



Premilitary Tobacco Use by Male Marine Corps Recruits

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Recognizing both the medical and operational costs of tobacco use, the Department of Defense has made tobacco cessation a top health promotion priority. Military tobacco rates remain high, however, especially among younger personnel and, particularly, in the Marine Corps. Tobacco is prohibited during basic training, but relapse is common following boot camp graduation. The objective of this study was to determine patterns and prevalence of tobacco use among Marine Corps recruits before entering basic training. Over a period of 14 months, 15,689 graduating male recruits completed a survey of their preservice tobacco use. Approximately 81% reported having tried tobacco at least once and 57% were classified as at-risk users. Compared to their civilian peers, more recruits were daily users and many more used smokeless tobacco. Approximately 67% of users evidenced at least one indicator of dependence. There is a clear need for additional tobacco cessation efforts to target this high-risk population.

Introduction

The literature on adolescent smoking reflects a consensus among health care providers, researchers, and health promotion specialists that prevention and cessation efforts directed toward our nation's young people are critical in arresting the scourge of tobacco addiction. A high-risk subpopulation of young tobacco users that has, until recently, been largely overlooked by outreach and intervention programs is that of U.S. military inductees. Young men and women who enter the military after leaving high school are two and a half times as likely as their college-bound age peers to be smokers.¹ Furthermore, as military enlistees, they join a large and influential adult subculture where tobacco use historically has not only been higher than in the civilian sector, but also has been an integral part of military identity.^{1,2} Researchers have linked both smoking and smokeless tobacco use to numerous deleterious outcomes that are of particular relevance to military personnel. Smokers have significantly higher attrition rates than nonsmokers, both in boot camp and during the first year of service.^{3,4} More importantly, tobacco use is associated with decreased readiness. A pronounced, negative dose-response relationship exists between smoking and physical performance,⁵ and to-

bacco use is one of the most significant modifiable risk factors for training injuries.⁶⁻⁸ Smokers also have more dental problems, more illnesses, higher hospitalization rates, greater risk of infection, and slower recovery times, all of which translate into more sick days or limited duty, lost productivity, and personnel shortages for the operational command.⁹

The Department of Defense (DoD), which now spends an estimated \$1.6 billion annually for medical treatment and lost productivity associated with regular tobacco use,^{10,11} has changed its tobacco policies dramatically over the past 25 years. Recognizing that tobacco causes meaningful deficits in operational readiness, as well as debilitating long-term health problems, the DoD now cites tobacco use reduction as a top military health promotion priority.^{11,12} Beginning in the mid-1980s, a series of reforms, including a total ban on all tobacco products during military basic training, have helped reduce tobacco use in the armed forces.^{13,14} Yet, while mandatory tobacco cessation during boot camp appears to facilitate long-term abstinence among a proportion of recruit tobacco users, overall relapse rates are high, and a significant fraction of nonusers initiate use following graduation from boot camp.^{4,15-17} This article presents prevalence rates and patterns of preservice tobacco use among male Marine Corps recruits. The findings not only establish a baseline for evaluating changes in use over time and the efficacy of intervention efforts, but also provide a much needed profile of this previously overlooked, high-risk population of young tobacco users.

Methods

Participants

A total of 15,689 male Marine Corps recruits participated in the study. All were either E1 or E2 privates, with a mean age of 19.5 years. Approximately 16.5% were active duty reservists; 3.3% were married. Most (95.9%) had a high school education; 1.7% had <12 years education, and 2.4% had >12 years. Racial/ethnic distribution was 69.5% Caucasian, 19.6% Hispanic, 3.4% African American, 3.4% Asian, 1.5% American Indian, and 2.6% Other.

Procedure

Between July 2002 and September 2003, all recruits reporting for their scheduled classroom instruction on training day 56 (~10 days before graduation) at the Marine Corps Recruit Depot (MCRD), San Diego, California, were invited to participate in the survey study. Each week, a new company of recruits assembled in the designated classroom, where a civilian facilitator described the purpose of the survey, distributed consent forms, and administered a short tobacco use questionnaire.

Survey items were drawn from a variety of instruments that have been used by the DoD to assess lifestyle behaviors, includ-

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ing tobacco use.^{13,18-23} In addition to basic demographic data, the survey tapped the following areas: any use of tobacco products; regular tobacco use; age first started using; consumption of at least 100 cigarettes or 20 dips of smokeless tobacco in one's lifetime; any use in the 30 days before basic training; time to first use of the day; amount used (both cigarettes and smokeless); cravings during boot camp; stage of change (intentions to quit); quit attempts; and use by family or friends. All questions other than the one concerning cravings referred to tobacco use before starting basic training.

