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The Impact of Unit Membership on Smoking Among Soldiers

CDR Robin L. Toblin, USPHS*†; CPT James A. Anderson, MSC USA*; Lyndon A. Riviere, PhD*; LTC Dennis McGurk, MSC USA‡; LTC (P) Maurice L. Sipos, MSC USA*

ABSTRACT Cultural, organizational, and dyadic influences have been found to be associated with smoking in the military while group-level influences have been identified in the general population. However, there are few studies examining group-level influences in the military and none using group-level analyses. Such studies are essential for understanding how to optimally forestall or cease smoking. This study, using mixed effects modelling, examined whether unit membership influenced smoking behavior in soldiers from brigade combat teams. Unit membership was assessed in 2008 to 2009 at the company level ($n = 2204$) and in 2012 at the platoon level ($n = 452$). Smoking was assessed by the number of daily cigarettes smoked (range: 0–99) with smoking status (nonsmoker vs. smoker) and smoking level (none, smoker, and heavy [20 + cigarettes/day]) as the outcomes. For both samples, unit membership was not significantly associated with a soldier's propensity to smoke when comparing either all smokers to nonsmokers or heavy smokers to smokers. These results suggest typical military unit-level training programs are unlikely to be the most effective mode of intervention for smoking prevention or cessation. Smoking rates in the military may be influenced instead by small group or individual relationships or by overall military culture.

INTRODUCTION

Smoking is the leading cause of preventable death in the United States.¹ Data from 2012 indicate that 18% of all adults and 20% of young adult males in the United States smoked cigarettes² with 7% classified as heavy smokers (≥ 20 cigarettes per day^{2,3}). Smoking prevalence is even higher in the military.⁴ A large study conducted with military personnel in 2008 reported that 33% of those in the Army smoked cigarettes; the prevalence was 43% for young adult males and the rate of heavy smoking was 13% among males.^{5,6} Smoking is extremely costly to the military in terms of physical readiness,^{7,8} long-term health care costs,⁹ and increased risk of early discharge.¹⁰

Smoking by others in one's social network has been found to influence smoking behavior at the dyadic level, group level, and at the broader levels of social networks and culture in both the general population^{11–14} and in military populations.^{6,7,15,16} In a study of adolescents in the general population, Siddiqui et al¹¹ looked at the dyadic level

and found that individual relationships with peers (defined as one's 10 closest friends) had a large influence on smoking initiation, particularly for males, even when controlling for the influence of classroom membership. Christakis and Fowler¹² used social network analysis to demonstrate that individuals whose family and peers quit smoking were more likely to quit themselves. A recent review found "substantial peer group homogeneity of smoking behavior" (p 191) among adolescents across numerous studies at levels including classrooms, grades, and whole schools.¹³ At the broader environmental or cultural level, neighborhood factors¹⁷ and social networks¹² influence an individual's likelihood of smoking.

In a military setting, having friends who smoke has been consistently related to tobacco use.^{15,16} For example, recent studies found that both new and more experienced service members were more likely to initiate or maintain smoking if their friends or leaders smoked.^{16,18} Furthermore, social interactions while smoking significantly reinforce the maintenance of smoking behavior among service members.^{19,20} Brown et al¹⁶ also found that, within combat units in the Army, 70% of respondents stated that most of their Army friends smoked and that, of those whose supervisor smoked, 50% were smokers compared to 31% of those whose supervisor did not smoke.

A report that aimed to identify influences on tobacco and alcohol in the military found unit type (defined as combat companies compared to combat service support and combat support companies) as well as more macro-level factors (e.g., installation and service) influenced smoking.¹⁶ Smoking

*Center for Military Psychiatry and Neuroscience, Walter Reed Army Institute of Research, 503 Robert Grant Avenue, Silver Spring, MD 20910.

†Commissioned Corps of the U.S. Public Health Service, 1101 Wootton Parkway, Plaza Level, Rockville, MD, 20852.

‡Military Operational Medicine Research Program, U.S. Army Medical Research and Materiel Command, 504 Scott Street, Fort Detrick, MD 21702.

