**Comparing the Proportion of Those Who Have Ever Served on Active-duty Who Get Sufficient Sleep to the General U.S. Population**

Dr. Alexander Dorin, DO

Department of Public Health, University of West Florida

Email: amd175@students.uwf.edu

Phone: (858) 603-7769

Preceptor: Dr. Jami Buckley, MD, MPH

Naval Hospital Jacksonville

**Abstract**

**Purpose:** To compare the proportion of sufficient sleep (as defined as ≥ 7 hours of sleep received per 24-hour period) in those who have ever served on active-duty military to the general U.S. population. **Methods:** This study utilized a sample of 26,359 adults 18 years or older from the 2022 National Health Interview Survey. The Chi-square Test of Independence was used to test for association and determine if the two different populations are statistically different from each other with regard to the dependent variable. The minimum significance level was set at p < 0.05, two-tailed. The analyses were conducted using IBM SPSS Statistics Data Editor software. **Results:** In the ever served active-duty military population (n = 2,355), the mean hours of sleep received per 24-hour period was 7.14 (M = 7.14, SD = 1.59). In the general U.S. population (n = 24,004), the mean hours of sleep received per 24-hour period was 7.13 (M = 7.13, SD = 1.382). A Chi-Square Test of Independence was performed to analyze the two target populations’ sleep data under the codes of 0 (< 7 hours of sleep received per 24-hour period) and 1 (≥ 7 hours of sleep received per 24-hour period). No statistically significant difference was found between the proportion of sufficient sleep (≥ 7 hours of sleep received per 24-hour period) in those who have ever served on active-duty military to the general U.S. population, χ2 (1, N = 26,359) = 2.963, p = .085. The expected counts for all cells were well above 5, meeting the minimum expected count assumption for conducting the Chi-Square Test with validity. **Conclusion:** The purpose of this study was tocompare the proportion of sufficient sleep (as defined as ≥ 7 hours of sleep received per 24-hour period) in those who have ever served on active-duty military to the general U.S. population. Although no statistically significant difference was found, the results help emphasize how active-duty personnel represent a unique population with unique, military-specific stressors that function as barriers to achieving sufficient sleep. Research aiming at better understanding the etiology of insufficient sleep in active-duty personnel and how to increase the proportion of sufficient sleep is needed. The goals of this study and recommended future studies are in alignment of one of the Healthy People 2030 goals of increasing the proportion of those who receive sufficient sleep in the U.S. population. Improving the proportion of those who receive sufficient sleep in active-duty personnel could lead to an increase in performance, decrease in mishaps, decrease in prevalence of comorbidities, and increase in lifespans.

**Overview of Host Organization**

This practicum is being completed under the preceptorship of Dr. Jami Buckley at Naval Hospital Jacksonville located in Jacksonville, Florida. Naval Hospital Jacksonville’s public health mission is to improve the physical and mental well-being of active-duty personnel and their dependents, as well as military retirees. The practicum began January 29, 2024, and will end April 01, 2024. The average number of hours dedicated to this practicum per week is 14.

**Practicum Rationale**

This research study focused on comparing the proportion of adults aged 18 and older in the United States who receive sufficient sleep to the proportion of those who have ever served on active-duty. The data for both populations came from the National Health Interview Survey (NHIS). Healthy people 2030 used data from the NHIS to obtain a baseline percent of adults aged 18 and older who got sufficient sleep in 2020 (72.3%) and set a target of 73.3% by 2030. The most recent data from 2022 revealed a worsening in the percentage of adults who are getting sufficient sleep to 69.9% (Centers for Disease Control and Prevention, 2022).

 The Department of Defense Health-Related Behavior Survey, conducted between 2005–2018, revealed that approximately 64% of active-duty personnel sleep less than seven hours per twenty-four-hour period (Meadows et al., 2021). This study also revealed that 56% of active-duty service personnel achieved less sleep than needed to perform their specific job-related duties well.