Measures

Defining Tobacco Users

The criterion generally used for an adult smoker is someone who has smoked at least 100 cigarettes in his or her lifetime and has smoked at least once in the past 30 days. Because smokeless tobacco (dip/chew/snuff) has emerged as an important health issue, particularly for young men, we expanded that definition to embrace those who use dip as well as cigarette smokers. For dippers, the defining criterion is having used smokeless tobacco at least 20 times.¹³ Thus, a conservative definition of an adult tobacco user would be someone who had smoked at least 100 cigarettes or used dip at least 20 times, and had used tobacco in the past 30 days.

Among adolescent smokers, prevalence is generally established simply by use in the past 30 days.²⁴ Given that recruits are typically between 17 and 20 years of age, this definition would not be inappropriate for them. Since recruits are banned from using any tobacco products during basic training, we asked participants about their use "in the 30 days before starting recruit training."

Previous research shows that young Marines have the highest tobacco use rates of any of the military services¹³ and a postgraduation tobacco recidivism rate of ~75%.¹⁵ In terms of targeting this high-usage population for intervention, we chose to cast a broad net, hoping to identify all users who, because of their level of premilitary tobacco use, might reasonably be considered at risk for continued use following basic training. An at-risk user was operationally defined as a recruit who had either smoked 100+ cigarettes or used smokeless tobacco 20+ times in his lifetime, or used any tobacco in the 30 days before beginning basic training. Experimenters were those who had tried tobacco at least once but had used <100 cigarettes, <20 dips, and had not used any in the month before beginning boot camp. Nonusers had never tried tobacco at all.

Total Tobacco Intake

We computed a variable, TOTLTOB, to account for total tobacco intake in terms of cigarettes per day, whether from cigarettes or smokeless tobacco. The amount of nicotine in moist snuff (the predominant form of smokeless tobacco) differs by brand, but it is estimated that one average-size pinch or pouch (i.e., one dip), held in the mouth between the cheek and gum for 30 minutes, delivers about the same amount of nicotine as three to four cigarettes.²⁵ Using the more conservative figure, we computed the cigarette equivalent for smokeless tobacco as dips per day $\times 3$. An individual's TOTLTOB

score was calculated as the number of cigarettes smoked per day (if any) plus the converted value for his daily smokeless tobacco use (if any). TOTLTOB was limited to those who had used tobacco daily within the month before basic training, and scores of zero were set to missing.

Indicators of Tobacco Dependence

No formal criteria have been adopted for adolescent nicotine dependence, although estimates of dependence range between 20% and 68% of young users.²⁶⁻²⁸ Although it is unclear whether typical measures of adult dependence apply to younger users, the following measures are considered to be standard indices of possible dependence: (1) cravings when tobacco is withdrawn^{23,29}; (2) multiple quit attempts^{29,30}; (3) daily use^{24,28}; (4) use within 30 minutes after waking for the day^{29,31-33}; and (5) average daily intake.³² Regarding this last criterion is an average daily intake of >25 cigarettes per day.³² However, several studies have reported probable nicotine dependence among young smokers using 10 to 20 cigarettes a day or even less.^{27,34-36} We therefore used 20 TOTLTOB units per day as our cut-off point for possible dependence.

Stage of Change

Prochaska and DiClemente's^{22,37} stage of change model assumes current behavior (e.g., current tobacco use); it is not, therefore, an exact fit for our recruit sample, which had been tobacco free for ~3 months when they completed the questionnaire. To address this, we created a slightly modified stage of change item, as follows (stage is noted in parentheses):

After graduation, you will be free to use any type of tobacco if you choose to. Which statement below will be most true for you at that time?

- a. I plan to remain tobacco free. (Action)
- b. I would seriously consider quitting within the next 30 days. (Preparation)
- c. I would seriously consider quitting within the next 6 months. (Contemplation)
- d. I would not plan to quit within the next 6 months. (Precontemplation)

Social Milieu

The influence of family and friends on tobacco use has been well-established.^{13,24} Peer use is a stronger risk factor than parental use,²⁴ but progression from initiation to established use is highest when both family and best friends use tobacco.³⁸ To measure social milieu, we asked respondents (1) whether anyone in the household they had lived in before entering basic training had used tobacco (yes/no) and (2) how many of their friends at home were tobacco users (most/at least one/none).

