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Cigarette Smoking and Military Deployment

A Prospective Evaluation

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Background: The stress of military deployment may compound occupational stress experienced in the military and manifest in maladaptive coping behaviors such as cigarette smoking. The current study describes new smoking among never-smokers, smoking recidivism among past smokers, and change in daily smoking among smokers in relation to military deployment.

Methods: The Millennium Cohort is a 21-year longitudinal study. The current analysis utilized participants (N=48,304) who submitted baseline data (July 2001–June 2003) before the current conflicts in Iraq and Afghanistan and follow-up data (June 2004–January 2006) on health measures. New smoking was identified among baseline never-smokers, smoking recidivism among baseline past smokers, and increased or decreased daily smoking among baseline smokers. Analyses were conducted March 2007–April 2007.

Results: Among never-smokers, smoking initiation was identified in 1.3% of nondeployers and 2.3% of deployers. Among past smokers, smoking resumption occurred in 28.7% of nondeployers and 39.4% of those who deployed. Smoking increased 44% among nondeployers and 57% among deployers. Those who deployed and reported combat exposures were at 1.6 times greater odds of initiating smoking among baseline never-smokers (95% CI=1.2, 2.3) and at 1.3 times greater odds of resuming smoking among baseline past smokers when compared to those who did not report combat exposures. Other deployment factors independently associated with postdeployment smoking recidivism included deploying for >9 months and deploying multiple times. Among those who smoked at baseline, deployment was not associated with changes in daily amount smoked.

Conclusions: Military deployment is associated with smoking initiation and, more strongly, with smoking recidivism, particularly among those with prolonged deployments, multiple deployments, or combat exposures. Prevention programs should focus on the prevention of smoking relapse during or after deployment.

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Introduction

Smoking is the leading preventable cause of death in the U.S. More than 400,000 people die each year due to smoking, with \$167 billion spent in annual health-related economic losses.¹ The long-term health consequences are well established.^{2–4} In the military, where smoking rates are higher than in the

general population,^{5,6} it is estimated that \$130 million is spent annually on excess training alone due to smokers who are prematurely discharged.⁷ In addition, smoking has implications for military readiness, because service members who smoke have lower fitness levels and are at greater risk for physical injury.^{8–10} Understanding the factors that influence smoking among the more than 2 million young adults currently serving in the military is of critical public health importance.

Smoking has been shown as a frequently reported maladaptive coping mechanism among those reporting chronic and acute stress.^{11,12} Individuals in stressful occupations have been shown to use tobacco at higher rates than the general population.^{13,14} Occupational stress related to serving in the military has also been shown to be a strong predictor for both cigarette smoking and nicotine dependence.^{15,16} The stress of

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military deployment may compound already high occupational stress and manifest in different maladaptive coping behaviors such as increases in the use of tobacco, alcohol, and other drugs. U.S. Navy and Marine Corps personnel exposed to violence prior to the current conflicts were reported to be at twice the risk for nicotine dependence than those not exposed.¹⁵ In a cross-sectional survey of U.S. troops deployed to Iraq and Afghanistan, nearly 40% smoked at least one half pack of cigarettes per day, with nearly half of smokers stating that they started or resumed smoking during their deployment.¹⁷ A survey of a small group of British military medical professionals reported similar findings of increased smoking rates postdeployment among nonsmokers and increased daily cigarette intake among smokers.¹⁸ All past studies have been done prior to the current military conflicts¹⁵ or are limited by cross-sectional design,¹⁷ the exclusion of nondeployers,^{17,18} or small sample sizes.¹⁸

To better understand cigarette smoking as a coping mechanism in response to the stress of military deployment, the current study prospectively investigated, among participants in a large, population-based military cohort, changes in cigarette use including smoking initiation among never-smokers, smoking recidivism among past smokers, and changes in daily smoking among smokers. Additionally, cigarette use and its relationship to extreme deployment lengths and multiple deployments were investigated among those deployed to Iraq and Afghanistan while adjusting for potential confounders.