The goal of this practicum is to analyze data from the 2022 NHIS in order to make recommendations on improving public health in the population of active-duty personnel. An educational brochure was created and will be made available to active-duty personnel. The brochure includes information on sleep hygiene, the importance of sleep, cognitive behavioral therapy-insomnia, and resources to improve the quantity and quality of sleep. An educational lecture was organized and completed for a group of active-duty personnel at Naval Air Station Jacksonville on how to achieve sufficient, high-quality sleep and the associated benefits.

**Literature Review**

Active-duty U.S. military personnel represent a unique population and are exposed to unique situations. Sleep deprivation, sleep efficiency, performance maintenance, circadian rhythm disturbances, and mission-related maladaptive sleep practices are but a few sleep-related subjects that have been studied in the military population (Office of Under Secretary of Defense, 2021). Of specific interest to this research study, the Department of Defense Health-Related Behavior Survey, conducted between 2005–2018, revealed that approximately 64% of active-duty personnel sleep less than seven hours per 24-hour period (Meadows et al., 2021). This study also revealed that 56% of active-duty service personnel achieved less sleep than needed to perform their specific job-related duties well. This is in comparison to the most recent data from U.S. Department of Health and Human Services (2020) that revealed 69.9% of U.S. adults aged 18 years and older receive sufficient sleep which is defined as at least seven hours per 24-hour period.

Compared to firefighters (46%), law enforcement officers (40%), and healthcare professionals (40%), active-duty military personnel (55-76%) have a much larger proportion of those who suffer from partial sleep deprivation, defined as approximately seven hours or less of sleep per night (Shockey & Wheaton, 2017).

A study published in *Neuropsychopharmacology* in 2020 emphasized some of the difficulties active-duty U.S. military personnel face with regard to achieving sufficient sleep; how continuous operations during training and deployed settings cause significant stress, and not only make it difficult to achieve meaningful sleep, but also lead to sleep disorders (Good et al., 2019). Good et al. found that approximately 60% of active-duty U.S. military personnel sleep less than six hours per night and that a substantial proportion of those who are deployed, or have been deployed in the past, sleep less than five hours per night. Of specific interest to unique situations, such as deployment, Good et al. found that 86% of U.S. Army personnel deployed to Afghanistan failed to achieve sufficient sleep, averaging less than seven hours per night.

Active-duty aviation personnel often use stimulant drugs for sustained or continuous operations; although these medications can improve performance temporarily, they are not meant as a substitute for high-quality, sufficient sleep. A study on the prevalence of these medications in combat aviation operations revealed that pilots used the drugs modafinil or dextroamphetamine in 35% of flights (Gore et al., 2010). This relatively high-percentage could be secondary to a considerable proportion of service members who are, at baseline, partially sleep deprived.

The U.S. Army *Health of the Force Report* in 2020 found that productivity decreased by 10-15% in Soldiers who slept less than six hours per night (Hauschild, 2023). In 2013, Mysliwiec et al. studied the prevalence of sleep disorders in active-duty personnel referred for polysomnography and found statistically significant associations between the disorders of post-traumatic stress disorder (PTSD), chronic pain syndromes, and insomnia. In a 2020 study that examined sleep problems in active-duty personnel that were seeking treatment for PTSD, Taylor et al. found that of the 128 participants, the average sleep duration was less than five hours per night. In 2021, Mysliwiec et al. developed the Military Service Sleep Assessment (MSSA) to specifically address and determine the specific and unique military-related events that have the greatest influence on service members’ sleep.

This study aims to utilize data from the National Health Interview Survey (NHIS) to further analyze the prevalence of insufficient sleep in those who have ever served on active-duty in the U.S. military. The 2022 NHIS includes 26,359 participants that responded to the questions applicable to this study. The two questions asked that relate to this study were: 1) how many hours per sleep do you get in a twenty-four-hour period, and 2) have you ever served as active-duty military (CDC, 2022).

