Nature and Science of Sleep

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ORIGINAL RESEARCH

Sleep Health and Serious Psychological Distress: A Nationally Representative Study of the United States among White, Black, and Hispanic/Latinx Adults

This article was published in the following Dove Press journal:
Nature and Science of Sleep

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Purpose: Prior studies investigating the relationship between sleep and serious psychological distress (SPD) have lacked racial/ethnic diversity and generalizability. We investigated associations between sleep and SPD among a large, nationally representative, and racially/ethnically diverse sample of US adults.

Methods: We pooled cross-sectional data from the 2004 to 2017 National Health Interview Survey. Participants self-reported sleep duration and sleep disturbances (eg, trouble falling and staying asleep). SPD was defined as a Kessler Psychological Distress Scale (K6) score ≥13. Adjusting for sociodemographic, health behavior, and clinical characteristics, we used Poisson regression with robust variance to estimate prevalence ratios (PRs) and 95% confidence intervals (CIs) of SPD for each sleep characteristic, overall and by race/ethnicity.

Results: Among 316,840 participants, the mean age ± standard error was 46.9 ± 0.1 years, 52% were women, 75% were non-Hispanic (NH)-White, 16% NH-Black, and 9% Hispanic/Latinx. The prevalence of SPD was 3.4% for NH-Whites, 4.1% for NH-Blacks, and 4.5% for Hispanics/Latinxs. Participants with <7 hours versus 7–9 hours of sleep duration were more likely to have SPD, and the magnitude of the association was strongest among NH-Black participants ($PR_{NH\text{-}Blacks}$=3.50 [95% CI: 2.97–4.13], $PR_{Hispanics/Latinx}$=2.95 [2.42–3.61], and $PR_{NH\text{-}Whites}$=2.66 [2.44–2.89]). Positive associations between sleep disturbances and SPD were generally stronger among NH-Black and Hispanic/Latinx compared to NH-White adults.

Conclusion: Poor sleep health was positively associated with SPD, and the magnitude of the association was generally stronger among racial/ethnic minorities. Future investigations should prospectively focus on the determinants and health consequences of SPD attributable to objectively measured sleep across racial/ethnic groups.

Keywords: sleep initiation and maintenance disorders, sleep, psychological stress, health status disparities, continental population groups, race factors

Introduction

The 2013 Global Burden of Disease Report identified five types of mental illness (ie, major depression, anxiety disorders, schizophrenia, dysthymia, and bipolar disorder) among the leading contributors of years lived with disability globally.[1] Experts also estimate that hundreds of billions of dollars are lost each year due to the detrimental effects of mental illness.[2,3] Depression and anxiety, which are often referred to collectively as serious psychological distress (SPD), contribute the most to the burden

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submit your manuscript | www.dovepress.com
DovePress
http://doi.org/10.2147/NSS.S268087

caused by mental illness and are, therefore, of particular importance. Individuals with SPD and related disorders have impaired physical and mental functioning, more work absenteeism, and greater use of health-care services.[4]

Sleep is a complex physiological and behavioral process that contributes importantly to physical and mental health. In 2014, the Center for Disease Control and Prevention estimated that roughly one-third of all US adults get less than the recommended 7 hours of sleep in a 24-hour period.[5] Insufficient sleep may contribute to SPD through dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis and over activation of the sympathetic nervous system. Such biological mechanisms are supported by studies demonstrating that 24-hour urinary free cortisol, norepinephrine, and catecholamine metabolite levels were higher in patients with insomnia and objective sleep disturbances as compared to controls.[6–9]

Further, epidemiologic evidence also supports that insufficient sleep may increase risk of SPD across a variety of study populations (eg, the elderly, adolescents, and couples).[10–13] However, most prior studies of the association between sleep and SPD had relatively small sample sizes and were conducted among special populations (eg, battered women, medical students, military personnel, and natural disaster survivors) exposed to particularly stressful environments.[14–17] Consequently, the findings from these studies are likely nongeneralizable to the general population. Of the few prior nationally representative studies of the US, only sleep duration was assessed, which is not comprehensive.[18–21] Despite this fact, these studies have shown that the association between insufficient sleep and SPD tend to be stronger among racial/ethnic minority groups.

To address these gaps in the literature, we sought to determine associations between sleep duration as well as sleep disturbances and SPD among a large sample of racially/ethnically diverse adults in the US. We hypothesized that poor sleep would be positively associated with SPD and that non-Hispanic Black as well as Hispanic/Latinx (a gender-neutral neologism) participants would have both higher levels of poor sleep health and SPD along with a stronger association between poor sleep and SPD compared to their non-Hispanic White counterparts.

Methods

National Health Interview Survey

Data for this analysis were collected from the 2004 to 2017 National Health Interview Survey (NHIS). The NHIS is a series of annual cross-sectional, household surveys conducted via computer-assisted, in-person interviews among non-institutionalized US civilians. NHIS uses a three-stage stratified cluster probability sampling design to obtain a nationally representative sample. All publicly/freely available NHIS data has been extensively reviewed by the National Center for Health Statistics' Disclosure Review Board to protect the confidentiality of survey participants. The final response rate (2004–2017) for sampled adults was 61.9% (range: 53.0–72.5%). Each study participant provided informed consent. A further detailed description of NHIS procedures has been published elsewhere.[22] Our study was considered exempt by the institutional review board (IRB) at the National Institute of Environmental Health Sciences because de-identified, publicly available data are not classified as human subjects research requiring IRB approval.