Results

Total Sample

Survey Response Rate

We had endeavored to enroll all graduating recruits in the study, but for a variety of reasons (e.g., medical absence,

TABLE I
PROPORTION OF MALE RECRUITS MEETING VARIOUS CRITERIA
FOR TOBACCO USE

Criterion	% (n)
Ever used tobacco	80.5 (12,613)
Several times	58.4 (9,156)
Only once or twice	22.1 (3,457)
Smoked at least 100 cigarettes in lifetime	41.0 (6,410)
Used smokeless tobacco at least 20 times in lifetime	26.1 (4,067)
100+ cigarettes and/or 20+ smokeless	48.7 (7,584)
100+ cigarettes only (no smokeless)	22.7 (3,529)
20+ smokeless only (no cigarettes)	7.6 (1,191)
100+ cigarettes AND 20+ smokeless	18.4 (2,864)
Any tobacco in the 30 days before basic training (BT)	48.5 (7,599)
100+ cigarettes and/or 20+ smokeless AND 30 days before BT	40.4 (6,279)
100+ cigarettes and/or 20+ smokeless OR 30 days before BT	57.0 (8,856)

guard duty, schedule changes) a proportion of the population (19%) did not attend their scheduled classroom session on the days we administered the tobacco survey. Nearly all recruits who were asked to participate in the survey research agreed to do so however, resulting in a response rate of 98.1%.

Tobacco Prevalence Rates

Table I presents the premilitary tobacco use profile for our cohort (note: categories are not all mutually exclusive). Nearly 81% of the recruits reported having tried tobacco at least once, and the majority had used it at least several times before entering the military. Although cigarettes were clearly the product of choice in this cohort, the growing popularity of smokeless tobacco is evident, with ~26% of the sample using dip and >18% using both smokeless products and cigarettes. Based on our operationally defined user categories, which required respondents to have complete data on four separate items ($N = 15,556$), only 19% of the sample were classified as

never users, while 24% were experimenters, and well over half (57%) were at-risk users.

Comparisons to Other Studies

Generally speaking, it is difficult to compare results across studies of tobacco use because of differences in study populations, age groups, type of tobacco being examined, and criteria for designating a user. Furthermore, most tobacco research has focused on adult smokers, potentially making comparisons to the present population inappropriate. However, several large epidemiological studies have examined tobacco use among adolescents or young adults, and some have presented their results in sufficient detail to enable us to descriptively compare our results with theirs. In Table II, we have identified four recent studies^{13,39–41} with which we could effect reasonable comparisons to the present findings. We tailored our analyses to match, as closely as possible, the criterion and age group used in each of the comparison studies indicated. All results presented in Table II are for males only.

Some of the percentages in Table II were estimated as follows. (1) We inquired about “any tobacco use” in the last 30 days, not just cigarette smoking. To arrive at our estimate of 42.4% cigarette users in the previous month among U.S. Marine Corps (USMC) recruits, we subtracted those using smokeless tobacco only (at the 20+ level) from the total reporting any tobacco use in the 30 days before basic training. (2) We did not ask about cigarette use “every day or some days,” so we used past 30 days’ usage as an indicator of regular (although not necessarily daily) use. (3) The Monitoring the Future survey⁴¹ did not report age for their 12th grade students, so we assumed this to be a 17- to 18-year-old age group.

With appropriate caveats regarding the purely descriptive nature of these comparisons, Table II provides a useful context for examining the level of tobacco use in our sample. Overall, the recruits’ usage was a little lower than that of active duty Marines the same age, but higher than their age peers still in high school. Compared with young adults in the

