

# Smokeless Tobacco Use in Military Personnel

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Military personnel are more than twice as likely as civilians to use smokeless tobacco (ST), and recent studies indicate that military prevalence rates are rising. However, few studies have examined factors related to ST use in the military. The present study evaluated the characteristics of ST use in 785 active duty military personnel. The results indicated that the average age of initiation was 17.7 years, participants had used ST for 12.3 years, and they used approximately four tins or pouches of tobacco per week. Army personnel were more likely than Air Force personnel to be older, to have used ST longer, and to be heavier users. Officers had used ST longer than enlisted personnel and were more likely to have had a recent quit attempt. Enlisted personnel were more than three times as likely to report concurrent cigarette smoking. These results indicate that there are significant differences in ST use patterns in military personnel, and cessation programs should be tailored to meet these differences.

## Introduction

Smokeless tobacco (ST) use has been shown to be related to a number of increased health risks, including (but not limited to) oral cancer,<sup>1-4</sup> pancreatic cancer,<sup>5,6</sup> and cardiovascular disease.<sup>7-10</sup> However, despite the significant health risks of ST use, it has received far less scientific attention than cigarette smoking. A publication citation search conducted through the National Library of Medicine Entrez PubMed database for the past 5 years (2001-2006) identified 35,330 citations for smoking, compared with only 488 for ST.<sup>11</sup> The reasons for this lack of scientific emphasis on ST are not known. One explanation might be the lower prevalence of using snuff or chewing tobacco, which has been reported to be 4 to 10 times lower than that of smoking.<sup>12</sup> Another reason might be the perception of decreased health risks associated with ST, compared with smoking.<sup>6-8</sup>

The lack of scientific research on ST has resulted in a limited knowledge base regarding factors related to ST use, especially for high-risk or vulnerable populations. One population at high risk for ST use is military personnel. Historically, the U.S. military has been an environment in which tobacco use has been accepted and sometimes even encouraged.<sup>13-15</sup> In 1980, just over one-half (51%) of all U.S. military personnel smoked.<sup>14</sup> However, over the past two decades the Department of Defense (DoD) has taken strong steps to reduce tobacco use among U.S. military personnel.<sup>16,17</sup> The DoD now bans smoking in all public

buildings and all branches of the U.S. military prohibit tobacco use of any kind during basic military training.<sup>17</sup> Tobacco cessation programs are available at every major military medical facility, including many deployed locations in Iraq and Afghanistan. As a result, smoking among U.S. military personnel was reduced to 32.2% by 2005.<sup>18</sup>

Unfortunately, similar reductions have not occurred in the use of ST. Recent data from the DoD Survey of Health-Related Behaviors Among Military Personnel<sup>18</sup> indicated that ST use in the previous 30 days for all military personnel increased by 24% between 1998 (11.7%) and 2005 (14.5%). Among men from all of the services, the ST use rate increased from 13.4% in 1998 to 16.8% in 2005.<sup>18</sup> Young men 18 to 24 years of age are the group mostly likely to use ST, and the survey by Bray et al.<sup>18</sup> indicated that military men in this age range reported a 26% increase in ST use between 2002 (17.1%) and 2005 (21.6%). However, the single greatest increase in ST use has been among older men. Among military men  $\geq 35$  years of age, ST use increased by 90% between 1998 and 2002 (from 5.3% to 10.1%). All of these increases in ST use rates were fairly consistent across all branches of military service.

Within the military, there are significant differences in ST use between the different service branches, with Marine Corps and Army personnel being the highest utilizers. In 2005, more than one-fourth (27.4%) of 18- to 24-year-old personnel in the Marine Corps reported ST use in the previous 30 days, compared with 25.6% in the Army, 16.8% in the Navy, and 14.3% in the Air Force. It is not known what factors contribute to the differences in ST use found in these different groups of U.S. military personnel.<sup>18</sup>

ST use is greater across all branches of the military, compared with civilian populations. According to the 2004 National Survey on Drug Use and Health,<sup>19</sup> the prevalence of ST use in the previous 30 days for civilian men between the ages of 18 and 25 years was 9.5%, compared with 17.1% for the U.S. military.<sup>18</sup> These results suggest that military personnel are a high-risk group and are almost twice as likely to use moist snuff or chewing tobacco as are civilians of the same age. However, there have been few studies examining factors related to ST use in the military.