This approach differs from the Army’s *Health of the* *Force* *Report*,and Department of Defense Health-Related Behavior Survey, in that instead of sampling from a population of entirely active-duty personnel, the study is utilizing the same data source that Healthy People 2030 uses. Healthy People 2030 uses the data from the NHIS to determine the percent of U.S. adults aged 18 years and older that achieve sufficient sleep (U.S. Department of Health and Human Services, 2020). This same database will be used to analyze and determine the percent of U.S. adults aged 18 years and older that ever served on active-duty; the percent of those in this subset population that achieve sufficient sleep.

 The goal of this strategy is to analyze data from the same data source that Healthy People 2030 utilizes in order to produce an accurate comparison of those who have ever served on active-duty to adults in the general U.S. population. The impact is the same locally, regionally, and nationally – to accurately identify the proportion of those who have ever served active-duty in the U.S. military to establish an accurate baseline and set a benchmark for improvement. Military personnel have a plethora of unique factors that impact the quality and duration of their sleep, as well as the presence of numerous sleep disorders that they are at high-risk of developing.

 The conceptual framework of this study is to identify the proportion of sufficient sleep in those who have ever served on active-duty to the general U.S. population, using the same data source as Healthy People 2030, the 2022 National Health Interview Survey. This study will analyze and compare the target population data to the general U.S. population data and serve as a baseline for further intervention and improvement. The Social Ecological Model is most closely aligned with this project, as there are many factors, individually, socially, and environmentally, that affect the amount of sleep one gets per 24-hour period, and those who are currently or formally served on active-duty service are subject to many influential factors that can and do negatively impact sleep duration and quality.

**Methods**

This study utilized a sample of 26,359 adults 18 years or older from the 2022 National Health Interview Survey. The conceptual framework of this study is to identify the proportion of sufficient sleep in those who have ever served on active-duty to the general U.S. population, using the same data source as Healthy People 2030, the 2022 National Health Interview Survey. This study analyzed and compared the target population data to the general U.S. population data and serves as a baseline for further intervention and improvement in alignment of the goals of Healthy People 2030. The raw data used for analysis is from the 2022 National Health Interview Survey. Participants in the survey that declined to answer whether they had ever served on active-duty military service were removed from the analyses. Participants in the survey that declined to answer how many hours of sleep they received per 24-hour period were also removed from the analyses.

 The Social Ecological Model is most closely aligned with this project, as discussed above, as there are many factors, individually, socially, and environmentally, that affect the amount of sleep one gets per 24-hour period.



(Centers for Disease Control and Prevention, 2022)

The outcome variable for this study is the number of hours of sleep that the participant receives in a 24-hour period. A variable called “SLPHOURS\_A” was created and measured as whole numbers between zero to twenty-four. The independent variable is those who have ever served on active-duty. This was determined through a survey question asking the participant if they have ever served on active-duty and the variable was called “AFVET\_A.”

The study utilized a cross-sectional data source (NHIS), the dependent variable was categorical, and the independent variable was dichotomous. The Chi-square Test of Independence evaluated for association and determined if the two different populations were statistically different from each other with regard to the dependent variable. The minimum significance level was set at p < 0.05. The analyses were conducted using IBM SPSS Statistics Data Editor software.

**Results**

 The analyses focus on comparing the proportion of sufficient sleep (as defined as ≥ 7 hours of sleep received per 24-hour period) in those who have ever served on active-duty military to those who have never served on active-duty military. Participants in the survey that declined to answer how many hours of sleep they received per 24-hour period were also removed from the analyses. The total number of participants used for analyses is 26,359 (n = 26,359, see Table 1 for frequency data for each of the two groups). See Tables 2 and 3 for each group’s mean, median, mode, standard deviation, range, and percentiles. In the ever served active-duty military population (n = 2,355), the mean hours of sleep received per 24-hour period was 7.14 (M = 7.14, SD = 1.59). In the never served active-duty military population (n = 24,004), the mean hours of sleep received per 24-hour period was 7.13 (M = 7.13, SD = 1.382).

