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## Daily Insufficient Sleep and Active Duty Status

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### Abstract

**Objective:** We assessed the relationship between active duty status and daily insufficient sleep in a telephone survey.

**Methods:** U.S. military service status (recent defined as past 12 months and past defined as >12 months ago) and daily insufficient sleep in the past 30 days were assessed among 566,861 adults aged 18 to 64 years and 271,202 adults aged 65 years in the 2009 to 2010 Behavioral Risk Factor Surveillance System surveys.

**Results:** Among ages 18 to 64 years, 1.1% reported recent active duty and 7.1% had past service; among ages 65 years, 0.6% reported recent and 24.6% had past service. Among ages 18 to 64 years, prevalence of daily insufficient sleep was 13.7% among those reporting recent duty, 12.6% for those with past service, and 11.2% for those with no service. Insufficient sleep did not vary significantly with active duty status among ages 65 years. After adjustment for sociodemographic characteristics, health behaviors, and frequent mental distress in multivariate logistic regression models, respondents aged 18 to 64 years with recent active duty were 34% more likely and those with past service were 23% more likely to report daily insufficient sleep than those with no service ( $p < 0.05$ , both).

**Conclusions:** Adults with either recent or past active duty have a greater risk for daily insufficient sleep.

### INTRODUCTION

While it has been noted that the military population enters the service comparatively healthy, its health frequently suffers from the onset of sleep disorders.<sup>1</sup> As is true of other competitive and time-intensive environments, sleep impairments can develop early in training and continue throughout service careers. For example, in a prospective study of enrollees at the United States Military Academy, incoming cadets reported that they

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averaged 8.39 hours of sleep per night before arrival, which fell precipitously to 5.67 hours of sleep per night during cadet basic training, a 34% reduction.<sup>2</sup> Similarly, Soldiers reported a reduction in sleep from an average of 8 to 9 hours at home to 5 to 6 hours per night during basic combat training.<sup>3</sup> Military exercises designed to simulate combat yielded sharp reductions in sleep with Soldiers obtaining an average of only 3 hours of actigraphically-measured sleep across a 53-hour exercise.<sup>4</sup> Not surprisingly, impairments in cognitive function, as well as increased confusion, fatigue, and depression were associated with this sleep loss.<sup>4</sup> Actigraphy data collected from a U.S. National Guard attack helicopter battalion during a 2-week exercise revealed that the commander of the battalion averaged <6 hours of sleep per night, with remaining headquarters personnel averaging 6.5 hours of sleep during this exercise.<sup>5</sup> Although variable, and not by any means representative of military experience as a whole, these data suggest that the sleep duration of military personnel may deviate considerably from the 7 to 9 hours of sleep recommended for adults by the National Sleep Foundation.<sup>6</sup>

Moreover, sleep disturbance has been found to adversely affect career military performance. Strikingly, 72% of pilots, investigated in a study of U.S. Army aviation personnel, indicated that they had ever flown while so drowsy they could have easily fallen asleep and 45% acknowledged they had actually “dozed off” while flying or in the cockpit.<sup>7</sup> These percentages are greater than those obtained in a study of the association between insufficient sleep and drowsy driving.<sup>8</sup> Moreover, research solely assessing military service personnel has reported impaired sleep efficiency, increased sleep latency, snoring, sleep-disordered breathing, and sleep apnea in this population.<sup>9–11</sup>

While military deployment has been associated with impaired sleep quality and quantity,<sup>12</sup> less is known about the specific association between active duty military status and similar sleep parameters. Obstructive sleep apnea has been reported among active duty personnel, independent of age or body mass index,<sup>13</sup> as have sleep latencies averaging 30 minutes or more,<sup>14</sup> and insomnia precipitating depressive and post-traumatic stress disorder (PTSD) symptoms.<sup>15</sup> This is the first study to assess the relationship between active duty military service status (recent, past, or none) and daily insufficient sleep, which is defined in this study as a self-report of having experienced adequate sleep or rest on none of the preceding 30 days. Furthermore, as insufficient or disturbed sleep has been associated with binge drinking,<sup>16</sup> smoking,<sup>17</sup> obesity,<sup>18,19</sup> physical inactivity,<sup>20,21</sup> and frequent mental distress,<sup>19</sup> we controlled for these variables.

## METHODS

### Participants

Participants responded to the 2009 and 2010 Behavioral Risk Factor Surveillance System (BRFSS), an annual state-based, random-digit-dialing telephone survey of noninstitutionalized adults aged 18 years residing with landline telephones in all 50 states, the District of Columbia, and U.S. territories. Information on military service, a sleep quality indicator (perceived insufficient rest or sleep), sociodemographic characteristics, and health-related behaviors were collected from 883,682 respondents. Specifically, 838,063 (94.8%) participants were included in this study after we excluded those with missing values

on active duty military status ( $n = 5,967$ ), insufficient sleep ( $n = 16,703$ ), or health behaviors and/or sociodemographic characteristics ( $n = 22,949$ ).