Several previous studies investigated ST use in military populations. Bray et al.<sup>14,18,20,21</sup> conducted repeated cross-sectional surveys of ST use in military personnel as part of the DoD Survey of Health-Related Behaviors Among Military Personnel. However, the research by Bray et al.<sup>14,18,20,21</sup> focused on the prevalence of ST use and did not examine the factors related to ST use. Most other studies included small samples ( $N \leq 60$ )<sup>22,23</sup> or basic military trainees upon initial entry into the military.<sup>23-27</sup> None of the studies included a comprehensive evaluation of

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patterns of ST use and factors related to ST use in a large sample of active duty military personnel from more than one branch of military service.

The present study evaluated ST use in a large sample ( $N = 785$ ) of active duty U.S. military personnel. To the best of our knowledge, this is the largest comprehensive assessment of ST use in military personnel that has been conducted to date. We provide data on demographic features of military ST users, differences between Army and Air Force ST users, and differences between officers and enlisted personnel. Assessments were designed to elucidate factors related to ST use in this high-risk population, including patterns of use (e.g., frequency, dependence, and history of quit attempts), psychosocial influences (e.g., spouse, friends, and depression), and the relationship of ST use to other behavioral risk factors (e.g., alcohol, cigarettes, and weight). A better understanding of the factors related to ST use in high-risk/high-use populations should help in the planning for targeted prevention and cessation programs.

## Methods

### Design and Procedures

This study was a collaborative effort among investigators at Wilford Hall Medical Center (Lackland Air Force Base, San Antonio, Texas), the Oregon Research Institute (Eugene, Oregon), and Wright-Patterson Medical Center (Dayton, Ohio). Active duty military participants were recruited during their annual dental examinations. Each of the military services includes assessment of tobacco use as a routine part of the annual dental screening, because of the known positive correlations between tobacco use, dental disease, and overall health<sup>28-30</sup> and dental pain.<sup>31</sup> The data in this article are part of the baseline assessment for a randomized clinical trial of ST cessation among military personnel.

### Participants

The participants were 785 active duty U.S. military personnel who reported current use of ST. The distribution of participants across the branches of military service is presented in Table I. A total of 20 military installations agreed to serve as recruitment sites. These military installations were located across the continental United States and included 28 different military dental clinics. Participants included individuals from the Air Force ( $n = 515$ ), Army ( $n = 237$ ), Navy ( $n = 9$ ), and Marine Corps ( $n = 24$ ). The participation rates for each of the services were inversely proportional to the time required to obtain institutional review board (IRB) approval at each site. In addition, the initiation of the study was just before the start of Operation Iraqi Freedom,

and some sites were hesitant to agree to participate because of heavy deployment taskings, including additional dental screenings.

### Measures

Data were obtained with a baseline questionnaire at the time of enrollment at the dental clinic. The 23-item baseline questionnaire surveyed a variety of behavioral risk factors covering three general domains, including demographic characteristics, tobacco (both ST and cigarettes) use history, and potential risk factors for tobacco use. In terms of demographic features, participants were asked to provide their age, gender, military rank, height, weight, marital status, educational attainment, race, and ethnicity.

History of tobacco use was assessed with 10 items, including the number of days per week ST was used, the number of days a can or pouch lasted, the time before the first dip or chew of the day, the age of first ST use, whether the participant swallowed the tobacco juice (never, sometimes, or almost always), and ST quit attempts during the past 12 months. Participants were asked whether they also smoked cigarettes, including the number of cigarettes smoked on a typical day for those who responded positively. Participants were asked whether their spouse/partner smoked, and they were asked about their readiness to quit ST by using a modification of the contemplation ladder<sup>32</sup> (11-point scale, with 0 = not ready to quit, 2 = should consider quitting someday, 4 = should quit but not quite ready, 6 = thinking about cutting down or quitting, 8 = have cut down and seriously considering quitting, and 10 = ready to quit now). Potential risk factors for ST use were also assessed, including current and past mental health status ( $\geq 2$  years in life when they felt depressed; in the past year,  $\geq 2$  weeks feeling sad, blue, or depressed), alcohol consumption during the past 7 days, and number of five best friends who currently use ST.

