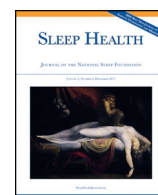




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Sleep deficiency among Native Hawaiian/Pacific Islander, Black, and White Americans and the association with cardiometabolic diseases: analysis of the National Health Interview Survey Data[☆]

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ABSTRACT

Purpose: Examine sleep deficiency, factors, and associations with cardiometabolic diseases in United States Native Hawaiian/Pacific Islanders (NHPI), Blacks, and Whites.

Design: Data from the 2014 National Health Interview Survey and NHPI National Health Interview Survey household interviews of adults were analyzed.

Participants: Of 31,724 participants, 7% were NHPI, 14% were Black, and 79% were White.

Methods: Habitual sleep duration and quality, sociodemographic/economic covariates, health behaviors, psychological distress, and chronic diseases were self-reported. Sleep duration was coded as very short (VSS; <5 hours), short (SS; 5-6 hours), long (LS; >8 hours), or healthy (7-8 hours). Using multivariate logistic regressions, the association between sleep duration and diseases was assessed after adjusting for covariates.

Results: NHPI were more likely to report sleep <7 hours compared to Whites (40.2% NHPI, 29.3% White) and less LS than Blacks (7% NHPI, 9.2% Black), report poor sleep quality, and use fewer sleep medications. VSS was related to smoking and psychological distress in NHPI men. VSS was associated with hypertension and SS with diabetes in NHPI, even in adjusted models. The relationship between SS and diabetes was higher in NHPI (risk ratio [RR]: 1.40, 95% confidence interval [CI]: 1.03-1.90) than Whites (RR: 1.01, 95% CI: 0.90-1.14, $P = .027$) and Blacks (RR: 1.02, 95% CI: 0.85-1.23, $P = .043$) even after adjusting for other covariates.

Conclusions: NHPI reported suboptimal sleep duration that was linked to hypertension and diabetes even after controlling for covariates. Additional prospective studies in NHPI are needed to understand biological, behavioral, and psychological factors of sleep deficiency and its impact on chronic diseases.

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Abbreviations: BMI, body mass index; CDC, Centers for Disease Control and Prevention; CVD, cardiovascular disease; HTN, hypertension; LS, long sleep (>8 hours); NCHS, National Center for Health Statistics; Blacks, non-Hispanic Blacks; NHIS, National Health Interview Survey; NHPI, Native Hawaii and Pacific Islanders; Whites, non-Hispanic Whites; SS, short sleep (5-6 hours); US, United States; VSS, very short sleep (<5 hours).

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Introduction

Although sleep is known to be a critical determinant of health and well-being,^{1,2} deficiency in sleep is reported by 30%-40% of United States (US) adults.³ Sleep deficiency is defined as a discrepancy in the duration and/or quality of sleep obtained compared to the amount needed for optimal health, performance, and well-being.^{4,5} Previous research establishes a U-shaped association between sleep duration and chronic diseases. Healthy sleep duration (7-8 h/d) is linked to a lower risk of developing cardiometabolic diseases (diabetes; hypertension [HTN]; and cardiovascular disease [CVD] including coronary heart diseases, heart attack, or stroke).⁶⁻⁹ Habitual short

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sleep and long sleep appear to present the greatest health risk.⁵ Detrimental changes in nocturnal blood pressure and heart rate, appetite regulation, insulin sensitivity, and nervous system overactivation are proposed mechanisms to explain the effect of sleep on chronic disease.^{10,11} Obstructive sleep apnea (OSA) and other sleep disorders have been linked to obesity, HTN, and insulin resistance.¹²

Growing evidence indicates that habitual sleep deficiency varies by race and ethnicity.^{13–16} In national surveys, US Native Hawaiians/Pacific Islanders (NHPI) report the lowest rates of healthy sleep duration compared to other racial/ethnic groups.^{17,18} NHPI are one of the fastest growing US populations¹⁹ comprised of people originating from Hawaii, Guam, Samoa, Marshall, or other Pacific Islands. Despite the growing recognition of the sleep–health nexus, the relationship between sleep deficiency and chronic diseases is understudied, particularly in some racial/ethnic groups. Most sleep research has centered on non-Hispanic Black and non-Hispanic White US populations (hereafter, Black and White).^{13,20,21} In part, this is due to data limitations. Nationally representative data often lack sufficient respondents from smaller racial/ethnic groups to undertake ethnically focused analysis of health outcomes. Consequently, using broad racial/ethnic categories, national data frequently underrepresent specific racial/ethnic groups. For example, data from NHPI are often aggregated with Asian Americans^{22,23} despite considerable differences between Asian Americans and NHPI including socioeconomic status, health care services utilization, and health practices,²⁴ which can influence sleep deficiency.