Methods

Study Population

The study population consisted of participants in the Millennium Cohort Study. Launched in 2001, this is the largest longitudinal study undertaken by the U.S. Department of Defense (DoD) to evaluate risk factors related to military service that may be associated with long-term health consequences. A detailed description of the methodology has been reported elsewhere.^{19,20} In short, invited participants were drawn from a stratified random sample of the 2.2 million U.S. military personnel in October 2000. Women, those with past deployment experience, and Reserve and National Guard members were oversampled. There were 77,047 service members who completed a baseline questionnaire between July 2001 and June 2003; of these, 55,021 (71%) also completed a follow-up questionnaire between June 2004 and January 2006, and it is they who form the basis for the current study. Previous analyses have demonstrated that Millennium Cohort participants well represent the U.S. military, prior health did not influence response rates, and questionnaire data are reliable.^{20–30}

Smoking Data

The Millennium Cohort survey instrument contains questions to assess lifetime cigarette-smoking habits. Participants were

classified as never-smokers at baseline if they answered that they had never smoked at least 100 cigarettes (five packs) in their lifetime. Participants who answered *yes* but also indicated that they had quit successfully were classified as past smokers. Participants who answered *yes* to the lifetime-smoking question but did not indicate that they had quit smoking successfully were classified as smokers at baseline. At follow-up, baseline never-smokers who responded *yes* to the lifetime-smoking question were considered new smokers, while baseline past smokers who at follow-up responded that they were current smokers were considered to have resumed their smoking habit. The question *When smoking, how many packs per day did you or do you smoke? (less than one half pack per day, one half to one pack per day, one to two packs per day, more than two packs per day)* was used to assess an increase or decrease in the daily quantity of smoking among those defined as smokers at baseline. Increase and decrease were measured by at least a one-level change in packs per day.

Deployment Data

The U.S. DoD Manpower Data Center maintains data for all deployments. Deployment frequency was categorized as (1) no deployments to Iraq or Afghanistan on record up to and including the submission date of the follow-up questionnaire, (2) only one deployment on record prior to follow-up, and (3) more than one deployment, with the second deployment beginning prior to follow-up.

Cumulative time deployed was based on all deployments prior to the follow-up questionnaire, from the first through last deployment. Extreme deployment experience was measured by whether a participant had any single deployment >9 months or <1 month, or had any between-deployment interval <1 month. Additionally, exposures reported at follow-up were used to assess combat experiences and were based on affirmative responses to questions about witnessing death, trauma, injuries, prisoners of war, or refugees.

Deployment history prior to the current conflicts in Iraq and Afghanistan was also obtained based on specific contingency operations, including the 1991 Gulf War, southwest Asia following the 1991 Gulf War until 2000, and Bosnia or Kosovo from 1998 through 2000.

Demographic and Other Covariate Data

In addition to demographic and occupational data (Table 1),³¹ major life events were assessed with questions based on the Social Readjustment Rating Scale.^{32,33} Participants were asked to consider whether they had ever experienced the following life events: divorce or separation; major financial problems (such as bankruptcy); forced sexual relations or sexual assault; severe illness or the death of a family member or loved one; or a disabling illness or injury. Each event was scored and categorized into a comprehensive stressful life-events rating of low, moderate, or major.

To evaluate pre-existing mental health issues that could be associated with the use of smoking as a maladaptive coping mechanism, a covariate was included to adjust for any one of the following at baseline: physician-diagnosed depression, schizophrenia, psychosis, manic-depressive disorder, or post-traumatic stress disorder; or taking medication for anxiety, depression, or stress.

Table 1. Smoking habits of Millennium Cohort participants (N=48,304) at baseline (2001–2003) and follow-up (2004–2006)

Smoking at baseline	Smoking at follow-up		
	Never-smoker <i>n</i> (%)	Past smoker <i>n</i> (%)	Smoker <i>n</i> (%)
Nondeployed			
Never-smoker (<i>n</i> =21,913)	20,998 (95.8)	622 (2.8) ^a	293 (1.3)
Past smoker (<i>n</i> =9534)	651 (6.8)	6143 (64.4)	2740 (28.7)
Smoker (<i>n</i> =5323)	130 (2.4) ^a	534 (10.0)	4659 (87.5)
Deployed once			
Never-smoker (<i>n</i> =5012)	4,754 (94.9)	143 (2.9) ^a	115 (2.3)
Past smoker (<i>n</i> =2035)	156 (7.7)	1077 (52.9)	802 (39.4)
Smoker (<i>n</i> =1442)	24 (1.7) ^a	107 (7.4)	1311 (90.9)
Deployed multiple times			
Never-smoker (<i>n</i> =1894)	1,791 (94.6)	61 (3.2) ^a	42 (2.2)
Past smoker (<i>n</i> =700)	59 (8.4)	359 (51.3)	282 (40.3)
Smoker (<i>n</i> =451)	7 (1.6) ^a	35 (7.8)	409 (90.7)

