadjusted association Smoking	**OR 9.68 (7.72, 12.13)**	**p-value <.0001**				
Adjusted Model						
	Overall OR, n=9655	**p-value**	**Female, n=5146 OR**	**p-value**	**Male, n=4509 OR**	**p-value**
Smoking	3.92 (2.89, 5.31)	<.0001	5.45 (2.16, 13.74)	.0003	3.73 (2.63, 5.30)	<.0001
Other variables:						
Male v. female	7.28 (5.25, 10.09)	<.0001				
Race/ethnicity						
NHW	2.55 (1.66, 3.92)	<.0001	1.74 (0.72, 4.23)	.0107	2.82 (1.87, 4.24)	<.0001
NHB	0.45 (0.22, 0.90)	<.0001	0.65 (0.18, 2.41)	.2288	0.42 (0.20, 0.89)	<.0001
Other	1.94 (1.13, 3.31)	.0227	1.07 (0.35, 3.30)	.9493	2.23 (1.25, 3.97)	.0198
Education						
Grade 10	1.08 (0.75, 1.55)	.2939	1.04 (0.55, 1.96)	.8076	1.09 (0.71, 1.68)	.3657
Grade 11	1.09 (0.80, 1.48)	.1996	1.05 (0.54, 2.07)	.7903	1.10 (0.76, 1.59)	.1976
Grade 12	0.82 (0.54, 1.25)	.0893	0.88 (0.41, 1.86)	.6700	0.80 (0.53, 1.23)	.0384
Playing a sport	0.57 (0.45, 0.72)	<.0001	0.77 (0.44, 1.36)	.3719	0.52 (0.40, 0.68)	<.0001
Overweight	1.46 (1.08, 1.96)	.0133	1.53 (0.83, 2.81)	.1736	1.42 (0.98, 2.06)	.0650
1–3 sodas/week	0.72 (0.56, 0.92)	.0094	0.64 (0.35, 1.18)	.1513	0.75 (0.58, 0.97)	.0271
Marijuana	1.31 (0.92, 1.87)	.1312	0.78 (0.32, 1.93)	.5894	1.47 (0.98, 2.21)	.0624
Sexual Intercourse	2.10 (1.38, 3.31)	<.0001	1.94 (0.86, 4.37)	.1081	2.13 (1.22, 3.72)	.0081
Binge drinking	2.50 (1.82, 3.45)	<.0001	2.73 (1.01, 7.38)	.0471	2.49 (1.82, 3.39)	<.0001
Riding with driver using alcohol	1.60 (1.20, 2.14)	.0014	1.30 (0.66, 2.56)	.4479	1.68 (1.19, 2.36)	.0029

OR=odds ratio AOR=adjusted odds ratio

The adjusted model includes: race/ethnicity (Non-Hispanic Whites and Non-Hispanic Blacks and Others, Non-Hispanic v. Hispanic); education (grades 10, 11, 12 v. 9); rode with a driver who had been drinking within the past 30 days (yes v. no); smoked within the past 30 days (yes v. no); played a sport (yes v. no); drank 1-3 sodas during the last week (yes v. no); used marijuana (yes v. no); had sexual intercourse (yes v. no); binge drinking (yes v. no) and body mass index (overweight v. normal weight).

Table 3

Association between smokeless tobacco and smokeless tobacco use
Youth Risk Behavior Survey 2011 Subgroup analyses by race/ethnicity:

	NHW n=4518	p-value	NHB n=145	p-value	Hispanic n= 2698	p-value
Smoking	3.74 (2.80, 5.00)	<.0001	31.16 (3.75, 259.12)	.0015	5.02 (2.20, 11.44)	.0001
Male v female	7.67 (5.17, 11.36)	<.0001	4.32 (1.31, 14.22)	.0160	4.89 (2.26, 10.55)	<.0001
Education						
Grade 10	1.04 (0.63, 1.72)	.7393	1.59 (0.35, 7.33)	.5243	0.83 (0.36, 1.90)	.7034
Grade 11	1.17 (0.80, 1.73)	.0616	0.50 (0.08, 3.21)	.1911	1.07 (0.55, 2.09)	.3790
Grade 12	0.83 (0.48, 1.44)	.1644	2.19 (0.60, 8.04)	.1862	0.74 (0.36, 1.51)	.3276
Playing a sport	0.57 (0.44, 0.78)	.0004	0.18 (0.06, 0.55)	.0026	0.67 (0.33, 1.34)	.2583
Overweight	1.87 (1.33, 2.63)	.0003	2.00 (0.34, 11.24)	.4477	0.56 (0.28, 1.10)	.0914
1–3 sodas/week	0.70 (0.54, 0.91)	.0075	0.42 (0.13, 1.39)	.1551	0.85 (0.46, 1.59)	.6148
Marijuana	1.38 (0.91, 2.09)	.1302	0.93 (0.17, 5.11)	.9346	1.02 (0.37, 2.84)	.9728
Sexual Intercourse	2.05 (1.51, 2.77)	<.0001	0.29 (0.05, 1.66)	.1636	2.34 (0.90, 6.10)	.0817
Binge drinking	2.48 (1.60, 3.85)	<.0001	1.99 (0.63. 6.31)	.2408	3.28 (1.86, 5.78)	<.0001
Riding with driver using alcohol	1.60 (1.08,2.35)	.0186	1.96 (0.51,7.55)	.3280	1.53 (0.86, 2.73)	.1504

The models include: sex (male v. female); education (grades 10, 11, 12 v. 9); rode with a driver who had been drinking within the past 30 days (yes v. no); smoked within the past 30 days (yes v. no); played a sport (yes v. no); drank 1-3 sodas during the last week (yes v. no); used marijuana (yes v. no); had sexual intercourse (yes v. no); binge drinking (yes v. no) and body mass index (overweight v. normal weight).