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rates were higher in combat units compared to combat support or combat service support units, which might suggest that soldiers in combat units are especially influenced by those around them. However, the Brown et al¹⁶ report did not examine the impact of a unit's level of smoking on an individual's smoking behavior.

Understanding the influence of unit membership on smoking may be useful in developing smoking prevention and cessation programs at the unit level, a frequent training and intervention method in the military. Given the influence of both dyadic and group-level factors in the general population and the strong influence of friends and supervisors in combat units, it seemed likely that there would also be unit-level (company and platoon) effects on smoking behavior in combat units. Consequently, this study assessed whether unit membership influences smoking status among soldiers at both the company and platoon levels.

METHODS

Participants and Procedure

Participants consisted of two separate groups of soldiers who took part in the Walter Reed Army Institute of Research Land Combat Study, part of which focused on tobacco use. Participants in the larger study completed an anonymous survey that took approximately 45 minutes to complete. Surveys were administered to large groups of soldiers either on stateside military posts or in a deployed setting. Participants were informed of the anonymity/confidentiality of their responses and that they could skip individual items on the survey. The study was approved by the Walter Reed Army Institute of Research Institutional Review Board.

The company-level sample consisted of soldiers from four infantry brigade combat teams (BCT) based in the United States approximately 6 months following the BCT's 12-month deployment to Iraq. Soldiers ($N = 3,380$) were surveyed between November 2008 and June 2009. Of those, 2,204 from 78 different companies provided informed consent to participate in the study, responded to questions about cigarette use, and were from units who had sufficient representation to reflect the company level ($n \geq 15$; P. D. Bliese, oral communication, April 2014).

The platoon-level sample consisted of soldiers from six BCTs who were surveyed between June 2012 and August 2012 during their combat deployment to Afghanistan. Of the 619 soldiers surveyed, 452 soldiers representing 25 different platoons provided informed consent to participate in the study, responded to questions about cigarette use, and were from units who had sufficient representation to reflect the platoon level ($n \geq 10$; P. D. Bliese, oral communication, April 2014).

Measures

Unit Membership

Unit membership is defined as the unit to which a soldier was assigned when they completed the survey. Units are nested

within larger units with the smallest size being 8 to 12 members (a squad). Typically, an Army company has between 50 to 200 soldiers generally organized into three to five platoons ranging in size from 16 to 44 soldiers with most including more than 30 soldiers. The company is typically viewed as the major contributor to a soldier's social climate because of the intragroup interaction required for the company to achieve its particular mission or goal.²¹ However, Bliese²¹ also suggests that in some contexts, the social climate could be formed at the platoon level even though this level tends to be more permeable. Consequently, given the possibility that smoking could be influenced at both the company and platoon level, this study includes samples from both types of units.

Smoking

For the company-level sample, smoking was measured by the question: "On average, how many cigarettes do you smoke per day?" For the platoon-level sample, cigarette use was measured by the question: "On average, how many cigarettes/cigars do you smoke per day?" In both cases, response options allowed up to 99 cigarettes/cigars (hereafter referred to as cigarettes) per day. Consistent with civilian³ and military⁵ studies, participants who reported smoking one or more cigarettes per day were considered smokers, whereas participants who reported smoking 20 or more cigarettes per day (i.e., one pack) were considered heavy smokers.

Analysis

Prevalence rates were examined for both smoking and heavy smoking. A binary logistic mixed effects model was used to examine how unit membership contributed to a two-group smoking status outcome (i.e., nonsmoking and any smoking) as well as a two-group smoking level outcome (i.e., nonheavy smoking and heavy smoking). As intraclass correlation (ICC) estimates can vary depending on the method used,²² this study also compared the estimates using the analysis of variance method²³ with a correction for unequal group sizes,^{24,25} no meaningful differences were found between the two approaches. All analyses were performed with SPSS, version 20.0.²⁶

RESULTS

Company-Level Sample

Demographic characteristics of the company-level sample ($n = 2,204$) are provided in Table I. The sample consisted primarily of 18- to 24-year-old junior enlisted (E1-E4) males. Over half of the sample was married (53.2%). Participants represented 78 different company units with sizes ranging from 15 to 83 soldiers (median = 25, SD = 12.5). Overall, nearly half of the sample reported smoking at least one cigarette per day (47.8%) with 18.0% heavy smokers. Among smokers, the median number of cigarettes smoked