Standardized questionnaires were administered by trained interviewers to households selected through a disproportionate stratified sample design. This procedure was conducted to obtain a nationally representative sample. The 2009 and 2010 annual BRFSS surveys were combined to yield an adequate sample size of active duty military personnel. Before data from these surveys were aggregated, we determined that there were no significant differences between 2009 and 2010 surveys in the prevalence of daily insufficient sleep or in the percentages of respondents who reported recent active duty or past active duty. Likewise, the two administrations of the BRFSS had a similar median response rate (52.5% and 54.6%, respectively) (BRFSS Summary Quality Report, version 1, revised on 2/18/2011 for 2009 and on 5/2/2011 for 2010). Further description of the BRFSS survey design, data collection techniques, and the full-text questionnaire can be found at <http://www.cdc.gov/brfss>.

## Measures

**Outcome Variable**—The outcome variable of interest, daily insufficient sleep, was defined as a response of 30 days to the question “During the past 30 days for about how many days have you felt you did not get enough rest or sleep?”

**Active U.S. Military Duty Service**—Active duty service was defined by the question “Have you ever served on active duty in the United States Armed Forces, either in the regular military or in a National Guard or military reserve unit? Active duty does not include training for the Reserves or National Guard, but DOES include activation, for example, for the Persian Gulf War.” Respondents were categorized as having recent active duty if that active duty occurred any time during the preceding 12 months. Past active duty was defined as active duty that occurred more than 12 months before participation in the present survey. Respondents who had never served in the military or who had trained with the Reserves or National Guard but had never been activated were categorized as no active duty.

**Covariates**—Sociodemographic variables featured in our data analyses included age (18–34, 35–44, 45–64, or 65 years), sex, race/ethnicity (non-Hispanic white, non-Hispanic Black, Hispanic, or other non-Hispanic), years of education (< 12, 12 or high school equivalency exam, or 12), employment status (employed for wage/self-employed, unemployed, retired, unable to work, or homemaker/student), and marital status (married, previously married [divorced, widowed, or separated], never married, or member of an unmarried couple).

Adverse health-related behaviors were examined, including binge drinking (men consuming 5 drinks on one occasion and women consuming 4 drinks on one occasion), smoking status (current smoker, former smoker, never smoked), and physical inactivity (response of “no” to the question “During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?”). Frequent mental distress was defined as reporting 14 days to the question “Now thinking about your mental health, which includes stress, depression, and

problems with emotions, for how many days during the past 30 days was your mental health not good?" Respondents were asked to report their height in inches and weight in pounds and these measures were converted to weight in kilograms (kg) and height in meters (m). Obesity was defined as a body mass index  $\geq 30$  kg/m<sup>2</sup>.

### Statistical Analyses

First, we examined weighted percentages of selected characteristics as a function of active duty status. Next, we assessed age-specific percentages of daily insufficient sleep as a function of active duty status. Because both active duty status and daily insufficient sleep varied significantly ( $p < 0.05$ ) by age group and an interaction between active military duty status and age group was significant ( $p < 0.0001$ ) in a logistic regression model, these data were analyzed separately for two age groups (ages 18–64 years and ages  $\geq 65$  years). For these stratified analyses, the unadjusted prevalence estimate and 95% confidence intervals (CIs) of daily insufficient sleep were obtained for groups defined by selected characteristics and active duty status. Multivariable logistic regression modeling was applied to examine possible differences among active duty groups in the likelihood of reporting daily insufficient sleep (with the no active duty group serving as the referent). For each age stratum, prevalence ratios (PRs) and 95% CI were obtained from separate models controlling first for age, then in a second model in which sex, race/ethnicity, education, employment, and marital status were added as covariates. A third model was created by adding binge drinking, smoking status, obesity, physical inactivity, and frequent mental distress to the second model, to determine the extent to which these factors further accounted for variance in daily insufficient sleep between the active duty groups. We also assessed whether active duty status was differentially associated with daily insufficient sleep in men and women, but that interaction term failed to reach statistical significance. All analysis estimates were weighted using SAS-callable SUDAAN to account for the complex sampling design of the survey.<sup>22</sup> Statistical significance level was  $p = 0.05$  for all statistical analyses unless otherwise noted.

## RESULTS

For all respondents, recent active duty in the past 12 months was reported by 1.1% (1.8% of men and 0.4% of women) of 838,063 BRFSS respondents. Past active duty was reported by 10.1% (19.2% of men and 1.4% of women) of study respondents. Table I shows the weighted percentages of selected characteristics by active duty status for all respondents aged  $\geq 18$  years. The majority of respondents who reported recent as well as past active duty service were men (80.8% and 92.8%, respectively); the sex distributions for both groups differed significantly from those with no active duty history ( $p < 0.05$ , both). Respondents who reported recent active duty status tended to be younger ( $p < 0.05$ ) and those who reported past active duty service tended to be older than those with recent active duty and no active duty service ( $p < 0.05$ , both). Respondents with recent active duty included a greater percentage of non-Hispanic Blacks than those reporting no active duty (13.8% vs. 9.9%, respectively,  $p < 0.05$ ) and a lower percentage of Hispanics (12.3% vs. 15.4%, respectively,  $p < 0.05$ ). Respondents with past active duty also included a lower percentage of Hispanics than those with no active duty history (6.4% vs. 15.4%, respectively,  $p < 0.05$ ). Respondents