## Results

### Characteristics of Participants and ST Use

Of the total of 785 participants who volunteered for the study, almost all were male (784 participants; 99.9%), and the average age was 30.40 years (SD, 7.63 years) (Table II). Most of the participants reported that they were married (72.0%) and that they had completed some college or higher (81.9%). The mean body mass index was 26.7 kg/m<sup>2</sup> (SD, 3.32 kg/m<sup>2</sup>).

The majority (86.8%) of participants were enlisted members and 13.2% were commissioned officers. Approximately 4% of participants identified themselves as Hispanic or Latino. In terms of race, most participants reported that they were Cau-

TABLE I  
ST STUDY PARTICIPANTS ACCORDING TO BRANCH OF MILITARY SERVICE ( $N = 785$ )

Branch of Military	No. of Military Installations	No. of Clinics	No. of Participants	Proportion of Participants by Branch of Service (%)
Air Force	12	15	515	65.6
Army	6	11	237	30.2
Marine Corps/Navy	2	2	33	4.2
Total	20	28	785	100.0

**TABLE II**  
DEMOGRAPHIC FEATURES OF ST USERS

	Mean or Proportion
Age, mean $\pm$ SD (years)	30.40 $\pm$ 7.63
Gender, no. (%)	
Male	784 (99.9)
Female	1 (0.1)
Married, no. (%)	536 (68.3)
Some college or higher education, no. (%)	618 (78.7)
Hispanic or Latino ethnicity, no. (%)	31 (4.0)
Race, no. (%)	
Caucasian	699 (89.0)
African American	15 (1.9)
American Indian	12 (1.5)
Asian	9 (1.1)
Military grade, no. (%)	
Enlisted	681 (86.8)
Officer	104 (13.2)

casian (696 participants; 89.0%), followed by African American (15 participants; 1.9%), American Indian or Alaska Native (12 participants; 1.5%), Asian (9 participants; 1.1%), and Native Hawaiian or other Pacific Islander (5 participants; 0.6%). Fifty-two of the participants (6.6%) did not indicate a specific race, and three participants reported belonging to more than one race.

The patterns of ST use are shown in Table III. The average participant started using ST before 18 years of age, and duration of use ranged from <1 year to 37 years (mean, 12.8 years). Participants reported that they used ST almost every day and consumed approximately two tins or pouches of ST per week. The majority (58.4%) of participants indicated that, on average, they had their first dip or chew <1 hour after awakening in the morning (<30 minutes, 23.9%; 30–60 minutes, 34.5%; >60 minutes, 41.6%). Approximately one-half of participants indicated that they swallowed the tobacco juice at least sometimes (almost always, 12.5%; sometimes, 37.4%; never, 50.1%).

Twenty percent of participants indicated that they also smoked cigarettes, although the majority (64%) of those individuals indicated that they smoked  $\leq 10$  cigarettes per day. Twenty-three percent of participants reported that their spouse smoked. In response to the question, "How many of your five best friends use ST?," 81.7% indicated that at least one friend also used ST

**TABLE III**  
CHARACTERISTICS OF ST USE BY MILITARY PERSONNEL

	Mean or Proportion
Days of dip or chew per week, mean $\pm$ SD	6.21 $\pm$ 1.47
Days that tin or pouch lasts, mean $\pm$ SD	3.7 $\pm$ 2.16
Years of ST use, mean $\pm$ SD	12.8 $\pm$ 8.39
Age of initiation, mean $\pm$ SD (years)	17.7 $\pm$ 5.11
Readiness to quit (0–10 on contemplation ladder), mean $\pm$ SD	6.43 $\pm$ 12.54
First use <30 minutes after waking (%)	23.9
Swallows spit (%)	49.9
Currently smokes (%)	20.0
Attempted to quit in past year (%)	45.9

(none, 18.3%; one, 19.2%; two, 22.5%; three, 24.0%; four or five, 16.0%). Almost one-half (45.9%) of the participants reported that they had attempted to quit ST use during the past year.