Study Population

Adults who self-identified as a race/ethnicity other than non-Hispanic (NH)-White, NH-Black, and Hispanic/Latinx (n=79,367) were excluded from our analysis due to small sample sizes. Because research has demonstrated that sleep and lifetime risk of mental disorder differs by nativity and acculturation, participants who specified that they were born outside of the US (n=160,183) were excluded as beyond the scope of this study.[23–25] Participants were also excluded if they had missing data on sleep duration (n=7,819), sleep disturbance (n=1,064) (measured from 2013 to 2017), or Kessler Psychological Distress Scale (K6) questions (n=2,809). Our final analytic sample comprised 316,840 adults (≥18 years old: Supplemental Figure 1).

Exposure Assessment: Sleep Characteristics

Sleep Duration

Sleep duration was assessed in all participants between survey years 2004 and 2017. Participants' estimates of overall time spent asleep were assessed with the question "On average, how many hours of sleep do you get in a 24-hour period?". Interviewers were instructed to report hours of sleep in whole numbers, rounding values of ≥30 minutes up to the nearest hour and rounding values <30 minutes down to the nearest hour. Sleep duration categories were: short (<7 hours), recommended (7–9 hours), and long (>9 hours).[26]

Sleep Disturbances

NHIS data on sleep disturbances were available for years 2013–2017. Sleep disturbances were assessed by asking participants (separately) how often in the past week they experienced trouble falling asleep, trouble staying asleep, felt rested upon awakening, and took sleep medication. If participants indicated that they experienced trouble falling asleep or trouble staying asleep ≥3 days per week, they were categorized as having the respective sleep disturbance. Participants indicating that they did not wake feeling rested ≥3 days per week were categorized as waking feeling unrested. Sleep medication use was based on self-reported use ≥3 days per week.

Outcome Assessment: Serious Psychological Distress

SPD was assessed using the Kessler Psychological Distress Scale (K6). The K6 is a validated and frequently used screening tool for serious mental illness that has high specificity across racial/ethnic groups.[27] Participants were asked how often they experienced symptoms of depression (ie, sadness, hopelessness, effort, or worthlessness) or anxiety (ie, nervous or restless/fidgety) in the past 30 days. Responses for each symptom ranged from 0 ("None of the time") to 4 ("All of the time"). Total scores ranged from 0 to 24 with higher scores representing higher levels of SPD. Consistent with the literature, participants with a total score ≥13 were categorized as having SPD.[27]

Potential Confounders

Potential sociodemographic confounders included age (18–49, 50–64, and 65+ years), sex/gender (men/women), educational attainment (<high school, high school, some college, and ≥college graduate), annual household income (<$35,000, $35,000 to <$75,000, and ≥$75,000), living in poverty (reported total family income <100% Federal Poverty Level or ≥100% Federal Poverty Level), occupational class (professional/management, support services, or laborers), employment status (yes/no), married/living with a partner (yes/no), and region of residence (South, Midwest, Northeast, or West). We considered health behaviors as potential confounders: smoking status (never, former, current), heavy alcohol consumption (≥2 drinks/day for women; ≥3 drinks/day for men), and physical activity (none, low, high).[28] Participants who engaged in at least some level of activity and who provided a specific number of activity bouts were dichotomized at the midpoint of these bouts and classified as having activity levels of "low" or "high." Participants reporting "never" or "unable to do this type activity" were categorized as "none." Regarding clinical characteristics, self-reported measures of height and weight were used to estimate body mass index (BMI). BMI was categorized as underweight (<18.5 kg/m^2), normal weight (18.5–<25.0 kg/m^2), overweight (25.0–<30.0 kg/m^2), and obese (≥30.0 kg/m^2).[29] Participants were separately asked if they had ever been told by a doctor or other health professional that they had hypertension (also called high blood pressure), diabetes/prediabetes, dyslipidemia, heart disease or cancer.[28] Rather than considering each health behavior and clinical characteristic separately, a dichotomized measure of "ideal" cardiovascular health (yes vs no) was estimated using the following criteria: never smoked or quit smoking >12 months prior to interview; high levels of physical activity; normal BMI; and report of no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes.[30] Additionally, we considered self-rated health ("excellent/very good", "good", or "fair/poor") as part of a sensitivity analysis.

Potential Moderators: Race/Ethnicity

Participants were asked, "What race or races do you consider yourself to be?" They then self-identified as one or more of the following categories: White, Black/African American, American Indian/Alaskan native, Asian, or multiple races. Further, participants were asked, "Do you consider yourself to be Hispanic or Latino?" Based on these responses, participants who self-identified as White or Black and did not consider themselves to be Hispanic or Latino were categorized as NH-White and NH-Black (hereafter White and Black) while all others were considered Hispanic/Latinx. Whites comprised the largest sample size and, therefore, were used as the comparison group to confer greater statistical stability.