with either recent active duty or past active duty were significantly more likely to have had >12 years education, and were more likely to report being currently married than were respondents with no active duty history ( $p < 0.05$ , both). Compared to those with no active duty history, those with recent active duty were also more likely to report being employed ( $p < 0.05$ ), whereas those with past active duty were more likely to report being retired ( $p < 0.05$ ). Compared to those with no active duty status, respondents reporting recent active duty were significantly ( $p < 0.05$ ) more likely to report binge drinking and current smoking, but less likely to report obesity, leisure-time physical inactivity, and frequent mental distress ( $p < 0.05$  all). Compared to those with no active duty history, respondents with past active duty were significantly ( $p < 0.05$ ) less likely to report binge drinking and frequent mental distress and were more likely to report obesity.

An examination of age-specific prevalence estimates indicated that respondents in any age group <65 years had a significantly greater prevalence of daily insufficient sleep than those aged ≥65 years ( $p < 0.05$ ), regardless of active duty status (Fig. 1). Within each of the 2 youngest age strata, respondents with either recent or past active duty consistently had a significantly greater prevalence of daily insufficient sleep compared to those with no active duty history ( $p < 0.05$ , both). Among respondents those aged 18 to 34 years, those reporting past active duty had a greater prevalence of daily insufficient sleep than those with recent active duty or no active duty ( $p < 0.05$ ). Among those aged ≥65 years, daily insufficient sleep did not vary significantly by active duty status (Fig. 1). There was a significant age group by active duty status interactive effect on insufficient sleep ( $p < 0.0001$ ) in a logistic regression analysis, which suggested a need for all further analyses to be stratified by age.

Among 566,861 respondents aged 18 to 64 years, 1.1% reported recent active duty in the past year and 7.1% reported past active duty. Table II shows the unadjusted prevalence estimates of daily insufficient sleep by active duty status and selected characteristics among those aged 18 to 64 years. The prevalence of daily insufficient sleep was significantly greater among respondents with recent active duty (13.7%,  $p < 0.05$ ) and among those with past active duty (12.6%,  $p < 0.05$ ) than those with no active duty history (11.2%) among respondents aged 18 to 64 years. Daily insufficient sleep tended to be more prevalent in women than in men, but this difference was not significant among those with recent active duty service. Prevalence of daily insufficient sleep also varied as a function of race/ethnic groups, with the greatest prevalence in non-Hispanic Blacks, compared to non-Hispanic Whites ( $p < 0.05$ ), no active duty group only. The prevalence of daily insufficient sleep declined with increasing education but this decline attained statistical significance only among those with no active duty history ( $p < 0.05$ ). Respondents who were previously married (divorced, widowed, or separated) had the greatest prevalence of daily insufficient sleep compared to other marital status groups. This increased prevalence reached statistical significance ( $p < 0.05$ ) only among those with no active duty history. Respondents who reported being unable to work had a significantly greater prevalence of daily insufficient sleep than those who were currently employed ( $p < 0.05$ ), regardless of active duty status. Binge drinkers with no history of active duty had a significantly lower prevalence of daily insufficient sleep than nonbinge drinkers ( $p < 0.05$  only in group with no active duty history). A greater prevalence of daily insufficient sleep was associated with current smoking ( $p < 0.05$ ; all active duty groups), obesity ( $p < 0.05$ ; past and no active duty

groups), leisure-time physical inactivity ( $p < 0.05$ ; past and no active duty groups), and frequent mental distress ( $p < 0.05$ ; all active duty groups).

Among 271,202 respondents aged  $\geq 65$  years, 0.6% reported recent active duty in the past years and 24.6% reported past active duty. Of those aged  $\geq 65$  years, the prevalence of daily insufficient sleep was relatively low (5.7% for recent active duty, 6.3% for past active duty, and 7.0% for no active duty) and did not differ significantly by active duty status (Table III). In contrast to the no active duty group, a lower prevalence characterized non-Hispanic Whites with past active duty; divorced, widowed, or separated respondents with recent active duty; nonbinge drinkers with either recent or past active duty. Similarly, among past active duty respondents, a lower prevalence was observed relative to no active duty group among former or never smokers; nonobese; and respondents with or without frequent mental distress. Because of the small number of respondents aged  $\geq 65$  years on recent active duty, comparisons within this group generally failed to achieve statistical significance.

For each stratified age group, the relationship between active duty status and daily insufficient sleep was examined by PRs obtained from multiple logistic regression models delineated in Table IV. Among respondents aged 18 to 64 years, those with recent active duty were 20% more likely and those with past active duty were 18% more likely to report daily insufficient sleep than respondents with no active duty history ( $p < 0.05$ , both) after adjustment for age only (Model 1). Controlling for additional sociodemographic variables (Model 2) resulted in a 33% greater likelihood of reporting daily insufficient sleep among both active duty groups compared to those with no active duty ( $p < 0.05$ , both). Finally, Model 3 revealed that these significant results remained largely unchanged for respondents with recent active duty after also controlling for binge drinking, smoking, obesity, physical inactivity, and frequent mental distress in the model.