In terms of self-reported symptoms of depression, approximately one (17.8%) of five participants indicated that in the past year they had  $\geq 2$  weeks in which they felt sad, blue, or depressed or had lost all interest or pleasure in things that they usually cared about or enjoyed. Approximately one of eight participants (12.4%) indicated that they had  $\geq 2$  years in their life when they felt depressed or sad on most days.

More than one-half (59.8%) of the participants reported that they had consumed alcohol during the previous week. In terms of number of alcoholic beverages consumed, 39.6% reported that they had consumed one to six drinks and 20.2% indicated consumption of more than six beverages. The mean number of drinks per week was 3.71 (SD, 5.10 drinks).

#### Comparison of Air Force and Army ST Users

A comparison of Air Force ( $n = 510$ ) and Army ( $n = 232$ ) participants with respect to demographic factors and ST use is presented in Table IV. Army personnel were significantly more likely to be older [33 vs. 30 years of age;  $t(723) = 4.60$ ,  $p < 0.001$ ] and to have used ST for a longer period of time [14 vs. 12 years;  $t(717) = 3.14$ ,  $p < 0.01$ ]. Most measures indicated that Army personnel were heavier users of tobacco and might have been more addicted to nicotine. Although there were no significant differences in the frequency of ST use, measured as the number of days used per week (6.24 vs. 6.20 days), Army participants used more ST on the basis of how long a tin or pouch of ST lasted. Similarly, more Army participants used ST within the first 30 minutes after waking (32% vs. 21%). The percentages of participants who reported that they at least sometimes swallowed their tobacco juice spit (54% vs. 49%) and smoked cigarettes (24% vs. 19%) were higher in the Army sample, but these differences did not reach statistical significance.

#### Comparison of ST Use by Officers and Enlisted Personnel

The data were also analyzed to compare commissioned officers ( $n = 104$ ; 13%) with enlisted members ( $n = 681$ ; 87%), and the results are presented in Table V. Commissioned officers, who are required to have completed a college degree before commissioning, were significantly older, more likely to be married, and more likely to have completed at least a bachelor's degree. Officers were significantly older when they first started to use ST and they had used ST for a longer period of time. Enlisted personnel were more than three times as likely to also smoke cigarettes (23% vs. 7%).

In terms of ST use patterns, officers and enlisted personnel were very similar. There were no significant differences in number of days per week that ST was used, how long a tin or pouch lasted, how soon after waking participants used ST, or the percentage that at least occasionally swallowed their tobacco juice spit. Officers were significantly more likely to have attempted to quit ST use during the past year (57% vs. 44%), and they also rated themselves as being significantly more ready to quit.

#### Discussion

This study is the largest and first of its kind to comprehensively evaluate patterns of ST use in U.S. military personnel. The

**TABLE IV**  
COMPARISON OF AIR FORCE AND ARMY PERSONNEL WITH RESPECT TO DEMOGRAPHIC FEATURES AND ST USE

	Air Force (n = 515)	Army (n = 232)	Significance Test	p
Age (years)	29.69	32.53	t(723) = 4.60	<0.001
Married (%)	70.7	77.7	$\chi^2(1, n = 710) = 4.70$	0.10
Some college or higher education (%)	82.2	85.4	$\chi^2(1, n = 721) = 1.10$	0.29
Days of dip or chew per week	6.24	6.20	t(740) = 0.44	0.26
Days that tin or pouch lasts	3.80	3.40	t(739) = 2.37	<0.05
Years of ST use	12.30	14.40	t(717) = 3.14	<0.01
Age of initiation (years)	17.41	18.09	t(379) = 1.53	0.13
Readiness to quit (0–10 on contemplation ladder)	7.20	6.73	t(739) = 2.63	0.009
First use <30 minutes after waking (%)	20.7	31.9	$\chi^2(1, n = 744) = 10.91$	0.001
Swallows spit (%)	48.7	54.3	$\chi^2(1, n = 743) = 1.99$	0.158
Currently smokes (%)	19.3	23.8	$\chi^2(1, n = 725) = 1.93$	0.164
Attempted to quit in past year (%)	43.6	47.4	$\chi^2(1, n = 743) = 0.95$	0.331
Body mass index (kg/m <sup>2</sup> )	26.41	27.32	t(721) = 3.57	<0.001

