



Original Article

Social and behavioral predictors of insufficient sleep among African Americans and Caucasians



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ARTICLE INFO

Article history:

Received 22 September 2014

Received in revised form 14 February 2015

Accepted 20 February 2015

Available online 28 March 2015

Keywords:

Social/behavioral
Determinants
Insufficient sleep
Race/ethnicity
Sleep duration

ABSTRACT

Background: Few studies have examined the social and behavioral predictors of insufficient sleep.
Objective: To assess the social and behavioral predictors of insufficient sleep in the U.S. population.
Methods: Data from the 2009 Behavioral Risk Factor Surveillance System (BRFSS) were analyzed. Telephone interviews were conducted in six representative states that completed the optional sleep module. A total of 31,059 respondents were included in the present analysis. BRFSS-provided weights were applied to analyses to adjust for the use of complex design.
Results: The mean age for the sample was 56 ± 16 years, with 63% of the sample being female; 88% identified as non-Hispanic white and 12% identified as non-Hispanic black; 42% were not married and 8% did not have a high school degree. The prevalence of insufficient sleep (<7 hours) was 37%. Multivariate-adjusted logistic regression revealed associations of four important factors with insufficient sleep, which were: working more than 40 hours per week [OR = 1.65, $p < 0.001$, 95% CI = 1.65–1.66], black race/ethnicity [OR = 1.37, $p < 0.001$, 95% CI = 1.37–1.38], history of heart disease [OR = 1.26, $p < 0.001$, 95% CI = 1.25–1.28], care-giving to family/friends [OR = 1.50, $p < 0.001$, 95% CI = 1.49–1.51], and lack of social and emotional support [OR = 1.24, $p < 0.001$, 95% CI = 1.23–1.25].
Conclusion: Social and behavioral predictors of health uniquely contribute to the report of insufficient sleep and should be considered when developing programs to increase awareness of the adverse effects of insufficient sleep.

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1. Introduction

U.S. national data show that adults are sleeping less and less, and over one-third have reported symptoms of sleepiness [1]. Insufficient sleep (<7 hours) has significant impacts on health and well-being and is associated with poor mental and physical health outcomes including weight gain and obesity [2], diabetes [3], cardiovascular disease [4,5], metabolic syndrome [6], depression and anxiety [7–9], and early mortality [10,11]. A few studies have also sought to examine some of the factors that predict insufficient sleep including history of heart disease [12] and other chronic diseases [13].

Evidence also suggests that sleep duration varies by race/ethnicity, with non-Hispanic blacks (hereafter referred to as black) sleeping less than their non-Hispanic white (hereafter referred to as white) counterparts [14,15]. These racial and ethnic disparities in insufficient sleep have been observed by our group and others utilizing large-scale population data [16–19]. Yet, few studies have examined the social and behavioral predictors, such as race/ethnic identity and health behavior, on insufficient sleep. Existing studies largely focus on socioeconomic factors [20,21] and, to a lesser extent, neighborhood and environmental factors [22]. Moreover, few studies have simultaneously examined other contributing factors such as health risk behavior and are insufficiently powered.

One of the goals of Healthy People 2020 is to decrease the proportion of U.S. adults who experience sufficient sleep, defined as 7–8 hours for adults aged 22 and older [23]. However, the Healthy People mid-year progress review indicated “little or no change” in reaching this target [23]. We believe that studies that are able to identify such factors, which may be amenable to change through behavioral interventions and public policies, are necessary.

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The goal of the proposed study was to examine social, behavioral and other contextual predictors of insufficient sleep using data from the 2009 U.S. Behavioral Risk Factor Surveillance System. Specifically, the analysis focused on socio-demographics, medical comorbidities, health risk behavior, and social and contextual factors that would be associated with insufficient sleep. We also examined the hypothesis that blacks would be more likely to report insufficient sleep, relative to their white counterparts, and that black race/ethnicity would be an important predictor of insufficient sleep.

2. Methods

Data from the 2009 Behavioral Risk Factor Surveillance System (BRFSS) were used for this cross-sectional data analysis. The BRFSS is a publicly available, de-identified dataset; thus, this study was exempt from institutional review board deliberations. BRFSS is conducted by the Centers for Disease Control and Prevention and represents the world's largest telephone-based survey. It is an ongoing, state-specific survey that measures behavioral risk factors among adults in the United States. In 2009, the median cooperation rate for all 50 states was 75.0% and the median response rate was 52.4%. A detailed description of the BRFSS survey design, data collection, and full-text questionnaires can be found at <http://www.cdc.gov/brfss>.

2.1. Study population

For the present analysis, we used data from six representative states (Illinois, Wyoming, Louisiana, Georgia, Hawaii, Minnesota) that completed the optional sleep module soliciting socio-demographic, medical, sleep, and health risk data, yielding observations for 31,059 black and white respondents. Individuals who did not self-report their race/ethnicity as black or white were excluded.