Statistical Analysis

Fourteen years of NHIS data (2004–2017) were merged by the Integrated Health Interview Series.[31] Continuous variables were expressed as means ± standard errors (SE), and categorical variables were expressed as weighted percentages derived after applying direct standardization to the sample using the age structure of the 2010 Census population where age groups were categorized as 18–49, 50–64, and 65+ years. All analyses included sampling weights, which represent the inverse probability of selection into

the sample, to account for unequal probability of selection resulting from the sampling design, nonresponse, and oversampling of the elderly and racial/ethnic minorities. We computed average sampling weights by dividing annual sampling weights by the number of survey years pooled. Thus, for our analysis of sleep disturbances that were available for years 2013–2017, we used sampling weights adjusted to a 5-year period whereas for all other analyses we used sampling weights adjusted to a 14-year period. We estimated descriptive statistics overall, by race/ethnicity, and by SPD status. We then used Poisson regression with robust variance to estimate prevalence ratios (PRs) and 95% confidence intervals (CIs) of SPD for each sleep characteristic, overall and by race/ethnicity.[32] We also used Poisson regression models with robust variance estimation to compare racial/ethnic minorities who reported short, recommended, and long sleep to Whites who reported the recommended amount of sleep. All models were adjusted for the following potential confounders: age, sex/gender, educational attainment, annual household income, occupational class, employment status, alcohol consumption, and "ideal" cardiovascular health.[19–21,33] A two-sided p-value of 0.05 was used to determine statistical significance.

As part of a sensitivity analysis to examine racial/ethnic variation in the association between poor sleep health and SPD, we stratified Poisson regression models with robust variance by self-rated health (excellent/very good/good vs fair/poor). Poor health or disease (which are more prevalent in the elderly) may influence the relationship between sleep health and SPD within and across racial/ethnic groups.[34] R, version 3.6.2, software (R Foundation for Statistical Computing, Vienna, Austria) was used for all analyses, and a two-sided p-value of 0.05 was used to determine statistical significance.

Results

Study Population Characteristics Overall, by Race/Ethnicity, and by SPD

Among 316,840 participants, 3.6% met the criteria for SPD. The mean age ± standard error was 46.9 ± 0.08 years, 52% were women, 75% were White, 16% were Black, 9% were Hispanic/Latinx, 9% had <high school education, 32% had an annual household income <$35,000, and 11% had "ideal" cardiovascular health (Table 1). Compared to participants without SPD, Whites with SPD were more likely to identify as women. The prevalence of unfavorable characteristics (eg, low socioeconomic status, harmful health behaviors, adverse clinical conditions) among Whites was generally lower than the prevalence of unfavorable characteristics among Black and Hispanic/Latinx participants. For instance, Blacks (17%) and Hispanics/Latinxs (19%) were more likely than Whites to attain a less than high school education (8%). Both in the overall population and across racial/ethnic groups, there was a higher prevalence of unfavorable characteristics among participants with SPD compared to the participants without SPD. For instance, the prevalence of current smoking was higher among participants with vs without SPD in the overall (40% vs 18%), White (41% vs 19%), Black (39% vs 19%), and Hispanic/Latinx (32% vs 14%) populations.

Prevalence of Sleep Characteristics by Race/Ethnicity and SPD

As illustrated in Figure 1, the prevalence of short sleep, long sleep, and sleep disturbances was greater among participants with vs without SPD in the overall population and for each race/ethnicity. Furthermore, Black participants had the largest absolute difference in the prevalence of short sleep duration among those with vs without SPD (61% vs 36% compared to 50% vs 28% among Whites and 51% vs 31% among Hispanics/Latinxs).

Associations Between Sleep Duration and SPD

As shown in Figure 2 and Supplemental Table 1, non-recommended sleep duration was positively associated with SPD overall and for each race/ethnicity. The association between short sleep duration (<7 hours) and SPD was strongest among Black participants: Black participants who reported short sleep had over a three-fold higher prevalence of SPD compared to Black participants who reported recommended sleep duration (PR=3.50 [95% CI: 2.97–4.13] vs PR=2.66 [95% CI: 2.44–2.89] among Whites and PR=2.95 [95% CI: 2.42–3.61] among Hispanics/Latinxs). Although the confidence interval overlapped with those of other races/ethnicities, the magnitude of the association between long sleep duration (>9 hours) and SPD was strongest among White participants (PR=3.36 [95% CI: 2.96–3.81] vs PR=2.27 [95% CI: 1.70–3.03] among Blacks and PR=2.71 [95% CI: 1.82–4.02] among Hispanics/Latinxs).

Table 1 Age Standardized Sociodemographic, Health Behavior, and Clinical Characteristics Among US Adults Overall, by Race/Ethnicity, and by Serious Psychological Distress (SPD), National Health Interview Survey, 2004–2017 (N=316,840)