TABLE II
COMPARISONS OF TOBACCO USE AMONG YOUNG MALES IN FIVE STUDY COHORTS

Criterion	Study ^a	Age Group (years)	Population	Year	% (n)
Cigarette smoking, any in last 30 days	NHRC	18–25	USMC recruits	2002–2003	42.4 ^b (6,344)
	DoD Survey ¹³	18–25	USMC	2002	49.3 (1,019)
	NSDUH ³⁹	18–25	U.S. civilians	2002	44.9 (3,720)
100+ cigarettes and every day or some days	NHRC	18–24	USMC recruits	2002–2003	35.1 ^b (5,203)
	NHIS ⁴⁰	18–24	U.S. civilians	2001	30.4 (NP ^c)
Daily use (cigarettes or smokeless)	NHRC	17–18	USMC recruits	2002–2003	30.6 (1,852)
	Monitoring the Future ⁴¹	17–18 ^b	12th graders	2002	21.5 (1,247)
Smokeless, any in last 30 days	NHRC	18–24	USMC recruits	2002–2003	22.7 (3,365)
	DoD Survey ¹³	18–24	USMC	2002	25.4 (NP ^c)
	NSDUH ³⁹	18–25	Civilians	2002	10.7 (891)

^a NHRC, Naval Health Research Center; NSDUH, National Survey on Drug Use and Health; NHIS, National Health Interview Survey.

^b Estimated value.

^c NP, not provided.

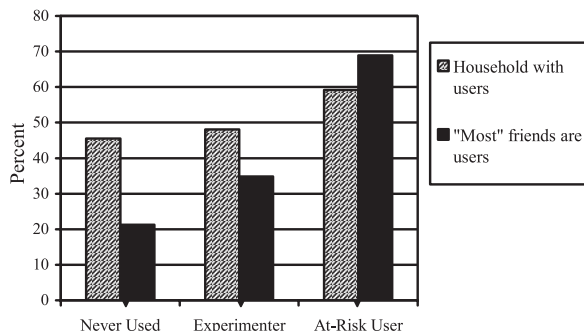


Fig. 1. Tobacco use and social milieu.

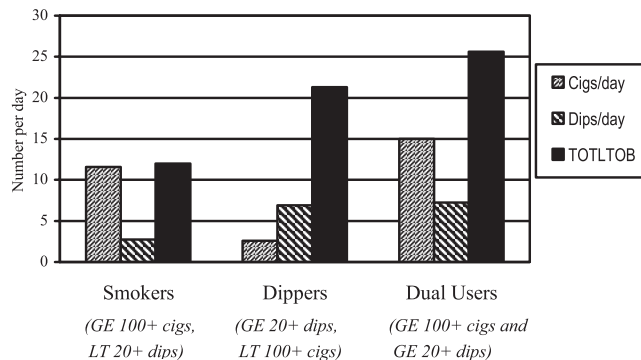


Fig. 2. Mean daily tobacco intake by type of tobacco user.

civilian sector, their usage was similar or a bit higher, except for smokeless tobacco, where military usage was much higher.

Stage of Change

As expected, essentially all never users (99.9%) said that they planned to remain tobacco free after graduating from boot camp, and virtually all experimenters (99.1%) intended to remain tobacco free, as well. Yet, only a little more than half of all at-risk users (56.1%) reported a similar intention—although when combined with those who said they would seriously consider quitting within 30 days after leaving basic training, almost 70% of at-risk users “seriously” intended to become nonusers after graduation.

User Category and Social Milieu

The apparent influence of peers on tobacco use—or of tobacco use on an individual’s choice of friends—is noteworthy. As Figure 1 demonstrates, the social sphere of at-risk users is preponderantly one composed of other tobacco users, with users having proportionately more tobacco-using friends than do experimenters or nonusers, $\chi^2(4) = 3087.8, p < 0.001$. When asked how many of their friends also use tobacco, only 2.9% of at-risk users answered “none,” compared with 14.5% of experimenters and 26.5% of never users. Sharing a household with another user (usually another family member) also has a significant, although less pronounced, effect in the same direction: respondents with another user in the same household were more likely to be users themselves, $\chi^2(2) = 233.0, p < 0.001$.

At-Risk Tobacco Users

Level of Use

The average at-risk user began using tobacco at age 15. By the time such users entered basic training, nearly two-thirds (63.3%) were smoking or dipping on a daily basis and one-third were dual users who both smoked and dipped. Average pack years for the sample, calculated using TOTLTOB, was 5.2 years; average daily tobacco intake was equivalent to ~19 cigarettes—almost a pack a day.

As shown in Figure 2, total tobacco intake differed by type of tobacco used, with dual users having the highest estimated intake (~26 TOTLTOB units/day), followed by dippers (21/day), and finally smokers (12/day), whose mean daily intake was roughly half that of dippers, $F(2) = 557.2, p < 0.001$. On

average, dual users consumed more cigarettes than smokers, and slightly more smokeless tobacco than dippers.