In contrast, persons aged  $\geq 65$  years with past active duty had a significantly lower age-adjusted prevalence of daily insufficient sleep relative to those with no active duty. However, after controlling for sociodemographic variables (Model 2) and then also controlling for smoking, binge drinking, obesity, physical inactivity, and frequent mental distress (Model 3) past active duty respondents aged  $\geq 65$  years had a 10% greater likelihood of reporting daily insufficient sleep than older adults with no active duty history.

## DISCUSSION

We assessed the prevalence of daily insufficient sleep as a function of military active duty status in the largest population-based survey of U.S. adults. Our results indicated that both recent and past active duty service are associated with increased prevalence of insufficient sleep (relative to no active military service among respondents aged 18–64 years). These findings are comparable to those studies in which military personnel were found to experience impaired sleep both during<sup>12,23</sup> and after<sup>12</sup> deployment. Considered with those of previous investigations, the present findings suggest that active duty service—not solely deployment—may be associated with various sleep impairments. Moreover, in the present investigation, past active duty was defined as active duty that occurred more than 12 months before survey, a longer period of time than has been assessed in previous

investigations.<sup>15,24</sup> Thus, the increased prevalence of daily insufficient sleep characterizing past active duty respondents in relation to those with no military history could, conceivably, extend indefinitely.

The present study revealed that the prevalence of daily insufficient sleep was greater in those with both past and recent active duty experience who were aged 18 to 64 years (compared to 18- to 64-year-old respondents reporting no active duty). This shows that active duty can have a persistent impact on nightly sleep that lasts at least one year. Likewise, although not specific to insufficient sleep, per se, in a review of the literature, Auxemery<sup>25</sup> described the “Gulf War Syndrome,” (in which sleep disorders and “fatigability” can continue for years), and noted that troops can be stressed without ever actually experiencing trauma. However, trauma has been shown to be an important factor in sustained sleep disturbance, as reflected by the persistence of combat nightmares precipitating pharmacotherapy.<sup>26</sup> It is important to note, however, that in the present investigation we were unable to determine whether, or to what extent, those in the active duty group had experienced actual combat.

In addition to the well-known cognitive and performance deficits associated with impaired sleep, prior research suggests that sleep may play a crucial role in the mental health of persons in the military. PTSD appears to have steadily increased in prevalence in military personnel over the previous decade and is now the most prevalent compensable psychiatric disorder within the U.S. Department of Veterans Affairs disability system.<sup>27</sup> Classified as an anxiety disorder, PTSD is characterized by exposure to a traumatic mental or physical stressor followed by persistent reexperiencing of the stressful event, avoidance of stimuli associated with the traumatic event, and increased arousal.<sup>28</sup> Significantly, veterans with chronic PTSD have been found to be hyper-reactive during both wakefulness and sleep.<sup>29</sup> Somewhat paradoxically, these individuals have an elevated arousal threshold during the night, posited to be a compensatory mechanism to avoid stimuli associated with arousal because of the hyperreactivity characterizing this disorder.<sup>29</sup> However, it is also possible that this increased arousal threshold merely reflects chronically elevated “sleep debt”: that it is the direct result of chronic insufficient sleep itself.<sup>30</sup>

Noting that sleep problems are pervasive among active duty service members and complicate the recovery from PTSD and mood disorders, Lande<sup>31</sup> retrospectively reviewed the medical records of active duty personnel who had completed enhanced sleep assessments across 18 months. This investigator found that service members reporting higher post-traumatic stress scores also reported a greater degree of both cognitive and somatic factors interfering with the initiation of sleep. Thus, enhanced sleep assessment appear particularly warranted for those service members with higher self-reported post-traumatic stress scores.

Insomnia has been found to be both the most commonly reported symptom and to predict the onset of other PTSD symptoms among service personnel returning from deployments.<sup>32</sup> Impaired subjective sleep quality has also been strongly associated with PTSD among U.S. veterans<sup>33</sup> and disturbed sleep has been associated with an increased risk for PTSD, which is characterized by sleep fragmentation and frequent nightmares.<sup>34</sup> However, 90% of Vietnam war veterans not meeting criteria for PTSD nevertheless reported sleep disturbance<sup>35</sup> showing that this symptom is both common and nonspecific.

Peppard and Reichmuth<sup>36</sup> advocate both screening and treatment of sleep problems in post-deployment service members. Treatment of sleep disturbances in military service personnel by differing modalities has been investigated. In an 8-week randomized study of U.S. military veterans reporting chronic sleep disturbance, both behavioral sleep interventions and a sympatholytic medication were significantly more effective in reducing insomnia severity than placebo.<sup>37</sup> Similarly, biofeedback has demonstrated efficacy in reducing insomnia among military service personnel stationed in a combat zone and merits further study.<sup>38</sup>

The present findings are subject to a number of limitations. First, daily insufficient sleep was measured by subjective self-report and was not corroborated by objective measures such as actigraphy or polysomnography—methods that are too costly and logistically difficult for inclusion in national surveillance systems. Second, the sample was limited to respondents with landline telephones. Relative to persons with landline telephones, those with only cell phones are more likely to engage in physical activity, to be binge drinkers and current smokers, and are less likely to be obese and to use preventive healthcare services.<sup>39</sup> Third, the wording of the question about insufficient sleep includes both the terms “rest” and “sleep,” thus being subject to differing interpretations among respondents. Furthermore, while we were able to differentiate between recent active duty in the past year and prior active duty at least more than a year previously, we are not able to determine how long it has been since the respondent was in military service. While we distinguished active duty personnel, our data did not permit assessment of whether, or the extent to which, respondents were exposed to combat during their deployments. Moreover, the present questionnaire did not permit assessment of associations between insufficient sleep and military performance, suggesting the need for more specialized research in this population.