^aGroup was excluded from multivariate modeling

Statistical Analyses

The incidence of new smoking in baseline never-smokers and the prevalence of resumed smoking in baseline past smokers were calculated. Univariate analyses were used to assess the significance of unadjusted associations between deployment and smoking. Interactions were tested to determine whether smoking initiation and deployment frequency varied by gender, service branch, or smoking at baseline. A manual backward-elimination approach was used to investigate confounding. Variables that were not significant at $\alpha=0.05$ but on removal distorted the measure of effect by more than 15% were retained in subsequent modeling. Multivariate logistic regressions were used to compare the adjusted odds of new smoking in never-smokers and resumed smoking in past smokers among those nondeployed, those deployed once, and those deployed multiple times. Among smokers, multivariate polychotomous logistic regression taking into account baseline smoking quantity was used to assess an increase or decrease in daily smoking among those nondeployed, those deployed once, and those deployed multiple times. Multivariate ordinal regression was attempted initially but abandoned due to a violation in the proportional odds assumption.

Analyses were conducted March 2007–April 2007 and completed using SAS software version 9.1.3.

Results

There were 55,021 participants who completed both a baseline and a follow-up questionnaire. Those who completed a baseline questionnaire during or after their first deployment (*n*=2851); completed their follow-up questionnaire during deployment (*n*=1986); had missing covariate information (*n*=58); or were missing smoking information at baseline or follow-up (*n*=1822) were removed, leaving 48,304 available for analysis. Cumulative length of deployment was highly collinear with deployment frequency and was removed from all modeling. Interactions to test whether smoking initiation and deployment frequency varied by gender, ser-

vice branch, or smoking at baseline were not significant (*p*-values >0.6).

Table 1 shows the transition in cigarette smoking from baseline to follow-up by deployment frequency. Most participants' habits did not change (85.9%). Of those who had never smoked at baseline, 1.3% of nondeployers and 2.3% of deployers initiated smoking by follow-up. Of those who were past smokers at baseline, 28.7% of nondeployers and 39.4% of those who deployed once, and 40.3% of those who deployed multiple times, had resumed

smoking by follow-up. There were 826 baseline never-smokers who at follow-up indicated that they were past smokers. Although it is reasonable that an individual could begin smoking after baseline but quit prior to the follow-up survey, these individuals were removed from the baseline never-smoker multivariate analysis because of the uncertainty of the temporal relationship between smoking initiation and deployment. There were 161 smokers at baseline who answered *no* to the lifetime-smoking question at follow-up. To reduce any bias that may be due to misclassification, these individuals were removed from the baseline smoker multivariate analysis.

The majority of the cohort had not deployed to Iraq or Afghanistan at the time they completed their follow-up questionnaire (*n*=36,770; 76.1%). There were 8489 who deployed once (17.6%), while 3045 deployed multiple times (6.3%). Those who deployed more than once were proportionately more likely to be men, non-Hispanic white, in the Air Force, reporting combat exposures, and to have had extreme deployment experiences, including deployment for a short duration (<1 month) and deployment for a long duration (>9 months; data not shown).

Baseline demographic, occupational, and deployment characteristics by cigarette smoking at baseline are described in Table 2. Most participants had never smoked (*n*=27,993; 59.2%); 25.9% were past smokers (*n*=12,269); 14.9% were current smokers at baseline (*n*=7055). When compared with never-smokers, both past and current smokers were proportionately more likely to be less educated, non-Hispanic white, enlisted, have a history of moderate to major life stressors, and report a prior mental health diagnosis or be taking medication for anxiety, depression, or stress.

Among never-smokers at baseline, those who reported combat exposures were at 1.6 times greater odds

Table 2. Baseline characteristics of Millennium Cohort participants by smoking habits at baseline (2001–2003)