	Overall N=316,840			**Non-Hispanic White n=238,880 (75%)**			**Non-Hispanic Black n=50,815 (16%)**			**Hispanic/Latinx n=27,145 (9%)**		
	All	**Without SPD (K6<13)**	**With SPD (K6≥13)**	**All**	**Without SPD (K6<13)**	**With SPD (K6≥13)**	**All**	**Without SPD (K6<13)**	**With SPD (K6≥13)**	**All**	**Without SPD (K6<13)**	**With SPD (K6≥13)**
Sample Size n (%)	**316,840 (100)**	**305,350 (96)**	**11,490 (4)**	**238,880 (100)**	**230,688 (97)**	**8,192 (3)**	**50,815 (100)**	**48,748 (96)**	**2,067 (4)**	**27,145 (100)**	**25,914 (96)**	**1,231 (4)**
SPD (%)	**3.6**	**0**	**100**	**3.4**	**0**	**100**	**4.1**	**0**	**100**	**4.5**	**0**	**100**
Sociodemographic Characteristics												
Mean Age, years ± SE	46.9±0.08	46.9±0.09	46.2±0.21	48.3±0.09	48.3±0.10	47.2±0.22	43.8±0.14	43.8±0.14	44.0±0.47	37.0±0.18	36.9±0.19	40.5±0.65
Women (%)	52	52	61	52	52	61	56	56	63	52	51	62
Educational attainment												
< High school	9	9	24	8	7	22	17	16	33	19	19	31
High school graduate	31	30	37	30	29	37	35	35	36	33	33	30
Some college	31	31	29	31	31	30	31	32	26	33	33	31
≥College	29	29	10	31	32	11	17	18	5	16	16	7
Annual Household Income (<$35,000)	32	31	63	29	27	61	52	51	77	39	37	62
Living in Poverty	10	9	30	8	7	26	23	22	47	15	14	33
Occupational Class												
Prof/Management	20	21	10	22	22	10	12	12	5	15	15	7
Support	47	47	44	47	47	44	44	44	40	46	46	47
Laborers	33	32	47	31	31	46	45	44	55	40	39	45
Unemployed	42	40	74	40	39	73	49	48	77	45	44	74
Married/Cohabitating	61	62	45	65	66	48	41	41	30	56	56	45
Region of Residence												
Northeast	17	18	14	19	19	15	13	13	13	9	9	10
Midwest	26	26	25	28	28	27	18	18	18	9	9	9
South	38	37	43	34	34	40	61	61	61	36	36	37
West	19	19	18	19	19	18	8	8	8	46	46	45

(*Continued*)

Table 1 (Continued).

	Overall N=316,840			Non-Hispanic White n=238,880 (75%)			Non-Hispanic Black n=50,815 (16%)			Hispanic/Latinx n=27,145 (9%)		
	All	Without SPD (K6<13)	With SPD (K6≥13)	All	Without SPD (K6<13)	With SPD (K6≥13)	All	Without SPD (K6<13)	With SPD (K6≥13)	All	Without SPD (K6<13)	With SPD (K6≥13)
Health Behaviors												
Sleep Duration												
<7 hours	30	29	52	28	28	50	37	36	61	31	31	51
≥7 - ≤9 hours	66	67	36	68	69	37	57	58	29	64	65	36
>9 hours	4	4	13	4	4	13	6	6	10	5	5	14
Sleep Disturbances												
Trouble falling asleep	21	19	66	21	19	65	22	20	69	23	21	72
Trouble staying asleep	29	28	70	30	29	70	27	25	73	26	24	69
Woke feeling unrested	36	35	79	36	35	79	35	34	75	37	35	77
Took sleep medication	11	10	38	11	10	38	8	7	32	9	7	39
Smoking Status												
Never	55	55	35	53	54	33	61	61	43	62	63	43
Former	26	26	25	28	28	26	19	19	18	23	23	25
Current	19	18	40	19	19	41	20	19	39	15	14	32
Heavy Alcohol Consumption	8	8	10	9	9	10	6	5	11	5	5	8
Physical Activity												
None/unable	36	35	60	33	33	59	48	47	63	40	40	58
Low	19	19	17	19	19	17	17	17	16	18	18	17
High	46	47	23	48	48	24	35	36	22	42	43	24
Clinical Characteristics												
Body Mass Index												
Normal (18 - <25 kg/m^2)	34	34	29	36	36	31	26	26	26	26	26	20
Overweight (25.0 - <30 kg/m^2)	36	36	29	36	36	29	34	34	28	38	38	34
Obese (≥30.0 kg/m^2)	30	30	42	28	28	41	41	40	46	36	36	46

Self-Rated Health																	
Excellent/Very good	59	60	17	61	63	18	44	45	16	51	52	19					
Good	27	27	25	26	26	25	32	33	22	30	30	22					
Fair/poor	14	13	58	13	11	57	24	22	63	19	18	59					
Hypertension	36	35	53	34	34	51	48	48	64	35	34	54					
Pre-Diabetes/Diabetes	15	15	27	14	13	26	21	21	32	23	22	35					
Dyslipidemia	52	51	64	52	51	64	52	51	67	50	49	67					
"Ideal" Cardiovascular Health [a]	11	11	3	12	12	3	5	5	2	8	8	3					
Heart Disease	13	13	25	13	13	25	12	11	24	10	10	22					
Cancer (any type)	11	11	15	12	12	16	6	6	12	7	7	11					

Notes: [a]"Ideal" cardiovascular health includes never smoking/quit >12 months prior to interview, BMI 18.5 - <25 kg/m^2, high levels of physical activity, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes.
Abbreviations: K6, Kessler Distress Scale [6 item]; SE, standard error; kg, kilograms; m, meters.