Using the 2014 Behavioral Risk Factor Surveillance System data, Liu et al¹⁷ found that the age-adjusted prevalence of healthy sleep (≥ 7 hours) was lowest among NHPI (53.7%), Blacks (54.2%), and American Indians/Alaskan Natives (59.6%) compared with Whites (66.8%), Hispanics (65.5%), and Asians (62.5%). Similarly, National Health Interview Survey (NHIS) data (2008–2010) showed that the rates of healthy sleep (7–8 hours/24) were lowest in NHPI (49.9%) and Blacks (48.9%) compared to Whites (63.7%) and Asians (63.8%).¹⁸ Neither study reported sleep quality or health outcomes, and the investigators called for more research in understudied racial/ethnic groups to address the growing sleep disparities.^{17,18}

NHPI are at elevated risk for the costly personal and public health consequences of sleep deficiency,¹⁷ including obesity, diabetes, CVD, and cancer.^{25–27} The Centers for Disease Control and Prevention's (CDC) NHIS documented that 44% of NHPI surveyed in 2010 were obese compared to 37% of Blacks and 32% of Hispanics/Latinos,²⁸ and high percentages of NHPI respondents experienced heart disease (20.2%), HTN (40.8%), and stroke (10.6%)—higher than any other racial/ethnic group.²⁸ To date, no studies in US NHPI have examined sleep quality, factors contributing to sleep deficiency, or the association between sleep deficiency and major chronic diseases.

With an increased risk for obesity, cardiometabolic disease,^{25–27} and sleep deficiency,^{17,18} understanding the role that sleep contributes to health disparities among NHPI is sorely needed. Although race and ethnicity have been associated with disease risk linked to sleep,^{13–16} socioeconomic, environmental, and behavioral factors also exert a strong influence on disease outcomes by way of sleep.^{29–31} For example, economically challenged individuals and those from disadvantaged neighborhoods report disproportionately high rates of sleep deficiency, OSA, and insomnia.^{32,33} To understand the complex interrelationships among race/ethnicity and other influences on sleep-related health outcomes, these factors need to be analyzed in adjusted and unadjusted models.

This study is the first to systematically investigate sleep deficiency among NHPI, sociodemographic and economic risk factors, health behaviors, psychological distress, and disease outcomes relative to Blacks and Whites (populations with the most comparative data). Specifically, the aims of this study are to:

1. Compare very short sleep (VSS: <5 hours), short sleep (SS: 5–6 hours), long sleep (LS: >8 hours), or healthy sleep (7–8 hours) among NHPI, Blacks, and Whites.
2. Examine sociodemographic/economic factors (age, sex, marital status, education, employment, income, insurance, US born/foreign born, years living in US), health behaviors (physical activity, smoking, alcohol), and psychological distress relative to sleep duration.
3. Determine if the influence of race/ethnicity on associations between sleep duration and the presence of obesity, diabetes, HTN, CVD, and cancer is independent of sociodemographic/economic factors, health behaviors, and psychological distress.

Methods

Data sources

This study was based on 2 data sources: the 2014 annual adult NHIS and the 2014 NHPI-NHIS. The NHIS is an ongoing, cross-sectional, in-person household interview conducted annually by the CDC's National Center for Health Statistics (NCHS). Using a multistage area probability design, the NCHS collects information about chronic health conditions, health insurance, risk factors, and health-related behaviors from noninstitutionalized representatives of the civilian population of the US.³⁴ One adult is randomly selected from each participating household, and that person is asked to complete the NHIS Sample Adult Core questionnaire.

In 2014, the NCHS also conducted the NHPI-NHIS, a survey patterned after the NHIS Adult Core questionnaire in which approximately 3000 households containing 1 or more NHPI adult residents were surveyed by NHIS staff. The NHPI-NHIS is the first survey designed exclusively to collect rich health data and sociodemographic/economic and health characteristics from a large NHPI sample in all 50 states.³⁵ The 2014 NHPI-NHIS has its own sampling design and sampling frame. It is based on a complex, stratified multistage area probability sample design.³⁴ A fuller description of the NHIS and NHPI-NHIS methodology and design can be found elsewhere.³⁶ In 2014, NCHS surveyed 36,697 adults. The response rate of the overall 2014 NHIS adult sample was 80.5%, and the NHPI-NHIS response rate was 82%.

Sample

The study used data from Blacks and Whites using the 2014 NHIS adult sample, and NHPI data are from the 2014 NHIS-NHPI adult sample. Respondents with missing information on the variables included in the analysis were excluded. The final sample included a total of 31,724 adults ≥ 18 years: 2222 NHPI (7%), 4488 Blacks (14%), and 25,014 Whites (79%).

Sleep measures

The primary measure for sleep deficiency was habitual sleep duration determined using responses to the following question: "On average, how many hours of sleep do you get in a 24-hour period?" Sleep duration (in full-hour increments over a 24-hour period) was coded as VSS (<5 hours), SS (5–6 hours), LS (>8 hours), or healthy (7–8 hours), with healthy sleep duration as the reference category. In addition to sleep duration, sleep deficiency refers to a discrepancy in sleep quality compared to the amount needed for optimal health, performance, and well-being. Measures of sleep quality included sleep onset latency, sleep maintenance (continuity), sleep aid/medication use, and the subjective feeling of being rested upon awakening. Respondents reported the number of times or days they had trouble falling asleep or staying asleep, took

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