In conclusion, our finding of increased prevalence of daily insufficient sleep among both past active duty and present active duty service personnel suggest serious implications for the health and functioning of these individuals, as well as the conduct of military operations. Both assessment of sleep and treatment of sleep disturbances in active duty personnel and veterans appear warranted, and consonant with the belief that sound sleep may be a “crucial component of military medicine’s armamentarium.”<sup>36</sup>

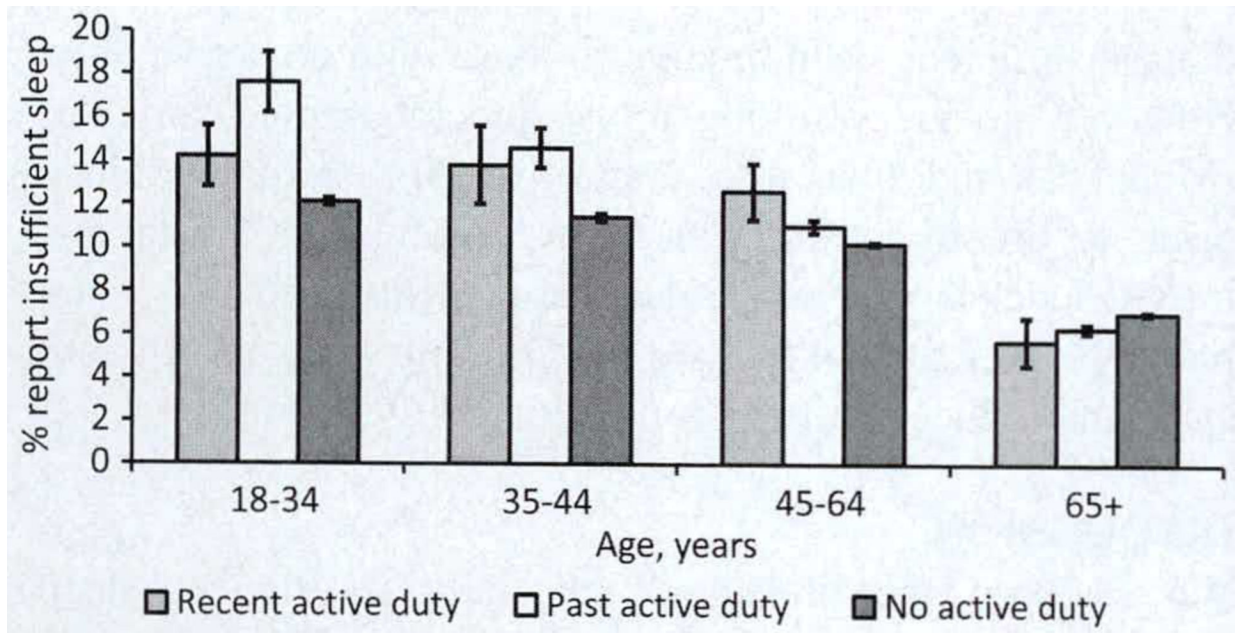
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**FIGURE 1.**

Age-specific prevalence of insufficient sleep over the past 30 consecutive days among adults aged 18 years, by active duty status: Behavioral Risk Factor Surveillance System, 2009 to 2010.

Selected Characteristics of the Study Population by Active Duty Status; Behavioral Risk Factor Surveillance System: 2009 to 2010

TABLE I.