Associations Between Sleep Disturbances and SPD

Also shown in Figure 2 and Supplemental Table 1, sleep disturbances were positively associated with SPD overall and for each race/ethnicity. Excluding the association between woke not feeling rested and SPD for the Hispanic/Latinx population, prevalence ratios for the relationship between sleep disturbances and SPD among racial/ethnic minority groups were larger than those observed among Whites. For instance, the positive association between trouble falling asleep and SPD was stronger among Hispanic/Latinx participants (PR=9.10 [95% CI:6.46–12.81]) compared to the positive association among Whites (PR=4.88 [95% CI:4.29–5.55]). The positive association between trouble staying asleep and SPD was stronger among Black participants (PR=6.50 [95% CI:4.97–8.51]) compared to the positive association among Whites (PR=4.21 [95% CI:3.72–4.75]).

Racial/Ethnic Comparison of SPD Prevalence Within Short, Recommended, and Long Sleep Duration Categories

As shown in Figure 3 and Supplemental Table 2, compared to Whites who reported recommended sleep duration, Blacks and Hispanics/Latinx who reported either short or long sleep were more likely to have SPD. Compared to Whites who reported recommended sleep duration, Blacks who also reported recommended sleep were 38% less likely to have SPD (PR=0.62 [95% CI:0.53–0.73]). Hispanic/Latinxs who reported recommended sleep were also less likely to have SPD compared to Whites who reported recommended sleep (PR=0.84 [95% CI:0.70–1.01]).

Sensitivity Analysis

Upon investigating the sleep-SPD association stratified by excellent/very good/good vs fair/poor self-rated health, we found that all associations between sleep health and SPD were stronger among those with excellent/very good/good compared to fair/poor self-rated health (Supplemental Table 3).

Discussion

In this large nationally representative study of White, Black, and Hispanic/Latinx adults in the US, we found that participants who reported <7 hours versus 7–9 hours of sleep duration were more likely to be classified

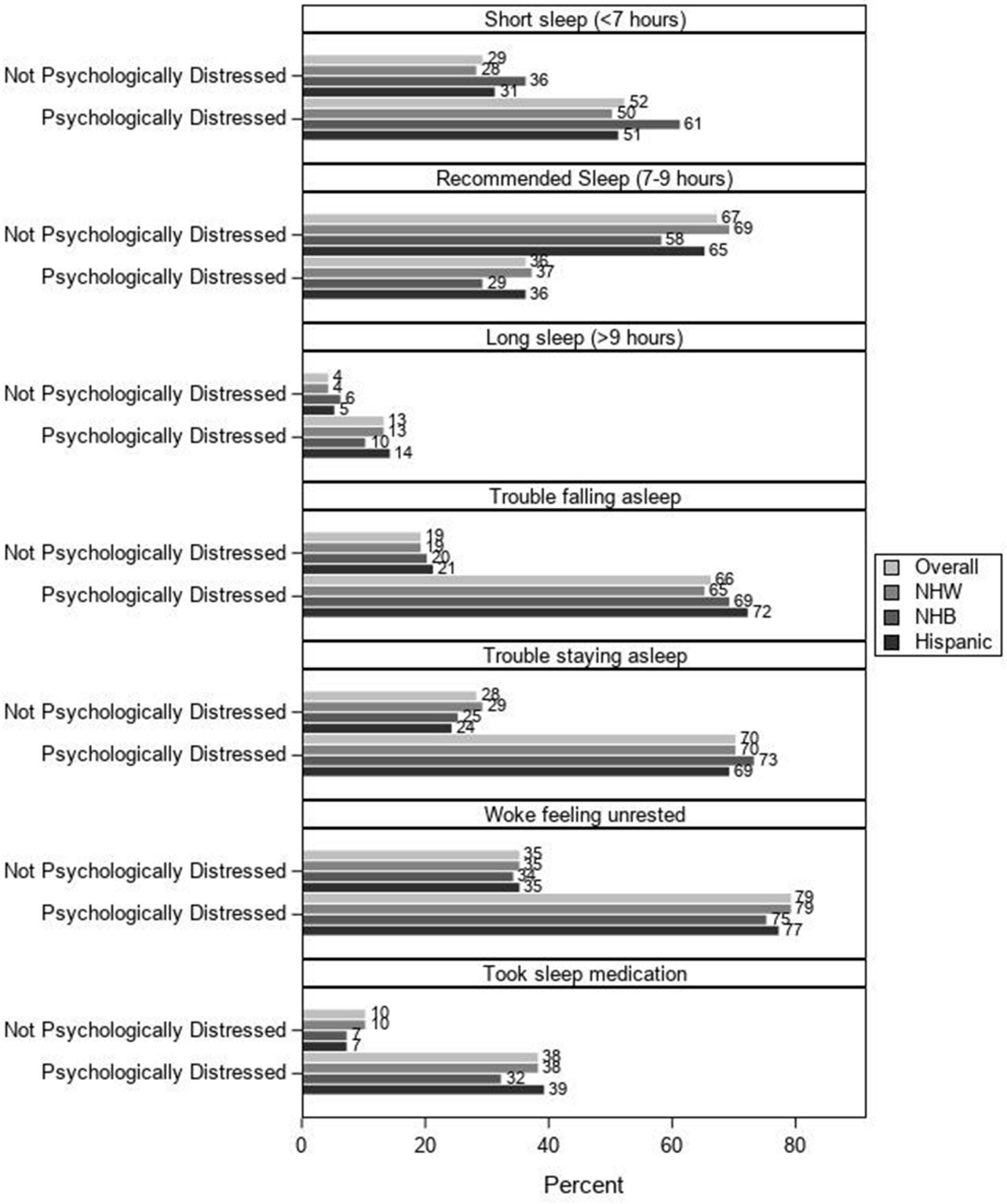

Figure 1 Prevalence of Sleep Duration and Sleep Disturbances Stratified by Serious Psychological Distress Status among the Overall Population, White, Black, Hispanic/Latinx Participants, N=316,840.

as having SPD, and that the positive association between short sleep and SPD was strongest among Black participants. Positive associations between sleep disturbances and SPD were generally stronger among Black and Hispanic/Latinx adults compared to White adults.