Characteristic	Never-smoker n=27,993 n (%)	Past smoker n=12,269 n (%)	Current smoker n=7055 n (%)
Gender			
Male	19,762 (70.6)	9,166 (74.7)	5214 (73.9)
Female	8,231 (29.4)	3,103 (25.3)	1841 (26.1)
Birth year			
Pre-1960	6,523 (23.3)	4,039 (32.9)	1469 (20.8)
1960–1969	11,898 (42.5)	4,732 (38.6)	2582 (36.6)
1970–1979	8,505 (30.4)	3,145 (25.6)	2529 (35.9)
1980 forward	1,067 (3.8)	353 (2.9)	475 (6.7)
Education			
<High school	1,210 (4.3)	723 (5.9)	616 (8.7)
High school diploma	9,143 (32.7)	4,874 (39.7)	3753 (53.2)
Some college	6,810 (24.3)	3,684 (30.0)	1967 (27.9)
Bachelor's degree	6,584 (23.5)	1,940 (15.8)	543 (7.7)
Advanced degree	4,246 (15.2)	1,048 (8.5)	176 (2.5)
Marital status			
Currently married	18,590 (66.4)	8,795 (71.7)	4228 (59.9)
Never married	7,570 (27.0)	2,515 (20.5)	2182 (30.9)
No longer married	1,833 (6.6)	959 (7.8)	645 (9.1)
Race/ethnicity			
Non-Hispanic white	18,408 (65.8)	9,491 (77.4)	5685 (80.6)
Non-Hispanic black	4,266 (15.2)	956 (7.8)	597 (8.5)
Asian/Pacific Islander	2,968 (10.6)	883 (7.2)	310 (4.4)
Hispanic	1,720 (6.1)	680 (5.5)	309 (4.4)
Other	631 (2.3)	259 (2.1)	153 (2.2)
Past mental health diagnosis^a or taking medication for anxiety, depression, or stress			
No	25,983 (92.8)	10,934 (89.1)	6128 (86.9)
Yes	2,010 (7.2)	1,335 (10.9)	927 (13.1)
Life-stressors score			
Low/mild	24,581 (87.8)	9,899 (80.7)	5463 (77.4)
Moderate	2,849 (10.2)	1,927 (15.7)	1263 (17.9)
Major	563 (2.0)	443 (3.6)	329 (4.7)
Military pay grade			
Enlisted	18,094 (64.6)	9,607 (78.3)	6471 (91.7)
Officer	9,899 (35.4)	2,662 (21.7)	584 (8.3)
Service component			
Active duty	15,639 (55.9)	6,517 (53.1)	3958 (56.1)
Reserve/National Guard	12,354 (44.1)	5,752 (46.9)	3097 (43.9)
Branch of service			
Army	13,010 (46.5)	5,813 (47.4)	3694 (52.4)
Air Force	8,567 (31.3)	3,613 (29.5)	1825 (25.9)
Navy/Coast Guard	5,015 (17.9)	2,321 (18.9)	1238 (17.6)
Marine Corps	1,212 (4.3)	522 (4.3)	298 (4.2)
Occupational category			
Service and functional support	8,173 (29.2)	3,624 (29.5)	2072 (29.4)
Combat specialists	6,067 (21.7)	2,260 (18.4)	1176 (16.7)
Healthcare specialists	3,626 (13.0)	1,375 (11.2)	582 (8.3)
Other	10,127 (36.2)	5,010 (40.8)	3225 (45.7)
Previous deployment^b			
No	17,918 (64.0)	7,578 (61.8)	4345 (61.6)
Yes	10,075 (36.0)	4,691 (38.2)	2710 (38.4)
Deployment			
Nondeployed	21,291 (76.1)	9,534 (77.7)	5193 (73.6)
Deployed once	4,869 (17.4)	2,035 (16.6)	1418 (20.1)
Deployed multiple times	1,833 (6.6)	700 (5.7)	444 (6.3)
Extreme deployment <1 month			
No	26,603 (95.0)	11,710 (95.4)	6744 (95.6)
Yes	1,390 (5.0)	559 (4.6)	311 (4.4)
Extreme deployment >9 months			
No	26,856 (95.9)	11,779 (96.0)	6678 (94.7)
Yes	1,137 (4.1)	490 (4.0)	377 (5.3)
Minimal time home (<1 month) before deploying again			
No	27,809 (99.3)	12,213 (99.5)	7021 (99.5)
Yes	184 (0.7)	56 (0.5)	34 (0.5)
Deployed with combat exposures			
No	24,941 (89.1)	10,995 (89.6)	6116 (86.7)
Yes	3,052 (10.9)	1,274 (10.4)	939 (13.3)

^aDiagnosed with depression, schizophrenia or psychosis, manic depressive disorder, or posttraumatic stress disorder^bPrevious deployment includes deployment to the 1991 Gulf War, southwest Asia from 1991 through 2000, or Bosnia or Kosovo from 1998 through 2000.