As can be seen in the frequencies cross tabulated in Tables 4 and 5, there is not a statistically significant difference in the proportion of sufficient sleep (≥ 7 hours of sleep received per 24-hour period) in those who have ever served on active-duty military to those who have never served on active-duty military, χ2 (1, N = 26,359) = 2.963, p = .085. The expected counts for all cells were well above 5, meeting the minimum expected count assumption for conducting the Chi-Square Test with validity (see Table 4). Figure 1 graphically illustrates the frequencies of both groups compared with the proportion of each group that receives sufficient sleep.



*Figure 1*. Frequencies of both groups (ever served active-duty military vs never-served active-duty military) displayed by hours of sleep per 24-hour period, as two separate categories (< 7 hours of sleep received per 24-hour period and ≥ 7 hours of sleep received per 24-hour period).

Table 1

|  |
| --- |
| *Ever served active-duty military vs never served active-duty military* |
|  | Frequency | Percent |  |  |
| Valid | Yes | 2355 | 8.9 |  |  |
|  No | 24004 | 91.1 |  |  |
| Total | 26359 | 100.0 |  |  |

|  |
| --- |
| Table 2 |
| *Hours of sleep in a 24-hour period for those who have ever served active-duty military* |
| N | Valid | 2355 |
| Missing | 0 |
| Mean | 7.14 |
| Median | 7.00 |
| Mode | 7 |
| Std. Deviation | 1.588 |
| Range | 20 |
| Percentiles | 25 | 6.00 |
| 50 | 7.00 |
| 75 | 8.00 |

Table 3

|  |
| --- |
|  |
| *Hours of sleep in a 24-hour period for those who have never served active-duty*  |
| N | Valid | 24004 |
| Missing | 0 |
| Mean | 7.13 |
| Median | 7.00 |
| Mode | 7 |
| Std. Deviation | 1.382 |
| Variance | 1.909 |
| Percentiles | 25 | 6.00 |
| 50 | 7.00 |
| 75 | 8.00 |

Table 4

|  |
| --- |
| *SLPHOURS\_A \* Ever served active-duty military Crosstabulation* |
|  | Ever served active-duty military | Total |
| Yes | No |
| SLPHOURS\_A | less than 7 hours | Count | 730 | 7034 | 7764 |
| % of Total | 2.8% | 26.7% | 29.5% |
| 7 hours or more | Count | 1625 | 16970 | 18595 |
| % of Total | 6.2% | 64.4% | 70.5% |
| Total | Count | 2355 | 24004 | 26359 |
| % of Total | 8.9% | 91.1% | 100.0% |

Table 5

|  |
| --- |
| *Chi-Square Tests* |
|  | Value | df | Asymptotic Significance (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) |
| Pearson Chi-Square | 2.963a | 1 | .085 |  |  |
| Continuity Correctionb | 2.882 | 1 | .090 |  |  |
| Likelihood Ratio | 2.937 | 1 | .087 |  |  |
| Fisher's Exact Test |  |  |  | .088 | .045 |
| Linear-by-Linear Association | 2.963 | 1 | .085 |  |  |
| N of Valid Cases | 26359 |  |  |  |  |
| a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 693.66. |
| b. Computed only for a 2x2 table |

**Discussion**

The purpose of this study was to compare the proportion of sufficient sleep (as defined as ≥ seven hours of sleep received per 24-hour period) in those who have ever served on active-duty military to those who have never served on active-duty military, utilizing data from the 2022 National Health Interview Survey (Centers for Disease Control and Prevention, 2022). The results of this study contradict previous studies which have shown a significant difference between active-duty personnel and non-active-duty personnel, and the proportion of those who receive sufficient sleep between the two populations (Meadows et al., 2021). The results from this study show that those who have ever served on active-duty, including those who are now veterans, receive approximately the same amount of sleep per 24-hour period and have approximately the same proportion of those who receive sufficient sleep, as those who have never served on active-duty (mean of each population was 7.14 hours vs 7.13 hours, respectively).