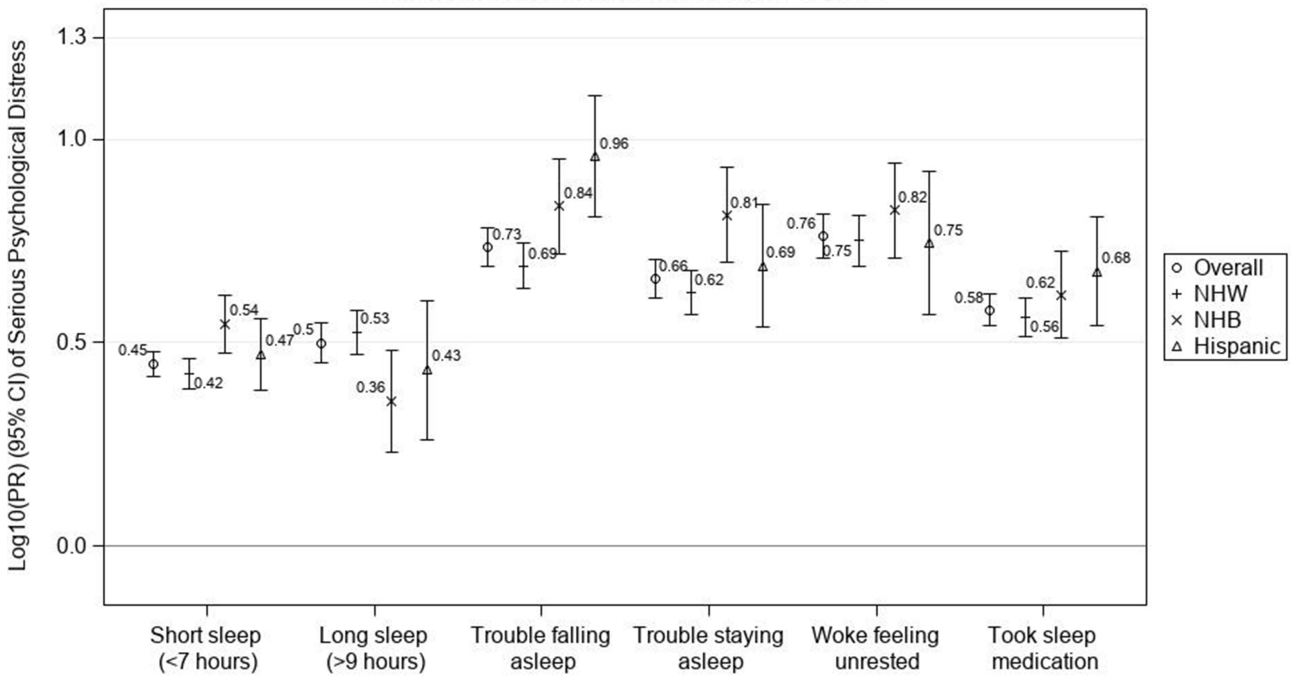

Figure 2 Fully Adjusted Prevalence Ratios for Serious Psychological Distress among Overall, White, Black, and Hispanic/Latinx Participants who Reported Short and Long Sleep Duration along with Sleep Disturbances Compared to their Racial/Ethnic Counterparts with Recommended Sleep, N=316,840.

Notes: Models were adjusted for age, sex/gender, educational attainment, annual household income, occupational class, employment status, region of residence, heavy alcohol consumption and "ideal" cardiovascular health; "Ideal" cardiovascular health includes never smoking/quit >12 months prior to interview, BMI 18.5 - <25 kg/m2, high levels of physical activity, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes.