TABLE I. Prevalence of Selected Characteristics by Cigarette Use in Two Samples of U.S. Service Members, 2008 to 2009 and 2012

Demographic	Company-Level Sample (n = 2,204)			Platoon-Level Sample (n = 452)				
	N	Nonsmoker (%) ^a	Smoker (%)	Heavy Smoker (%)	N	Nonsmoker (%) ^a	Smoker (%)	Heavy Smoker (%)
Overall	2204	52.2	29.8	18	452	49.6	40.9	9.5
Gender ^b								
Male	1962	50.4	30.6	19.1	452	49.6	40.9	9.5
Female	218	68.3	24.8	6.9	—	—	—	—
Age								
18–24	1057	47	31.5	21.5	284	45.4	43.3	11.3
25–29	599	52.3	32.6	15.2	114	52.6	41.2	6.1
30+	545	62	23.7	14.3	52	65.3	26.5	8.2
Rank								
E1-E4	1319	45.1	34	20.9	296	47.6	42.9	9.5
E5-E9	709	57.3	26.8	15.9	135	48.9	40	11.1
Officer/Warrant Officer	159	89.3	10.1	0.6	19	84.2	15.8	0
Marital Status								
Single	747	53.7	28.6	17.7	238	51.7	37.8	10.5
Married	1153	53.3	29.6	17.2	168	49.4	44	6.5
Divorced/Separated/Widowed	267	44.6	33.7	21.7	25	32	48	20

Differences in sample sizes for any of the demographics are because of missing data. ^aPercentages are the proportion of the characteristic that falls into each smoking status. ^bThe platoon-only sample only included deployed combat arms units, and women were prohibited from such units at the time of the data collection.

per day was 13. The prevalence of smoking within companies ranged from 16.7 to 72.7% (median = 46.7%, SD = 12.2%) and heavy smoking ranged from 0 to 44.4% (median = 17.4%, SD = 9.9%). Male gender, younger age, lower rank, and being previously married were correlates of both smoking and heavy smoking (see Table I).

A binary logistic mixed-effects unconditional 2-level model comparing nonsmokers to all smokers was conducted to examine the influence of company membership on smoking. To calculate an ICC for a binary outcome variable, the error (or within groups) variance is computed as $\pi^2/3$, which is roughly equivalent to 3.29.^{27,28} The results showed that the random intercept for smoking was not significantly related to company membership ($\beta = 0.07, p = 0.06; ICC = 0.02$). Then to examine the influence of company membership on the level of smoking comparing non-heavy smoking and heavy smoking, another binomial logistic mixed-effects unconditional 2-level model was used. Nonheavy smokers were set as the reference group. The analysis showed that the random intercept for heavy smoking was not significantly related to company membership ($\beta = 0.10, p = 0.13; ICC = 0.03$).

Platoon-Level Sample

Demographic characteristics of the platoon-level sample (n = 452) are also provided in Table I. This sample consisted primarily of 18- to 24-year-old junior enlisted (E1-E4) males. Less than half of the sample was married (39.0%). Participants were from 25 platoon units ranging in size from 10 to 29 soldiers (median = 17, SD = 5.45). Approximately half of those surveyed (50.4%) reported smoking at least one cigarette per day, and 9.5% reported heavy smoking. Smokers

consumed a median of eight cigarettes per day. The prevalence of smoking within platoons ranged from 15.4 to 72.2% (median = 50.0%, SD = 12.4%) and heavy smoking ranged from 0 to 25.9% (median = 9.1%, SD = 8.4%).

As with the first sample, a binary logistic mixed-effects unconditional model was used to compare all smokers to nonsmokers. Similarly, the results showed that the random intercept for smoking was not significantly related to platoon membership ($\beta = 0.003, p = 0.97; ICC = 0.001$). In order to examine the influence of platoon membership on the level of smoking, comparing non-heavy smoking and heavy smoking, another binomial logistic mixed-effects unconditional 2-level model was used. Again, non-heavy smokers were set as the reference group. The analysis showed that the random intercept for heavy smoking was not significantly related to platoon membership ($\beta = 0.476, p = 0.16; ICC = 0.11$).