**TABLE V**  
COMPARISON OF OFFICER AND ENLISTED PERSONNEL WITH RESPECT TO DEMOGRAPHIC FEATURES AND ST USE

	Officer (n = 104)	Enlisted (n = 681)	Significance Test	p
Age (years)	34.71	29.74	t(756) = 6.21	<0.001
Married (%)	84.2	70.5	$\chi^2(1, n = 742) = 7.89$	<0.01
Some college or higher education (%)	100	79.1	$\chi^2(1, n = 754) = 25.30$	<0.001
Days of dip or chew per week	6.16	6.22	t(773) = 0.38	0.701
Days that tin or pouch lasts	4.04	3.64	t(772) = 1.73	0.084
Years of ST use	15.33	12.41	t(750) = 3.26	<0.001
Age of initiation (years)	19.4	17.3	t(776) = 3.83	<0.001
Readiness to quit (0–10 on contemplation ladder)	7.1	6.3	t(739) = 3.26	<0.01
First use <30 minutes after waking (%)	17.5	24.9	$\chi^2(1, n = 746) = 2.72$	0.10
Swallows spit (%)	41.3	51.2	$\chi^2(1, n = 775) = 3.49$	0.062
Currently smokes (%)	7.0	22.8	$\chi^2(1, n = 757) = 13.19$	<0.001
Attempted to quit in past year (%)	56.9	44.3	$\chi^2(1, n = 774) = 5.65$	<0.05
Body mass index (kg/m <sup>2</sup> )	26.82	26.62	t(754) = 0.58	0.564

data were collected on use patterns of 785 active duty military personnel in the relatively low-threat setting of dental clinics, as part of the annual examination. Because of the clear relationship of ST to oral health, the dental clinic setting was a particularly opportune location to assess ST use.

The demographic features of the military participants in this study were similar to the demographic features reported in most civilian studies. The mean age in the present study was 30.4 years, which compares favorably to the participants in one civilian study in which the average age of the 402 participants was 30.8 years.<sup>33</sup> However, participants in the present study were younger than those in two other dental office-based intervention studies by Severson and colleagues,<sup>34,35</sup> in which the mean ages of participants were 36.9 and 38.5 years.

Although most of the participants in the present study were Caucasian men, this is similar to reports in civilian populations<sup>33–35</sup> and is an accurate reflection of the population most likely to consume ST. Similarly, 72% of the participants in the present study reported being married or living with a partner, which was similar to the large majority of participants in other studies. Regarding the level of education, 82% of the military participants in this study reported some college or higher,

which was somewhat higher than in a previous civilian study<sup>35</sup> in which 69% of participants reported some postorhigh school education. This difference might be attributable to the educational opportunities and tuition assistance available to active duty military personnel. The ratio of enlisted participants to officer participants in this sample (enlisted, 87.8%; officer, 13.2%) is similar to the average composition of the DoD as a whole (enlisted, 85.5%; officer, 14.5%).<sup>36</sup>

The two largest groups of participants in our study were members of the Air Force (n = 515) and the Army (n = 237), and the differences found between these military branches were quite interesting. Army participants were more likely (1) to be older, (2) to have used ST for a longer period of time, (3) to be heavier users of ST, and (4) to report use patterns consistent with higher levels of addiction to nicotine. Although it is not uncommon to hear anecdotal and lay descriptions of the differences between Air Force and Army personnel, the specific factors that might have contributed to the differences in ST use found in this study are not known.