This conflicting evidence could be secondary to limitations of this study, including the fact that previous studies have examined solely active-duty personnel, whereas this study utilized data from the 2022 National Health Interview Survey to conduct analyses on those who have ever or never served on active-duty. A significant limitation is that the ‘ever served as active-duty military’ population may include those who are currently active-duty in addition to those who have served on active-duty in the past but are now civilians. The distinction between the two subset populations of the ‘ever served as active-duty military’ group is that active-duty personnel face many military-specific situations such as deployments, detachments, circadian rhythm disruptions, and uniquely high-stress environments (Good et al., 2019). These environmental and situational stressors are known to cause disruptions in sleep and most of these active-duty military-specific stressors are likely to cease to exist after a veteran has separated from active-duty service (Shockey & Wheaton, 2017).

Active-duty military personnel face many unique challenges that decrease their ability to achieve sufficient sleep. Sleep deprivation, sleep efficiency, performance maintenance, circadian rhythm disturbances, and mission-related maladaptive sleep practices are but a few sleep-related subjects that have been studied in the active-duty military population (Office of Under Secretary of Defense, 2021). Numerous studies have shown that active-duty personnel fail to achieve sufficient sleep at a much larger proportion than the general U.S. population (Meadows et al., 2021). The prevalence of sleep disorders such as obstructive sleep apnea and insomnia are increasing in active-duty personnel (Ryan, 2021). Between 2005 and 2019, the incident rate for insomnia increased from 6 to 272 per 10,000, while the incident rate for obstructive sleep apnea increased from 11 to 333 per 10,000 (Moore et al., 2021). Comorbidities such as anxiety, depression, post-traumatic stress disorder, chronic pain are unfortunately common as well and contribute to poor sleep (Mattei, 2020).

It is possible that a considerable proportion of veterans have improvements in their sleep after separating from active-duty service, including those who may suffer from comorbidities such as insomnia, obstructive sleep apnea, movement disorders, anxiety, depression, PTSD, or chronic pain. Continued research on this subject should be conducted given the known high proportion of active-duty personnel that fail to receive sufficient sleep. There should be the establishment of a dedicated, military-funded sleep research team that seeks to identify mitigation strategies to improve the proportion of active-duty personnel who receive sufficient sleep, regardless of military-specific stressors/settings such as deployments or sustained operations. More research is also needed in comparing the sleep in those are currently active-duty personnel to the sleep in those who have separated from service to better understand the differences between the two populations and what role service-connected comorbidities or disabilities play in veterans’ ability to achieve sufficient sleep. A research study that incorporates demographic variables such as gender, race, age, and sex would also add valuable information.

Active-duty personnel represent a unique population with unique, military-specific stressors; they deserve to achieve sufficient sleep. Research aiming at better understanding the etiology of insufficient sleep in active-duty personnel and how to increase the proportion of sufficient sleep is needed. The goals of this study and recommended future studies are in alignment of one of the Healthy People 2030 goals of increasing the proportion of those who receive sufficient sleep in the U.S. population. Improving the proportion of those who receive sufficient sleep in active-duty personnel could lead to an increase in performance, decrease mishaps, decrease comorbidities, and increase lifespans.

**References**

Centers for Disease Control and Prevention. (2022, January 18). *The Social-Ecological Model: A Framework for Prevention*. Centers for Disease Control and Prevention; CDC. https://www.cdc.gov/violenceprevention/about/social-ecologicalmodel.html

Centers for Disease Control and Prevention. (2022, February 8). *NHIS - 2022 NHIS*. <https://www.cdc.gov/nchs/nhis/2022nhis.htm>

Good, C. H., Brager, A. J., Capaldi, V. F., & Mysliwiec, V. (2019). Sleep in the United States Military. *Neuropsychopharmacology*, *45*(1), 176–191. <https://doi.org/10.1038/s41386-019-0431-7>