Table 3. Adjusted odds of smoking postdeployment (2004–2006) in 27,993 never-smokers and 12,269 past smokers at baseline (2001–2003), the Millennium Cohort Study

Characteristic	Smoking initiation among never-smokers		Smoking recidivism among past smokers	
	OR ^a	95% CI	OR ^b	95% CI
Deployment				
Deployed once/nondeployed	1.03	0.75, 1.44	1.23	1.06, 1.41
Deployed multiple times/nondeployed	1.36	0.86, 2.15	1.55	1.24, 1.93
Extreme deployment <1 month				
Yes/no	0.90	0.56, 1.47	0.93	0.73, 1.17
Extreme deployment >9 months				
Yes/no	1.29	0.88, 1.89	1.28	1.03, 1.59
Minimal time home (<1 month) before deploying again				
Yes/no	0.52	0.12, 2.21	1.29	0.71, 2.34
Deployed with combat exposures				
Yes/no	1.63	1.15, 2.32	1.27	1.07, 1.51

^aOdds of smoking initiation are adjusted for all variables listed in addition to gender, age, marital status, race/ethnicity, prior mental health issues, pay grade, service component, service branch, and previous deployment history. Education, life-stressors score, and occupation were not significantly associated with smoking initiation, nor were they confounders, and thus were removed from the final model.

^bOdds of smoking recidivism are adjusted for all variables listed in addition to gender, age, education, marital status, prior mental health issues, life-stressors score, and pay grade. Race/ethnicity, service component, service branch, occupation, and previous deployment history were not significantly associated with smoking recidivism, nor were they confounders, and thus were removed from the final model.

of initiating smoking postdeployment than those who did not report such exposures (95% CI=1.2, 2.3; Table 3). Experiences of deploying multiple times, for <1 month, for >9 months, or being home <1 month between deployments were not significantly associated with smoking initiation. In addition to deployment variables, ORs were adjusted for gender, age, marital status, race/ethnicity, prior mental health issues, pay grade, service component, service branch, and previous deployment history. Education, life-stressors score, and occupation were not significantly associated with smoking initiation, nor were they confounders, and thus they were removed from the final model.

Among past smokers at baseline, those who deployed once between their baseline and follow-up surveys were at 1.2 times greater odds of resuming smoking (95% CI=1.1, 1.4), while those who deployed multiple times were at 1.6 times greater odds of resuming smoking (95% CI=1.2, 1.9). Past smokers with a deployment lasting >9 months were at 1.3 times greater odds of resuming smoking (95% CI=1.0, 1.6). Those who reported combat exposures were at 1.3 times greater odds of resuming smoking postdeployment than those who did not report such exposures (95% CI=1.1, 1.5). Deploying for <1 month and being home between deployments for <1 month were not significantly associated with smoking recidivism. ORs were adjusted for gender, age, education, marital status, prior mental health issues, life-stressors score, and pay grade, as well as the deployment variables. Race/ethnicity, service component, service branch, occupation, and previous deployment history were not significantly associated with smoking recidivism, nor were they confounders, and thus they were removed from the modeling.

The percentage of new smoking among baseline never-smokers varied little with time from the end of the most recent deployment to submission of the follow-up questionnaire (data not shown). While past smokers resumed smoking at a higher rate, no discernible decreasing pattern could be observed up to 12 months postdeployment to suggest that past smokers who resumed smoking during deployment successfully returned to their nonsmoking status during this follow-up period.

Among baseline smokers, 3724 (52.8%) smoked the same amount at follow-up as they reported at baseline; 2559 (36.3%) smoked less; and 1117 (10.9%) smoked more. No deployment variables were significantly associated with a decrease or increase in quantity of smoking after adjusting for gender, age, and service branch (Table 4). There were 235 baseline smokers removed from this analysis because they did not answer the question regarding smoking quantity at follow-up.

Discussion

Over a period of 3 years, the prevalence of smoking increased 48% in this study population. Smoking increased 44% among nondeployers and 57% among deployers. Among those who never had smoked prior to deployment, the present study found that >2% initiated smoking postdeployment. While initiation rates were relatively low, this represented a 71% increase over the initiation rate in nondeployers. In contrast to initiation, smoking recidivism was high (31%) among all past smokers. In this group, deployment was also predictive of higher rates of resuming smoking. Recidivism in deployers was 38% higher than in nondeployers.