Tobacco Dependence: Dependence Indicators

In addition to the 63% who reported using tobacco on a daily basis, at-risk users exhibited other signs of tobacco dependence. Approximately 37% experienced mild to strong cravings when forced to stop using tobacco during basic training. More than 28% used tobacco within 30 minutes after waking for the day; an additional 16% used within the first hour. More than 56% had tried to quit at least once before entering boot camp, and >26% had tried two or more times. Finally, ~43% of at-risk users had an average daily tobacco intake equivalent to a pack or more a day.

Almost 67% of at-risk users received a positive (dependent) score on at least one of the five dependence criterion measures; ~6% scored positive on all five indicators. Interestingly, this varied considerably by type of tobacco used: 71% of cigarette smokers, 57% of smokeless tobacco users, and 92% of those who used both had a positive score on at least one indicator, while 4% of smokers, 2% of dippers, and 13% of dual users scored as dependent on all five measures.

Stage of Change and Confidence to Quit

Responding to the questionnaire at the end of a 3-month tobacco ban during basic training, the majority of at-risk participants expressed their intentions regarding future tobacco use in terms of the highest stage of change. Approximately 56% said that they intended to remain tobacco free after boot camp graduation, and a total of 78% indicated that they either planned to remain tobacco free or to quit within 6 months. Moreover, the recruits were confident in their ability to do so. Although 44% had never attempted to quit (apart from the mandated abstinence during boot camp), 71% were “sure” that they could, whereas only ~8% felt that they probably could not.

Discussion

Our survey revealed a high rate of premilitary tobacco use among Marine Corps recruits. Approximately 41% were smokers and 26% used smokeless tobacco; many were dual users who used both products. Overall, 57% of the recruits were at risk for continued tobacco use after graduation, having smoked at least 100 cigarettes, used smokeless tobacco at least 20

times, or used some form of tobacco in the 30 days before entering recruit training. The recruit smoking rates were similar to those for adolescents and young adults in the civilian sector, indicating that, while military culture may contribute to the development or continuation of a tobacco habit, the military recruiting pool itself is composed of significant numbers of young tobacco users. However, two important differences between military and civilian samples suggest that USMC recruits are actually somewhat heavier users. Considerably more Marines smoked or dipped on a daily basis, signifying a more firmly established habit as well as higher mean nicotine intake. But the most striking difference was in smokeless tobacco use. The prevalence of dippers among young Marines was more than double the rate in a comparable civilian cohort.

Until recently, most tobacco researchers overlooked smokeless tobacco, in part because national rates have generally been low.⁴² But as restrictions on smoking have become more widespread, the market for smokeless products has grown. There is increasing recognition among researchers and users alike that smokeless tobacco is more dangerous than many had thought. One dip of chewing tobacco exposes the user to three or four times as much nicotine as does one cigarette, in addition to potent carcinogens and other chemical toxins.²⁵ Nicotine dependence, transient hypertension, musculoskeletal injuries, and cardiovascular disease have all been linked to smokeless tobacco as well as to cigarettes.^{6-8,43} Furthermore, like cigarettes, smokeless tobacco has numerous deleterious effects on dental health, including gingival recession, tooth loss, periodontal soft and hard tissue destruction, and cancers of the mouth, larynx, and esophagus.^{7,8,43,44}

The first symptoms of nicotine dependence, such as cravings and withdrawal complaints, can emerge in young users within just a few weeks of the initiation of even occasional tobacco use.⁴⁵ Analyses of five different dependence indicators in our cohort produced potential dependence rates between 28% and 63%, with more than two-thirds of all users scoring positively on at least one of the five criteria. The wide variability seen in these measures parallels the variability in estimates of the prevalence of adolescent nicotine dependence²⁷ and suggests that the measures are somewhat independent. This highlights the importance, and difficulty, of appropriate criterion selection when investigating tobacco dependence in this population. Further exploration of the interrelationships among dependence indicators is recommended.

Dual users were more likely to exhibit dependence than either smokers or smokeless users alone. Yet many participants believed that they could quit whenever they wanted to. This is a common misperception among young users, who generally underestimate the addictive power of tobacco.⁴⁶ Unfortunately, tobacco use in adolescence is a strong predictor of continued use as an adult.^{27,37} Two of the main factors associated with successful cessation among young users—occasional (vs. regular) use and number of nonsmoking friends—weigh against our cohort of at-risk users. Nearly two-thirds were daily users and over two-thirds reported that “most” of their friends also used tobacco.