Gore, R. K., Webb, T. S., & Hermes, E. D. A. (2010). Fatigue and stimulant use in military fighter aircrew during combat operations. *Aviation, Space, and Environmental Medicine*, *81*(8), 719–727. <https://doi.org/10.3357/asem.2755.2010>

Hauschild, V. (2023, March 15). *Military recognizes importance of sleep, investigates use of alternative treatment device for sleep apnea*. U.S. Army. <https://www.army.mil/article/264859/military_recognizes_importance_of_sleep_investigates_use_of_alternative_treatment_device_for_sleep_apnea>

Mattei, M. (2020, January 10). *Sleep Deprivation in the Military: Resources for Seeking Help*. The Sleep Advisor. https://www.sleepadvisor.org/military-and-veteran-sleep/

Meadows, S. O., Engel, C. C., Collins, R. L., Beckman, R. L., Breslau, J., Bloom, E. L., Dunbar, M. S., Gilbert, M., Grant, D., Hawes-Dawson, J., Holliday, S. B., MacCarthy, S., Pedersen, E. R., Robbins, M. W., Rose, A. J., Ryan, J., Schell, T. L., & Simmons, M. M. (2021, April 28). *2018 Department of Defense health related behaviors survey (HRBS): Results for the active component*. RAND. <https://www.rand.org/pubs/research_reports/RR4222.html>

Moore, B. A., Tison, L. M., Palacios, J. G., Peterson, A. L., & Mysliwiec, V. (2021). Incidence of insomnia and obstructive sleep apnea in active-duty United States military service members. *Sleep*. https://doi.org/10.1093/sleep/zsab024

Mysliwiec, V., McGraw, L., Pierce, R., Smith, P., Trapp, B., & Roth, B. J. (2013). Sleep disorders and associated medical comorbidities in active-duty military personnel. *Sleep*, *36*(2), 167–174. <https://doi.org/10.5665/sleep.2364>

Mysliwiec, V., Pruiksma, K. E., Brock, M. S., Straud, C., Taylor, D. J., Hansen, S., Foster, S. N., Gerwell, K., Moore, B. A., Carrizales, F. A., Young-McCaughan, S., Vanecek, R., Mintz, J., & Peterson, A. L. (2021). The Military Service Sleep Assessment: An instrument to assess factors precipitating sleep disturbances in U.S. military personnel. *Journal of Clinical Sleep Medicine*, *17*(7). <https://doi.org/10.5664/jcsm.9206>

Office of Under Secretary of Defense. (2021). *Study on effects of sleep deprivation on readiness of members of the Armed Forces*. <https://www.health.mil/Reference-Center/Reports/2021/02/26/Study-on-Effects-of-Sleep-Deprivation-on-Readiness-of-Members-of-the-Armed-Forces-Final-Report>

Ryan, T. (2021, May 26). *The Military and Sleep*. Sleep Foundation. https://www.sleepfoundation.org/sleep-in-the-military

Shockey, T. M., & Wheaton, A. G. (2017). Short sleep duration by occupation group — 29 states, 2013–2014. *Morbidity and Mortality Weekly Report*, *66*(8), 207–213. <https://doi.org/10.15585/mmwr.mm6608a2>

Taylor, D. J., Pruiksma, K. E., Hale, W., McLean, C. P., Zandberg, L. J., Brown, L., Mintz, J., Young-McCaughan, S., Peterson, A. L., Yarvis, J. S., Dondanville, K. A., Litz, B. T., Roache, J., & Foa, E. B. (2020). Sleep problems in active-duty military personnel seeking treatment for posttraumatic stress disorder: Presence, change, and impact on outcomes. *Sleep*. <https://doi.org/10.1093/sleep/zsaa065>

U.S. Department of Health and Human Services. (2020). *Sleep*. <https://health.gov/healthypeople/objectives-and-data/browse-objectives/sleep>