2.2. Measures

The main outcome variable was self-reported insufficient sleep duration, defined as sleep duration <7 hours. In previous analysis, this cut-off point was associated with lowest mortality risk [11]. Sleep duration of 7–8 hours was used as a reference [24]. Participants were asked: "On average, how many hours of sleep do you get in a 24-hour period?" Participants reported their amount of sleep in whole numbers. This is consistent with other BRFSS studies on self-reported sleep duration [25]. All covariates were selected *a priori* based on their association with insufficient sleep [12,14].

2.2.1. Socio-demographic variables

Socio-demographic variables included self-reported race/ethnicity (black and white), sex, age (18–24; 25–34; 35–44; 45–54; 55–64; ≥65), education (no high school diploma, high school diploma, college graduate), household income (<\$10,000; \$10,000–\$15,000; \$15,000–\$20,000; \$20,000–\$25,000; \$25,000–\$35,000; \$35,000–\$50,000; \$50,000–\$75,000; or >\$75,000), and marital status (married, divorced, widowed, or never married).

2.2.2. Health and health risk variables

Participants were asked if they have ever been told by a health care professional that they have any of the following medical conditions: hypertension, diabetes, high cholesterol, overweight/obesity, heart disease, arthritis, cancer, and stroke.

Participants were asked about the frequency of engaging in health-related behaviors. These included: being a current smoker, use of an alcoholic beverage within the past 30 days, physical

inactivity, lack of fruits/vegetables in habitual diet, and no regular physical exams within the past 12 months.

Overweight and obesity were estimated based on self-reported height and weight used to derive individual body mass index (BMI = kg/m²). This is consistent with other epidemiological studies investigating overweight and obesity [26].

2.2.3. Social and contextual variables

Social and contextual factors included: care-giving ("During the past month, did you provide any such care or assistance to a friend or family member?"), social and emotional support ("How often do you get the social and emotional support you need?") assessed as "never" or "sometimes", life satisfaction ("In general, how satisfied are you with your life?") assessed as "very satisfied" or "not at all satisfied", hours worked per week (<40 hours vs. >40 hours), household size (number of adults/children in the household), and geographic residence using the participants' county.

2.3. Statistical analysis

BRFSS-provided weights were applied to adjust for the use of complex design. An *a priori* decision [4,27] was made regarding the selection of the four categories of social and behavioral predictors: (1) socio-demographic, (2) health risks, (3) medical conditions, and (4) social and contextual factors. First, descriptive analysis was conducted. Next, analysis of variance (ANOVA) was used for omnibus group mean comparisons and chi-square was employed to assess differences in distributions of categorical variables. The following variables were entered into the model with the block method and only factors showing a p value less than 0.05 were considered significant in the final model. The variables included: demographics (sex, age, race, education, household income, and marital status); medical comorbidities (hypertension, diabetes, high cholesterol, overweight/obesity, heart disease, arthritis, cancer, and stroke); health risk factors (being a current smoker, alcohol use, physical inactivity, lack of fruit/vegetable, no regular physical exams, and BMI); and social and contextual factors (care-giving, social and emotional support, life satisfaction, hours worked per week, household size and geographic residence). Analysis was conducted using SPSS, version 20.0 (SPSS Inc., Chicago, IL).

3. Results

Participants in the sample had a mean age of 56 ± 16 years, and the sample largely consisted of women (63%). Approximately 52% were employed and 35% worked >40 hours per week. Forty-two percent were not married and 8% did not have a high school diploma. Chronic conditions reported included hypertension (40%), diabetes (12%), heart disease (6%), high cholesterol (43%), cancer (14%) and arthritis (36%). Approximately 65% were either overweight or obese. Prevalence of insufficient sleep (<7 hours), compared with healthy sleep (7–8 hours), was 37%.

Socio-demographic and health characteristics of blacks and whites are described in Table 1. Compared to whites, blacks were less likely to be married, graduate high school, and to have a household income above \$35,000. Blacks reported significant comorbidities including history of hypertension, heart disease, diabetes, stroke, and overweight/obesity than whites.

Using multivariate-adjusted logistic regression analysis, the associations of four factor sets with insufficient sleep were assessed. These included socio-demographic factors, medical comorbidities, health risk, and other social and contextual factors. The main predictors in the model were working more than 40 hours per week [OR = 1.65, p < 0.001, 95% CI = 1.65–1.66], black race/ethnicity [OR = 1.37, p < 0.001, 95% CI = 1.37–1.38], history of heart disease [OR = 1.26, p < 0.001, 95% CI = 1.25–1.28], care-giving to family/friends [OR = 1.50, p < 0.001, 95%

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