Characteristic	Recent Active Duty (N = 6,869)			Past Active Duty (N = 106,033)			No Active Duty (N = 725,161)		
	% (95% CI)			% (95% CI)			% (95% CI)		
Sex									
Men	80.8 (79.1–82.4)*			92.8 (92.5–93.1)*			43.3 (43.1–43.6)		
Women	19.2 (17.6–20.9)*			7.2 (6.9–7.5)*			56.7 (56.4–56.9)		
Age, Years									
18–34	43.7 (41.3–46.2)*			7.3 (6.9–7.8)*			30.6 (30.3–30.9)		
35–44	25.7 (23.7–27.8)*			11.9 (11.4–12.4)*			21.1 (20.9–21.3)		
45–64	20.6 (19.1–22.1)*			38.8 (38.3–39.4)*			33.8 (33.6–34.0)		
65	10.0 (9.1–10.9)*			41.9 (41.4–42.5)*			14.4 (14.3–14.6)		
Race/Ethnicity									
White, Non-Hispanic	66.8 (64.3–69.2)			78.7 (78.1–79.3)*			67.5 (67.3–67.8)		
Black, Non-Hispanic	13.8 (12.2–15.5)*			9.7 (9.3–10.1)			9.9 (9.8–10.1)		
Hispanic	12.3 (10.4–14.4)*			6.4 (6.0–6.9)*			15.4 (15.2–15.6)		
Other, Non-Hispanic	7.2 (5.9–8.7)			5.2 (4.9–5.5)*			7.1 (7.0–7.3)		
Education, Years									
<12	4.2 (3.2–5.3)*			4.9 (4.7–5.1)*			11.0 (10.9–11.2)		
12 or High School Equivalent	26.8 (24.7–29.0)			28.3 (27.8–28.9)			27.8 (27.6–28.1)		
>12	69.0 (66.8–71.2)*			66.7 (66.2–67.3)*			61.1 (60.9–61.4)		
Marital Status									
Married	71.3 (69.1–73.5)*			72.4 (71.9–72.9)*			59.7 (59.5–60.0)		
Divorced, Widowed, Separated	11.9 (10.7–13.3)*			19.6 (19.2–20.1)*			16.4 (16.3–16.5)		
Never Married	14.0 (12.3–15.9)*			6.3 (5.9–6.6)*			20.0 (19.7–20.2)		
Member of Unmarried Couple	2.7 (1.9–4.0)			1.7 (1.5–1.9)*			3.9 (3.8–4.0)		
Employment Status									
Employed	74.7 (72.8–76.6)*			44.0 (43.5–44.6)*			58.7 (58.5–58.9)		

Characteristic	Recent Active Duty (N = 6,869)		Past Active Duty (N = 106,033)		No Active Duty (N = 725,161)	
	% (95% CI)		% (95% CI)		% (95% CI)	
Unemployed	5.9 (4.8–7.3)*	6.0 (5.7–6.3)*	9.0 (8.8–9.1)			
Retired	11.6 (10.5–12.7)*	42.4 (41.9–43.0)*	13.0 (12.9–13.1)			
Unable to Work	2.5 (1.9–3.3)*	5.5 (5.3–5.8)	5.4 (5.3–5.5)			
Homemaker or Student	5.2 (4.3–6.4)*	2.0 (1.8–2.2)*	14.0 (13.8–14.1)			
Adverse Behaviors						
Binge Drinking	22.4 (20.3–24.8)*	13.5 (13.0–14.0)*	15.2 (15.0–15.4)			
Current Smoking	20.1 (18.1–22.3)*	17.9 (17.4–18.4)	17.5 (17.3–17.7)			
Leisure-Time Physical Inactivity	14.4 (12.9–16.0)*	24.7 (24.2–25.2)	24.4 (24.2–24.6)			
Obesity	20.1 (18.4–21.9)*	30.0 (29.5–30.6)*	27.5 (27.3–27.7)			
Frequent Mental Distress	8.6 (7.3–10.1)*	9.3 (8.9–9.7)*	10.9 (10.7–11.0)			
Insufficient Sleep Everyday	12.9 (11.4–14.6)*	9.9 (9.6–10.3)*	10.6 (10.4–10.7)			

Percentage (%) and 95% confidence interval (CI) were weighted to reflect the complex sampling design.

\*  $p < 0.05$ .

$p$  value was obtained from two-sided  $t$  test to make a comparison of either recent active duty group or past active duty group with no active duty group.

Unadjusted Prevalence of Insufficient Sleep Over the Past 30 Consecutive Days Among Adults Aged 18–64 Years by Active Duty Status and Selected Characteristics: Behavioral Risk Factor Surveillance System, 2009 to 2010

TABLE II.

Characteristic	Recent Active Duty (N = 5,250)			Past Active Duty (N = 47,655)			No Active Duty (N = 513,956)		
	% (95% CI)			% (95% CI)			% (95% CI)		
Total	13.7 (12.1–15.6)*	12.6 (12.0–13.2)*	11.2 (11.0–11.4)						
Sex									
Men	13.0 (11.2–15.0)*	12.1 (11.5–12.8)*	9.5 (9.2–9.8)						
Women	16.9 (13.3–21.3)*	16.5 (14.7–18.5)*	12.7 (12.5–12.9)						
Race/Ethnicity									
White, Non-Hispanic	11.2 (9.7–12.9)	12.0 (11.3–12.6)*	11.1 (10.9–11.3)						
Black, Non-Hispanic	16.5 (12.3–21.9)	14.0 (12.3–15.9)	13.7 (13.1–14.3)						
Hispanic	19.1 (12.6–27.8)*	13.5 (10.6–17.2)*	10.1 (9.6–10.6)						
Other, Non-Hispanic	20.8 (13.4–30.8)*	15.7 (13.2–18.6)*	11.0 (10.4–11.8)						
Education, Years									
<12	22.2 (10.0–2.2)	18.5 (15.3–22.0)	14.8 (14.2–15.5)						
12 or High School Equivalent	13.1 (10.1–16.9)	15.3 (14.0–16.8)*	13.0 (12.7–13.4)						
>12	13.6 (11.7–15.6)*	11.2 (10.6–11.9)*	9.9 (9.7–10.1)						
Marital Status									
Married	12.8 (11.0–14.8)*	11.7 (11.0–12.4)*	10.6 (10.4–10.8)						
Divorced, Widowed, Separated	19.7 (13.8–27.2)	16.2 (14.6–17.9)	15.8 (15.4–16.3)						
Never Married	13.5 (9.6–18.6)	12.2 (10.4–14.3)	10.2 (9.8–10.6)						
Member of Unmarried Couple	17.7 (8.1–34.5)	15.3 (11.2–20.4)	12.7 (11.7–13.7)						
Employment Status									
Employed	13.5 (11.6–15.5)*	10.7 (10.0–11.4)	9.9 (9.7–10.1)						
Unemployed	13.2 (8.4–20.1)	16.3 (13.8–19.2)	13.5 (12.8–14.1)						
Retired	11.2 (6.1–19.7)	8.4 (7.4–9.5)	7.6 (7.1–8.1)						
Unable to Work	32.3 (21.1–45.9)	28.6 (26.4–30.8)	26.9 (26.0–27.8)						
Homemaker or Student	11.6 (6.3–20.4)	18.6 (14.4–23.7)*	10.7 (10.3–11.2)						