We also analyzed differences in ST use patterns for officers and enlisted personnel. Overall, the patterns of use were quite similar, in terms of current use patterns. However, officers were

more likely (1) to have completed a college degree, (2) to be older, (3) to be married, (4) to have been older when they initiated ST use, (5) to have used ST for a longer period of time, (6) to report being ready to quit, and (7) to indicate that they had attempted to quit at some point in the past year. The most dramatic difference in ST use patterns between enlisted personnel and officers was related to the co-occurrence of smoking. Enlisted personnel were >3 times as likely as officers to also smoke cigarettes. Previous studies with civilian subjects found negative correlations between education levels and rates of smoking.<sup>37-39</sup> This is consistent with the inverse relationship between ST use and education found in adult civilian populations of ST users.<sup>40</sup> The data collected in the present study do not allow us to explain why these differences were found. We do, however, have three hypotheses that may explain these differences. It may be that military ST users do not believe that there are significant health risks associated with ST use, compared with the risks of smoking. Another hypothesis is related to the potential for secretive use of ST by officers, who are often looked upon as role models for enlisted personnel. Whereas smoking tends to be a more publicly observable behavior, ST use can be much more easily concealed. Finally, some ST users may believe that any health risk symptoms of ST, such as oral leukoplakia, will quickly resolve after quitting.<sup>41</sup>

Another interesting finding is that almost one-half of all participants reported that they had attempted to quit ST use during the past year. This is consistent with previous military reports by Bray et al.<sup>14,18,20,21</sup> that indicated that most individuals who attempt to quit are not successful and very few participate in formal, evidence-based, cessation programs. There are many barriers to participation in such programs by military personnel, including duty requirements, times when such programs are offered, and the requirement to attend multiple appointments in many programs. The results of the present study suggest that a large percentage of military personnel would be interested in quitting ST if programs were easier to access and to use and were designed to meet their specific cessation needs. This finding is important, considering that, despite this reported interest in quitting, there has been a significant increase in ST use over the past several years.

Several limitations of the present study should be noted. First, the data were obtained through self-report measures, and no biological verification measures were obtained. The study would have been strengthened by the inclusion of larger numbers of Navy and Marine Corps personnel. Approximately two-thirds of the participants were Air Force personnel. The reduced participation by the other branches of the military was related to significant delays in obtaining IRB approval. Air Force IRB approval was obtained in ~3 months, whereas the other service IRBs took up to 1 year or more to approve the protocol. Although data at Air Force sites were collected at dental clinics at 15 different locations, the Air Force allowed one IRB to serve as the primary IRB of record and did not require full IRB review for most other Air Force recruitment sites. The delays at other sites were related to the requirement for multiple IRB reviews within the same service branches, significant differences in IRB protocol requirements, and differences in the requirements for informed consent documents.

The results of the present study have implications for military tobacco cessation programs and policy. First, these results sug-

gest that tobacco cessation programs for military personnel should be flexibly tailored to meet the needs of the particular target group. For example, the significant co-occurrence of smoking among enlisted personnel should be addressed if the overall goal is complete tobacco cessation. Army personnel, who tended to be more addicted to nicotine, might benefit from the addition of nicotine replacement therapy as part of the tobacco cessation program.

The results of the present study may also have implications for military tobacco use policy, especially considering the report of a recent significant increase in tobacco use in the military.<sup>18</sup> Specific factors related to the recent increase in ST use in military are not known. One hypothesis is that this increase may be related to increased stress in the military related to frequent deployments in support of Operation Enduring Freedom and Operation Iraqi Freedom. Another hypothesis involves the significant increase in advertising of ST products specifically targeting military personnel.<sup>42</sup> Also, lit cigarettes are illuminated targets for enemy combatants in deployed settings, which may prompt individuals to use ST.

Recent military policies have also targeted limitations on all forms of tobacco use in the workplace.<sup>17</sup> Although this policy is fairly easy to implement and to enforce for smoking, that is not the case for ST. It may be that some individuals have switched to ST use, either totally or partially, as a way to get around this policy. For example, some individuals might prefer to smoke cigarettes and may use ST only in public settings where smoking is prohibited. This may at least partially account for the large co-occurrence of smoking and ST use we found for enlisted personnel in the present study. Similarly, it may be that ST use is more common in deployed settings, where there are even greater limitations on smoking behavior.

In summary, the results of the present study suggest that military personnel represent a high-risk population for ST use and there may be unique factors that contribute to patterns of use that differ between branches of the military, as well as between officers and enlisted personnel. Additional research is needed to examine ST use patterns in Navy and Marine Corps populations. More importantly, the results of this study provide important information to be incorporated into tailored ST cessation programs for military personnel.

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