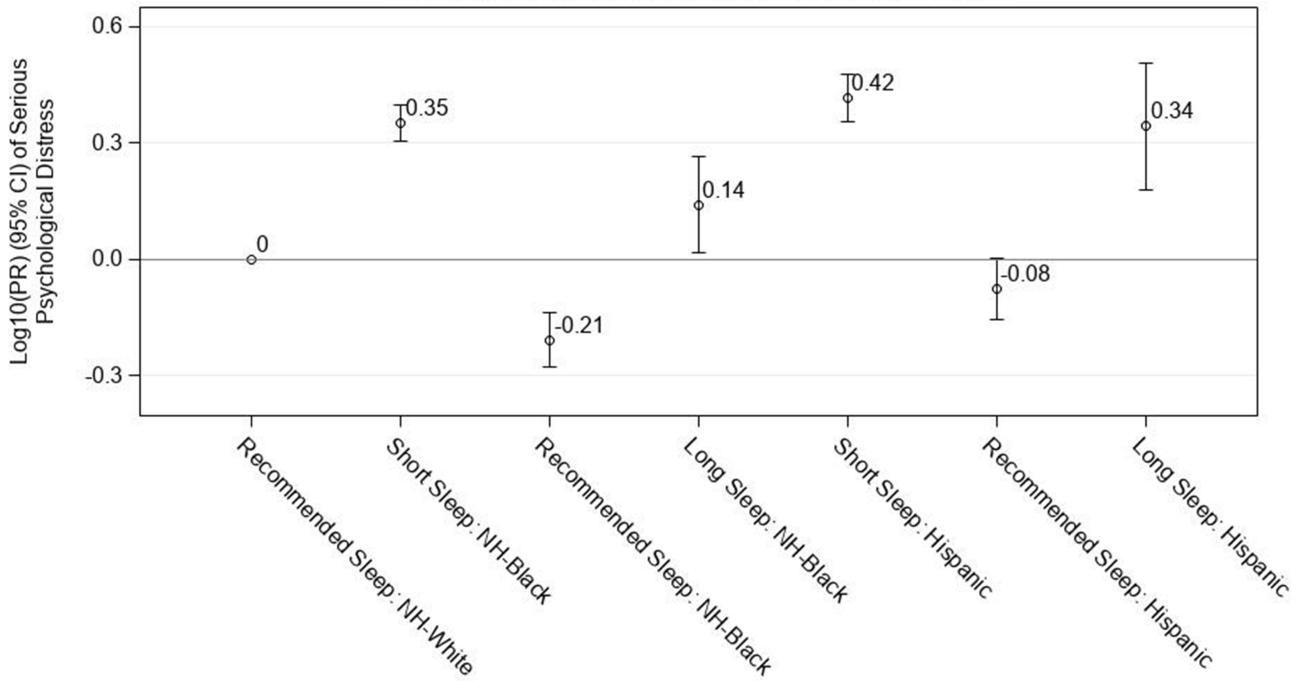

Figure 3 Fully Adjusted Prevalence Ratios for Serious Psychological Distress among NH-Blacks and Hispanics/Latinxs Reporting Short (<7 hours), Recommended (7–9 hours), and Long (≥ hours) Sleep Duration Compared to NH-Whites with Recommended Sleep, N=316,840.

Notes: Models were adjusted for age, sex/gender, educational attainment, annual household income, occupational class, employment status, region of residence, heavy alcohol consumption and "ideal" cardiovascular health; "Ideal" cardiovascular health includes never smoking/quit >12 months prior to interview, BMI 18.5 - <25 kg/m^2, high levels of physical activity, and no prior diagnosis of dyslipidemia, hypertension, or diabetes/prediabetes.

These findings are consistent with previous research and are relevant because poor sleep health is thought to cause SPD by dysregulating brain areas (eg, the ventrolateral preoptic nucleus and the orexinergic system) that are important for awake to sleep and non-REM to REM transitions as well as mood-regulation.[35] In a cross-sectional study conducted in 2015 by Cunningham et al, the Behavioral Risk Factor Surveillance System was used to cross-sectionally examine the association between various definitions of SPD and short and long sleep duration by sex/gender. Acknowledging the likely bidirectional relationship, the authors found that adults with SPD were more likely to report short and long sleep duration.[21] Although this study used a different data source, considered SPD as the exposure and short or long sleep duration as the outcome, and did not include sleep disturbances, the significance and magnitude of the associations between poor sleep duration and SPD were comparable to our study. Also similar to our study, a prior study using NHIS data from 2009 observed positive associations between poor sleep and SPD in that Seixas et al found that individuals with SPD had 55% greater odds of reporting unhealthy sleep.[19] Previous literature has also identified racial/ethnic disparities in sleep duration and disturbances, which were found in this study. In a meta-analysis of 14 non-overlapping studies, disparities among Black and White US adults were observed for sleep duration. Black adults had lower amounts of time in bed spent sleeping and percentages of time spent in deeper stages of sleep.[36] Additionally, this meta-analysis found that sleep continuity and duration were moderated by biopsychosocial factors like mental illness. Consistent with this meta-analysis, our results suggested that while the associations between poor sleep health and SPD were significant for all race/ethnicities, the magnitude of the associations were generally stronger among racial/ethnic minorities. Furthermore, the strong association found between long sleep duration and SPD for Whites in our study is inconsistent with the literature that generally found associations between long sleep duration and SPD are strongest among racial/ethnic minorities, which warrants further investigation.[20]

After stratifying by self-rated health, we found that the magnitude of the associations between poor sleep health and SPD were stronger among participants who reported excellent/very good/good health compared to those who reported fair/poor health. This finding underscores the likely connection between SPD and sleep health. Poor sleep health has been consistently associated with poor overall health.[37,38] The absence of individuals with poor health among participants with excellent/very good/good health likely resulted in a less obscured association between sleep and SPD. This finding further supports the importance of sleep as a potential contributor to SPD.