Characteristic	Recent Active Duty (N = 5,250)		Past Active Duty (N = 47,655)		No Active Duty (N = 513,956)	
	% (95% CI)		% (95% CI)		% (95% CI)	
Binge Drinker						
Yes	11.5 (8.3–15.8)	14.0 (12.2–16.0)*	10.4 (10.0–10.9)			
No	14.5 (12.6–16.6)*	12.3 (11.7–12.9)*	11.4 (11.2–11.5)			
Smoking Status						
Current Smoker	20.2 (15.7–25.6)	17.2 (15.9–18.6)	17.9 (17.4–18.4)			
Former Smoker	9.6 (7.5–12.3)	12.0 (11.0–13.0)	11.7 (11.3–12.0)			
Never Smoked	12.8 (10.7–15.2)*	10.3 (9.5–11.3)*	9.0 (8.8–9.2)			
Obese						
Yes	17.6 (14.1–21.7)*	14.7 (13.6–15.9)	14.0 (13.6–14.3)			
No	12.6 (10.8–14.7)*	11.3 (10.7–12.1)*	10.0 (9.8–10.2)			
Leisure-Time Physical Inactivity						
No	12.9 (11.2–14.9)*	10.5 (9.8–11.1)*	9.6 (9.4–9.8)			
Yes	19.2 (14.5.1–25.1)	19.5 (18.1–21.1)*	16.7 (16.3–17.1)			
Frequent Mental Distress						
No	11.0 (9.5–12.7)*	9.3 (8.8–9.9)	8.7 (8.6–8.9)			
Yes	41.0 (32.4–50.2)*	34.5 (32.0–37.2)*	29.7 (29.0–30.4)			

Percentage (%) and 95% confidence interval (CI) were weighted to reflect the complex sampling design.

\*  $p < 0.05$ .

$p$  value was obtained from two-sided  $t$  test to make a comparison of either recent active duty group or past active duty group with no active duty group.

Unadjusted Prevalence of Insufficient Sleep for the Past 30 Consecutive Days Among Adults Aged 65 Years by Active Duty Status and Selected Characteristics: Behavioral Risk Factor Surveillance System, 2009 to 2010

TABLE III.

Characteristic	Recent Active Duty (n = 1,619)		No Active Duty (n = 211,205)	
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Total	5.7 (3.9–8.3)	6.3 (6.0–6.6)	7.0 (6.8–7.1)	
Sex				
Men	5.4 (3.4–8.4)	6.3 (5.9–6.6)	6.4 (6.0–6.8)	
Women	7.6 (4.5–12.4)	6.9 (5.6–8.6)	7.2 (6.9–7.4)	
Race/Ethnicity				
White, Non-Hispanic	4.7 (3.3–6.6)	6.0 (5.7–6.3) <sup>*</sup>	6.5 (6.3–6.7)	
Black, Non-Hispanic	6.2 (2.1–16.9) <sup>d</sup>	8.3 (6.3–10.7)	8.1 (7.3–9.0)	
Hispanic	7.4 (2.8–18.3) <sup>d</sup>	7.4 (5.5–9.8)	9.3 (8.3–10.4)	
Other	22.0 (4.2–64.3) <sup>d</sup>	9.1 (7.5–11.0)	8.1 (7.1–9.3)	
Education, Years				
<12	12.9 (4.6–31.3)	9.9 (8.7–11.3)	10.8 (10.2–11.4)	
12	5.9 (3.9–8.9)	7.2 (6.6–7.8)	7.2 (6.9–7.6)	
>12	4.1 (2.5–6.6)	5.4 (5.1–5.8)	5.6 (5.3–5.8)	
Employment Status				
Employed	7.9 (3.4–16.9) <sup>d</sup>	5.2 (4.5–6.0)	5.9 (5.5–6.4)	
Unemployed	10.7 (2.1–40.0) <sup>d</sup>	6.1 (4.3–8.8)	7.6 (6.0–9.5)	
Retired	5.4 (3.4–8.3)	6.0 (5.7–6.4)	6.4 (6.2–6.6)	
Unable to Work	4.4 (1.4–13.3) <sup>d</sup>	23.3 (19.1–27.9)	18.9 (17.5–20.4)	
Homemaker or Student	6.9 (1.0–35.9) <sup>d</sup>	3.6 (1.9–6.7) <sup>d</sup>	6.8 (6.2–7.4)	
Marital Status				
Married	5.9 (3.6–9.7)	5.7 (5.4–6.1)	6.2 (5.9–6.4)	
Divorced, Widowed, Separated	4.7 (3.1–7.2) <sup>*</sup>	7.9 (7.4–8.6)	7.9 (7.7–8.2)	
Never Married	9.3 (3.3–23.4) <sup>d</sup>	7.1 (5.6–8.9)	7.5 (6.5–8.6)	



