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

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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 = 137, $p < 0.001$, 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].

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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.

Keywords

Social/behavioral; Determinants; Insufficient sleep; Race/ethnicity; Sleep duration

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.

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, Georgian, 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/m^2). 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% CI = 1.49–1.51], and lack of social and emotional support [OR = 1.24, p < 0.001, 95% CI = 1.23–1.25]. Lack of physical activity, general health, and being a current

smoker were other factors showing significant relationships with insufficient sleep (see Table 2). Factors not showing significance were marital status, being a current drinker, income, and diabetes and history of hypertension.

4. Discussion

The present study examined the social and behavioral predictors of insufficient sleep among black and white adults. Approximately one-third of the participants in the study reported insufficient sleep. These findings are in line with other U.S. population-based studies showing that a significant number of American adults are sleeping less than 7–8 hours [2,16], which is recommended in the Institute of Medicine's Report on sleep disorders [28]. Using a large nationally representative sample, we found that blacks had 37% greater odds of reporting insufficient sleep, relative to whites. Extended work hours, caring for a family member and lack of social and emotional support were also significant predictors of insufficient sleep. While these social and contextual factors have been examined previously [12,14], the present study examined a wide array of novel risk factors and their associations with insufficient sleep, considering the role of race/ethnicity.

The finding of a greater likelihood of reporting insufficient sleep among blacks is consistent with the literature on racial/ethnic differences in habitual sleep time [12,14,15,18]. Using the 2005 National Health Interview Survey, we found that blacks were less likely to report sufficient sleep than whites (23% vs. 30%; $\chi^2 = 94$, p < 0.0001) [19]. The current findings support the hypothesis that there is a consistent trend in self-reported insufficient sleep duration with blacks being less likely to achieve the optimal sleep time, and that the gap in reports of sufficient sleep comparing blacks and whites is widening. Future studies should examine these racial/ethnic differences using other national data, which may provide important insights into the race/ethnic sleep disparities.

The fact that black race/ethnicity identity is a predictor of insufficient sleep is an important finding that warrants further attention; blacks bear a disproportionate burden of cardiovascular disease, hypertension, diabetes, and obesity [29], and have higher levels of C-reactive protein, an important marker of inflammation [30]. Also, insufficient sleep is associated with greater cardiometabolic diseases among blacks [3,31]. Thus, targeting these conditions in conjunction with achieving optimal sleep duration would be an important intervention strategy benefiting overall quality of life.

Prior studies did not assess race/ethnicity as a predictor of sleep duration; rather, they focused on inter-differences in sleep duration. While large-scale epidemiological studies that focus on insufficient sleep among blacks are growing, the extent to which sleep, a biological necessity, is a significant contributor to racial and ethnic health disparities is scarce. Thus, the lack of empirical evidence makes it difficult to draw firm conclusions about the importance of sleep in understanding the ongoing racial and ethnic disparities in adverse health outcomes in the U.S.

5. Limitations and strengths

Some important limitations of this study are worth noting. First, self-reported/subjective data were used to assess sleep duration; hence, estimates may not be comparable to objectively derived sleep durations. However, self-reported sleep data have been proven reliable and have been used in most epidemiological studies [12]. Second, the present study used cross-sectional data; therefore, causality cannot be inferred. Future studies should utilize objective measures of sleep duration to replicate the present observations. This would corroborate published reports of associations of self-reported sleep duration with various physical and mental health outcomes. Other important limitations refer to the fact that factors including shift work that might contribute to insufficient sleep were not included in our analysis. These findings also highlight the need to better categorize "short sleepers," as it is plausible that individuals who experience insufficient sleep may do so voluntarily or non-voluntarily [32], and that these individuals may have insomnia or experience other sleep disorders [33]. Finally, there may be societal and cultural variations among individuals who report insufficient sleep [34].

Nonetheless, this research makes an important contribution to the literature given the large sample size, which is important for the generalizability of the findings as well as the use of a wide array of social, behavioral, and contextual factors, which are becoming increasingly important in understanding health status [35]. A better understanding of the impact of the social and behavioral predictors on the sleep experience is warranted. Evidence derived from studies ascertaining the role of contextual factors may inform development of effective interventions to reduce the public health consequences of insufficient sleep. Individuals who experience sufficient sleep may be at a competitive advantage in managing chronic health conditions, thus improving their overall quality of life.