DISCUSSION

Although previous studies have examined the influence of individuals' social environments on their smoking behavior, this is the first known study to have examined the influence of company and platoon membership—the groupings of soldiers in which most social interactions likely occur—on an individual soldier's smoking behavior. The results showed about half of both samples smoked daily and that heavy smoking was reported by nearly one-fifth of the company-level sample and one-tenth of the platoon-level sample. However, the association of unit membership with an individual's smoking status was not significant in the company or platoon-level samples for smokers compared to nonsmokers or heavy smokers compared to nonheavy smokers.

This result was surprising given the strong associations of peer groups within the civilian literature¹³ and numerous military findings linking smoking to installation and military-wide factors.^{6,7,16,18} Furthermore, military life revolves around the company and platoon units such that these levels seemed likely to exert the greatest influence on smoking behaviors. The fact that unit membership was not significant for both samples suggests that the influence on smoking behavior within the military instead likely resides (1) at a more granular level than was capable of being assessed with the available data (e.g., a squad consisting of 8–12 soldiers) and/or (2) more universally within military culture as a whole.

This is important to note because many of the prevention trainings provided by the military occur at the same levels assessed in this study including behavioral and physical health interventions such as resilience training (Army Regulation 350-1) and physical fitness training. However, our findings suggest that a similar strategy for smoking cessation may not be ideal. Rather than focusing on company and platoon initiatives, pushing smoking cessation efforts down to even lower levels such as a squad, peer mentor, or sponsor model similar to Alcoholics Anonymous could prove more effective.²⁹

Similarly, as has been noted by numerous studies,^{4,15,30} changes to the overall military culture that supports smoking still need to be implemented. One such seemingly easy target would be to make the cost of tobacco products on military installations comparable to that of civilian shops.³¹ The Institute of Medicine has also provided other suggestions to help effect a change in military culture.⁷ Unfortunately, several studies published following the Institute of Medicine recommendations have shown resistance from those in other uniformed services^{31–33} highlighting the difficulty of tobacco control in the military.

Although the results of this initial study suggest company- and platoon-level influences do not drive smoking behaviors among military personnel, certain limitations need to be considered. First, data for the samples were collected several years apart and in different settings (stateside versus deployed); differences in the operational tempo of the Army between those years and locations may affect soldiers' well-being and associated level of smoking; however, the relative consistency of smoking rates suggests that these differences may be minimal. Second, units were represented by those who attended data collection and consented to have their data used for research and may not have been representative of their whole unit. The median number of participants from a company was 25 while companies typically have 50 to 200 soldiers and the median number of participants from platoons was 17 whereas BCT platoons usually have 30 to 44 soldiers. However, by including only those units with a minimum of 15 and 10 participants, respectively, it is reasonable to expect this to generally reflect the units. A third limitation is that the company-level sample surveyed daily cigarette use, whereas the platoon-level survey asked about cigarettes or cigars. Although this could lead to

an under-reporting of tobacco smoking in the company-level sample, about 90% of tobacco smoking in the United States is in the form of cigarettes³⁴ suggesting this would have little effect on the results. Fourth, the data were self-reported and asked for a daily average of smoking, which may have led to an underestimate of smoking.³⁵ Fifth, the sample size for the platoon-level sample was relatively small. The ICC for heavy smoking in that sample was not significant, but was of a moderate size suggesting that with a larger sample size, there may have been some effect. Finally, data were cross-sectional preventing assessment of changes in tobacco use after joining a particular unit.

CONCLUSIONS

Overall, these findings suggest the influence of smoking within one's platoon or company does not appear to be a risk factor for smoking in the military and may not be the appropriate level for provision of smoking prevention and cessation programs. Consequently, broader military culture interventions such as making military installations smoke free as well as a more narrowly focused approach such as a peer mentor emphasis may be better options for cessation strategies.

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