Characteristic	Recent Active Duty (n = 1,619)		No Active Duty (n = 211,205)	
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Member of Unmarried Couple	25.8 (6.3–64.5) <sup>d</sup>	6.1 (3.5–10.2)	6.6 (4.9–8.9)	
Binge Drinker				
Yes	17.6 (7.1–37.2) <sup>d</sup>	6.4 (5.2–7.8)	6.3 (5.2–7.7)	
No	4.2 (3.1–5.7) <sup>*</sup>	6.2 (5.9–6.5) <sup>*</sup>	7.0 (6.8–7.2)	
Smoker Status				
Current Smoker	5.6 (2.2–13.1) <sup>d</sup>	9.7 (8.4–11.1)	10.3 (9.5–11.1)	
Former Smoker	5.9 (3.3–10.4)	6.4 (6.0–6.8) <sup>*</sup>	7.1 (6.8–7.4)	
Never Smoked	5.6 (3.3–9.5)	5.1 (4.6–5.7) <sup>*</sup>	6.4 (6.1–6.6)	
Obesity				
Yes	6.4 (3.7–11.0)	8.8 (8.0–9.6)	8.8 (8.4–9.2)	
No	5.3 (3.2–8.5)	5.5 (5.2–5.8) <sup>*</sup>	6.2 (6.0–6.5)	
Leisure-Time Physical Inactivity				
No	4.7 (2.7–8.2)	5.0 (4.7–5.4)	5.2 (5.0–5.5)	
Yes	7.9 (5.0–12.4)	9.8 (9.1–10.5)	10.3 (10.0–10.7)	
FMD ( 14 Days/30 Days)				
No	4.3 (2.6–6.9)	5.1 (4.8–5.4) <sup>*</sup>	5.6 (5.4–5.7)	
Yes	24.0 (14.1–37.7)	26.9 (24.2–29.8) <sup>*</sup>	23.0 (21.8–24.3)	

Percentage (%) and 95% confidence interval (CI) were weighted to reflect the complex sampling design.

<sup>\*</sup>  $p < 0.05$ .

<sup>d</sup>  $p$  value was obtained from two-sided  $t$  test to make a comparison of either recent active duty group or past active duty group with no active duty group.

<sup>4</sup> Unreliable estimates because of small sample size ( $N < 50$ ).

TABLE IV.

Prevalence of Insufficient Sleep for the Past 30 Consecutive Days and Prevalence Ratio (PR) for the Likelihood of Insufficient Sleep Among Adults Aged 18 Years by Age Group and Active Duty Status: Behavioral Risk Factor Surveillance System, 2009 to 2010

Active Duty Status	Age-Adjusted Prevalence, % (95% CI)	Model 1		Model 2		Model 3	
		PR (95% CI)	PR (95% CI)	PR (95% CI)	PR (95% CI)		
Aged 18–64 Years							
Recent Active Duty	13.4 (11.7–15.1)	1.20 (1.06–1.37)	1.33 (1.17–1.51)	1.34 (1.18–1.52)			
Past Active Duty	13.1 (12.5–13.8)	1.18 (1.12–1.24)	1.33 (1.26–1.40)	1.23 (1.16–1.29)			
No Active Duty	11.2 (11.0–11.3)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)			
Aged 65+ Years							
Recent Active Duty	5.8 (3.6–7.9)	0.83 (0.57–1.21)	0.97 (0.67–1.40)	0.74 (0.55–1.00)			
Past Active Duty	6.3 (6.0–6.6)	0.91 (0.86–0.97)	1.14 (1.05–1.23)	1.10 (1.02–1.19)			
No Active Duty	6.9 (6.8–7.1)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)			

Age-adjusted prevalence and 95% confidence interval (CI) obtained from a logistic regression model that included active duty status as the predictor variable and age as the only covariate. Model 1: Prevalence ratio (PR) and 95% CI obtained from a logistic regression model that included active duty status as the predictor variable and age as the only covariate. Model 2: PR and 95% CI obtained from a logistic regression model that included age, sex, race/ethnicity, education, employment, and marital status as covariates. Model 3: PR and 95% CI obtained from a logistic regression model that included all the covariates in Model 2 with the addition of binge drinking, smoking status, obesity, physical inactivity, and frequent mental distress as covariates.