On the other hand, Klesges et al.⁴ found that the best predictor of long-term cessation was the participants' intentions with respect to quitting. That 56% of our at-risk users planned to

remain tobacco free after graduation, and another 22% said they would consider quitting within 1 to 6 months, reveals a commonly shared desire to stop smoking or dipping. That more than half had already made at least one quit attempt lends credence to their intentions. Adults are usually slow to attempt tobacco cessation, but 18- to 19-year-old users in the contemplation stage usually move to the action stage within a year,⁴⁷ so these are encouraging findings.

Like tobacco users of all ages, however, many of the recruits were ambivalent about their plans. Although 78% expressed some degree of intention to quit within 6 months, when asked whether they thought they would be using tobacco in a year, almost 46% responded “yes.” Ambivalence is one of the primary obstacles to successful tobacco cessation. Users who are just beginning to contemplate quitting may require information designed to enhance motivation, while those closer to the action stage might need help with specific quitting skills and relapse-prevention strategies.⁴⁸

Certain study limitations should be noted. The sample, although large, was limited to male recruits, since MCRD San Diego trains only men. Women, who are trained at MCRD Parris Island, South Carolina, comprised ~5.7% of all graduating USMC recruits in 2003. Although this is a small percentage of the total recruit population, patterns of tobacco use generally differ between men and women^{13,39,40} and should be explored in further studies of this population. Another limitation is the fact that only those recruits completing basic training were included in the survey. As preservice smoking is a significant predictor of boot camp attrition,⁴⁹ the preservice tobacco rates found in our sample are likely somewhat lower than rates in the entire population of USMC accessions.

The study has several strengths. The sample was very large and represented recruits entering the USMC over an entire calendar year. Survey completion rate was quite high. Inclusion of smokeless tobacco in the assessment of total tobacco use is a particularly important contribution, since smokeless tobacco is an increasingly significant source of both nicotine and toxins among military tobacco users. Finally, prevalence rate comparisons with other large studies, and the use of multiple measures of tobacco dependence, enhance the usefulness of these findings.

During basic training, new enlistees undergo a radical transformation. Not only are they trained to maximize their physical fitness and performance, but they are required to learn new information and new behaviors, and to assimilate military culture and military ways of thinking. Perhaps most importantly, they are indoctrinated with core values, high standards of personal conduct, and a desire to realize their personal best. This environment presents an excellent opportunity to expose recruits to well-formulated instruction to help them achieve a tobacco-free lifestyle. Banning all tobacco use during basic training is a crucial first step, but successful tobacco cessation involves complex behavioral and cognitive changes on the part of the individual user.⁵⁰⁻⁵² Unless cessation is freely chosen and accompanied by such cognitive and motivational changes, the likelihood of relapse is high.^{16,17,53} There is a clear need for additional tobacco cessation efforts to target this high-risk population. We recommend that the tobacco ban be augmented with a tailored intervention program to provide re-

cruits with salient information, enhance their motivation, and teach basic skills for remaining tobacco free after leaving basic training.

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14. ABSTRACT (maximum 200 words)

Recognizing both the medical and operational costs of tobacco use, the Department of Defense has made tobacco cessation a top health promotion priority. Military tobacco rates remain high, however, particularly among younger personnel, and especially in the Marine Corps. Tobacco is prohibited during basic training, but relapse is common. The objective of this study was to determine patterns and prevalence of tobacco use among Marine Corps recruits before entering basic training. A survey of premilitary tobacco use was administered to 15,689 male USMC recruits. Measures included level of use of both cigarettes and smokeless tobacco, average daily nicotine intake, social milieu, beliefs about tobacco and fitness, tobacco dependency, stage of change, and confidence to quit. Approximately 81% reported having tried tobacco at least once, and 57% had used at a level that put them at risk for continued use. Compared with young civilian men, more recruits were daily users, and many more used smokeless tobacco. Approximately 69% of users evidenced at least one indicator of dependency. There is a clear need for tobacco cessation efforts to target this high-risk population. The tobacco ban should be augmented with an intervention program to provide information, enhance motivation, and teach basic skills for remaining tobacco-free after boot camp graduation.

15. SUBJECT TERMS
Tobacco cessation, military recruits, Marine Corps, smokeless tobacco, tobacco prevalence rates, nicotine dependence, health promotion

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