Differential exposure to various threats to both sleep health and psychosocial stressors that can cause distress by racial/ethnic group likely contribute to the observed disparities in the sleep-SPD relationship.[39–41] For instance, racial/ethnic minorities are more likely than Whites to be exposed to unique discriminatory practices and policies through institutional, personally mediated, and internalized racism that are embedded in US culture.[42–45] Discrimination and racism have been linked to both poor sleep and SPD.[13,46,47] Racial/ethnic disparities in sleep health may also be explained, in part, by the various types of structural factors such as work or school hours that differ among race/ethnicities.[48,49] For instance, racial/ethnic minorities have been shown to have disproportionate exposure to financial strain, unemployment, job strain, neighborhood disorder, and substandard housing.[50–53] Research has shown that exposure to, for instance, poverty, violence, and a lack of social cohesion and integration into society are powerful social determinants of mental illness.[4] These factors may contribute to disadvantaged communities including racial/ethnic minorities having a higher prevalence of poor sleep health and SPD.

Interestingly, the prevalence of SPD among Blacks and Hispanics/Latinxs with recommended sleep duration was lower compared to the prevalence of SPD among Whites with recommended sleep duration, suggesting that sleep duration may partially explain racial/ethnic differences in SPD. Research is warranted to investigate, for instance, if structural interventions aimed to increase the attainment of recommended sleep among racial/ethnic minorities could reduce the burden of SPD among racial/ethnic minorities.[54,55]

With regard to women, the percentages of women among participants with SPD were larger than the percentage of women found among participants without SPD in our study, which is consistent with prior literature regarding mental health outcomes such as depression.[56] Women have been found to be more likely than men to seek help for and disclose mental health problems to their healthcare providers while men are more likely to seek specialist mental health care.[57]

The limitations of this study include its cross-sectional design, which precludes causal inference as temporality between sleep and SPD cannot be established. The relationship between poor sleep health and SPD is bidirectional (poor sleep health can be treated as an outcome of SPD). Consequently, either getting poor sleep or having SPD might contribute to the poor sleep-SPD relationship.[58] SPD does not constitute a clinical diagnosis; however, studies have validated its utility among populations with clinically significant anxiety or depression.[27] All data were self-reported. Generally, self-reported measures of sleep duration overestimate sleep duration data derived from objective measures (eg, actigraphy and PSG). Concordance studies have revealed that self-reported measures of sleep duration and sleep disturbances are moderately to poorly comparable to objective measures such as actigraphy.[59–63] Of note, it has been shown that such measurement error is nondifferential across racial/ethnic groups depending on the sleep item.[64,65] Because mental health is stigmatized in the US and globally, it is possible that self-reported measures of SPD could underestimate the true prevalence of SPD, especially among racial/ethnic minority groups.[66] Sex/gender was also assessed in a binary vs non-binary manner.

Despite these limitations, strengths of this study include its large sample size where the most recently available data were collected over multiple survey years, which decreases potential influence attributable to single-year collection periods. The sample size also allowed robust stratification by race/ethnicity. Data also allowed for adjustment of relevant confounders. Furthermore, the data are generalizable to the current US population of White, Black, and Hispanic/Latinx adults.

Future studies will likely benefit from objective measurements of sleep health characteristics (eg, actigraphy with daily diaries) and should consider how psychometric properties of measures that could differ by race/ethnicity potentially contribute to racial/ethnic disparities in sleep health among US adults. Factors such as race/ethnicity and sex/gender are all important in determining how mental health, distress, and disorder are related to one another.[67] Understanding how environmental factors along with individual sociodemographic, behavioral, and clinical factors influence the effects of poor sleep on SPD will help identify populations at a higher risk of developing SPD. Such information can direct public health efforts towards both prevention and reduction of adverse mental health among vulnerable populations.

Conclusion

In conclusion, our study found that poor sleep health was positively associated with SPD, and the magnitude of the association was generally stronger among racial/ethnic minorities. Future studies should seek to inform actionable public health and social policy initiatives that aim to address the drivers of both poor sleep and SPD as well as eliminate sleep disparities to achieve social, environmental, and health equity.

Acknowledgments

This research was presented, in part, at Society for Advancement of Chicanos and Native Americans in Science – The National Diversity in STEM Conference in Honolulu, Hawaii on October 31 – November 2, 2019 and at the State of North Carolina Undergraduate Research and Creativity Symposium in Durham, North Carolina on November 23, 2019. We are grateful to Stacy Mantooth and Erin Knight for assistance with the literature search.

Author Contributions

All authors contributed to data analysis, drafting or revising the article, have agreed on the journal to which the article will be submitted, gave final approval of the version to be published, and agree to be accountable for all aspects of the work. Authors: Samuel J. Goldstein, Symielle A. Gaston, John A. McGrath, Chandra L. Jackson Study concept and design: CL Jackson Acquisition of data: CL Jackson Statistical Analysis: JA McGrath, SJ Goldstein Interpretation of data: SJ Goldstein, SA Gaston, JA McGrath, CL Jackson Drafting of the manuscript: SJ Goldstein Critical revision of the manuscript for important intellectual content: SJ Goldstein, SA Gaston, J McGrath, CL Jackson Administrative, technical, and material support: CL Jackson Obtaining funding and study supervision: CL Jackson Final Approval: Goldstein SJ; Gaston SA; McGrath JA; Jackson CL.

Funding

This work was funded by the Intramural Program at the NIH, NIEHS (Z1AES103325-01) and the NIEHS Scholars Connect Program.

Disclosure

The authors have no conflicts of interest to disclose.

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