6. Implications

This study has significant implications for both population and clinical approaches. The Centers for Disease Control has partnered with the American Academy of Sleep Medicine to improve healthy sleep behavior. Care must be taken to ensure that racial/ethnic disparities are addressed adequately in order to change the course of these trends [36]. Clinical approaches are needed such that individuals should be encouraged to discuss their sleep habits, behaviors, and sleep problems with their health care providers [37].

7. Future directions

Future studies should consider the sources and mechanisms underlying greater prevalence of insufficient sleep among blacks, as well as whether these trends vary by gender, age, region, and other socio-demographic characteristics. In addition, other contextual factors including housing and food insecurity [38], and Internet use [39], which tend to influence sleep duration, could be important variables to consider as well.

8. Conclusion

The findings from the present study indicate black race/ethnicity, extended work hours, caregiving, and lack of social and emotional support are important facilitators of insufficient sleep among blacks and whites. The findings may serve as the foundation for future studies examining contextual factors that potentially influence sleep duration. They point to an important relationship between race/ethnicity and insufficient sleep. Thus, expanding this line of research may contribute to a greater understanding of sleep patterns among minority groups, and may potentially contribute to reduction in sleep-related health disparities.

Acknowledgments

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Table 1

Socio-demographic, medical, health risk, social and contextual characteristics of study participants.[a]

Variables (%)	White 27,309 (88%)	Black 3,750 (12%)	P
Sex			<0.0001
Male	41	38	
Female	64	62	
Age			<0.0001
18–24	2	4	
25–34	8	12	
35–44	13	16	
45–54	21	24	
55–64	24	21	
65	33	22	
Education			<0.0001
Less than high school	5	13	
High school	31	28	
College graduate	37	26	
Marital status			<0.0001
Married	61	35	
Widowed	15	15	
Divorced	13	18	
Never married	9	25	
Household income (>$35,000)	9	11	<0.0001
Smoking status (current)	83	81	<0.0001
Alcohol consumption (current drinker)	52	34	<0.0001
Physical limitation	24	24	
Regular physical exams (within the past year)	83	73	<0.0001
Social and emotional support (always)	82	66	<0.0001
Satisfied with life (yes)	95	92	<0.0001
Hours worked per week (>40 h)	39	26	<0.0001
Care-giving (yes)	25	26	
Insufficient sleep			<0.0001
<7 h[b]	33	47	
>8 h	16	11	
Self-report co-morbid conditions			
High cholesterol	43	41	<0.010
Diabetes	11	21	<0.0001
Hypertension	38	53	<0.0001
Stroke	4	6	<0.0001
Heart disease	6	6	
Arthritis	35	36	
Cancer	15	7	<0.0001

Variables (%)	White 27,309 (88%)	Black 3,750 (12%)	P
Overweight/obesity	62	73	<0.0001

Legend: weighted sample.

[a] Categories might not sum to survey total because of missing responses.

[b] Insufficient sleep referenced to 7–8 hour sleepers.

Table 2

Multivariate-adjusted associations of insufficient sleep and socio-demographic, medical, health risk, and social and contextual factors.[a]

Variables	OR[b]	95% CI	p
Race/ethnicity, black	1.37	1.37–1.38	.001
Working, >40 hours per week	1.65	1.65–1.66	.001
Caregiving	1.50	1.49–1.51	.001
No social and emotional support	1.24	1.23–1.25	.001
Current smoker	1.14	1.13–1.15	.001
Lack of physical activity	1.20	1.19–1.21	.001
History of heart disease	1.26	1.25–1.28	.001
General health	1.20	1.19–1.21	.001

[a] Final model adjusted socio-demographics (age, gender, household income, marital status, education), health risk (smoking status, alcohol history, physical activity, fruit and vegetable consumption, regular physical exams), comorbidities (history of hypertension, high cholesterol, diabetes, cancer, heart disease, stroke, arthritis, overweight/obesity), social and contextual factors (general health, quality of life, care-giving, social and emotional support, geographic region, hours worked per week, household size).

[b] Regression coefficients of the insufficient sleep measure on socio-demographic, psychosocial and medical factors among black and white Americans.