Smoking recidivism has been strongly associated with negative affect (e.g., anger, distress, fear), with many lapses marked by intense negative affect in the hours preceding the relapse.^{34,35} Reducing negative affect during combat deployments is impractical; however, increasing positive affect may not be. Recent findings have shown that an increase in positive affect through physical exercise can reduce cigarette cravings and relapse.³⁶ Increased positive affect through physical exercise and interest-stimulating activities may also thwart some of the main reasons service members report that they start or resumed smoking, which include boredom, social factors, and stress.^{18,37}

The finding that nonsmokers initiate or reinstate smoking behaviors during deployment is consistent with the suggestions of previous reports.^{17,18} Further, individuals experiencing acute or chronic stress have been described as more likely to smoke and less likely to achieve successful abstinence.¹² The current study describes a significant increased risk for smoking recidivism in deployers when compared to nondeployers over the same period (mean length of follow-up=2.7 years) and documents an even stronger association in those who deployed multiple times. Single deployments lasting >9 months were also independently associated with smoking recidivism. The finding that individuals who reported combat exposures were at greater odds of initiating or resuming smoking is consistent with hypotheses about stress triggers for smoking.¹⁵

Among smokers, the current study found no deployment measures, including deployment frequency, extreme deployments, and combat exposures, to be associated with an increase or decrease in daily smoking quantity. This contrasts with a previous report documenting increases in daily smoking among British medical personnel who smoked during deployment.¹⁸ The difference may be due to population, study design, or the duration of follow-up. It is possible that more changes in smoking occur among deployers but such changes are not sustained. Of interest is the observation that almost 10% of smokers quit smoking over the nearly 3-year period of this study. Rates of quitting were lower among deployers (7.6%) than nondeployers (10.3%).

Limitations to these analyses should be mentioned. The study population consists of a sample of responders to the Millennium Cohort questionnaire and may not be representative of the U.S. military population in

Table 4. Adjusted odds of change in daily smoking postdeployment (2004–2006) in 7055 smokers at baseline (2001–2003), the Millennium Cohort Study

Characteristic	Decreased smoking ^a AOR (95% CI) ^b	Increased smoking ^a AOR (95% CI)
Deployment		
Deployed once/nondeployed	1.00 (0.84, 1.19)	1.01 (0.77, 1.33)
Deployed multiple times/nondeployed	1.13 (0.86, 1.49)	0.99 (0.65, 1.53)
Extreme deployment <1 month		
Yes/no	0.95 (0.71, 1.28)	1.06 (0.68, 1.65)
Extreme deployment >9 months		
Yes/no	0.99 (0.76, 1.30)	0.98 (0.67, 1.42)
Minimal time home (<1 month) before deploying again		
Yes/no	1.34 (0.64, 2.81)	0.84 (0.23, 3.01)
Deployed with combat exposures		
Yes/no	0.87 (0.71, 1.08)	1.22 (0.89, 1.67)

^aDecreased and increased smoking were measured by at least a one-level change in packs per day self-reported at follow-up in comparison with baseline self-report.

^bOdds of smoking are in reference to unchanged smoking quantity and are adjusted for all variables listed in addition to gender, birth cohort, and service branch. There were 235 baseline smokers removed because they did not answer the question about smoking quantity at follow-up.

general. Multiple metrics have been validated and very little response bias has been identified among Millennium Cohort participants but, by design, participants are more likely to be older and include slightly more women than a random sample of current military.^{20–30} Due to the nature of the smoking questions on the survey, some illogical patterns were witnessed (i.e., baseline smokers who at follow-up indicated they never had smoked 100 cigarettes in their lifetime) that may be indicative of some misclassification. Additionally, 826 never-smokers at baseline who indicated that they were past smokers at follow-up were also removed from the analyses. While these individuals likely represent those who began smoking after baseline but quit by the time they completed their follow-up, they were excluded because of the uncertainty of the temporal relationship between smoking initiation and deployment. Were these individuals to more heavily represent those who began smoking postdeployment than those who began smoking pre-deployment, removing these individuals would bias the findings toward the null. This, in addition to the relatively small amount of new smoking in this population may, in part, explain the nonsignificant findings in the initiation model. Finally, among smokers, a change in smoking was dependent on an increase or decrease of one half pack or more and prevented the current research from detecting smaller behavior changes in smoking quantity.

Despite these limitations, the study has several strengths. The large population size, the longitudinal design of the Millennium Cohort Study, and the temporal sequence of world events have allowed for the prospective analysis of smoking pre-deployment and postdeployment while linking to objective military data to assess the additional impact of multiple and extreme deployments. The robust sample size allowed for ample power while considering numerous potential confounders.

Smoking in the military has a long tradition and remains a current public health challenge. The current study found a significant increase in new smoking and an extremely high rate of smoking relapse postdeployment. Long-term morbidity associated with smoking makes prevention programs focused on this high-risk population to be of critical public health importance.

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