PERCEIVED RACIAL DISCRIMINATION AS AN INDEPENDENT PREDICTOR OF SLEEP DISTURBANCE AND DAYTIME FATIGUE

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ABSTRACT

Perceived discrimination is a potential cause of racial and ethnic disparities in health. One direct mechanism through which perceived discrimination may affect health is by impeding quality sleep. We investigate the Behavioral Risk Factor Surveillance System from 2006, with 7,148 adults from Michigan and Wisconsin. Sleep Disturbance and Daytime Fatigue were reported in 19% and 21%, respectively. Black respondents (21%) report perceiving worse experience compared to people of other races when seeking health care at higher rates than white respondents (3%). Our results from logistic regression models show that perceived racial discrimination is associated with increased risks of sleep disturbance (OR=2.61, $p<.001$) and daytime fatigue (OR=2.09, $p<.001$), whereas significant differences do not exist for blacks vs. whites. Future work on racial differences in sleep should investigate discrimination as a pathway through which racial differences in sleep exist.

INTRODUCTION

Increasing attention has been drawn to health disparities between racial groups across many domains of health, particularly in comparing White and Black individuals [1-3]. A number of factors have been shown to play a role in these inequalities, including socioeconomic factors [4-6], social environment [7], access to healthcare and other services [8,9], and others, including exposure to racial discrimination [5].

Sleep is an important health outcome [10]. Many previous studies have shown that sleep disturbance (short sleep duration, long sleep duration, and/or poor sleep quality) is an independent predictor of mortality [11], including all-cause and disease-specific mortality. Large population-based studies have reported significant associations between sleep disturbance and many other negative health outcomes, including obesity [12-18], cardiovascular disease[12,19-21], heart attack [22], stroke [23,24], diabetes [14,21,25-30], depression [31-33], and substance abuse [34-36]. Important determinants of sleep disturbance have included socioeconomic factors such as income, education, employment status, and marital status[37]. These relationships, interestingly, interact with race to produce differential outcomes [37,38].

The present study explored how perceived racism relates to sleep disturbance and daytime fatigue, using data from the 2006 administration of the Behavioral Risk Factor Surveillance System, a large survey conducted by the Centers for Disease Control and Prevention. Our hypotheses were that perceived racism was an independent predictor of (1) sleep disturbance and (2) daytime fatigue. Furthermore, we investigated whether demographics, socioeconomic factors, general health, and depressed mood play a role in this relationship.

METHODS

Data from the 2006 Behavioral Risk Factor Surveillance System (BRFSS)[41] were used for this analysis. Two states (Michigan and Wisconsin) collected data on perceived racism as part of the 2006 BRFSS. The current analyses utilized this data. Perceived racism was assessed with the question, “Within the past 12 months when seeking health care, do you feel your experiences were worse than, the same as, or better than for people of other races?” Response choices were dichotomized as either “Worse” (including “Worse than other races” and “Worse than some races, better than others”) and “Same” or “Better” (including “The same as other races” and “Better than other races”). Participants also answered a question on Sleep Disturbance: “Over the last 2 weeks, how many days have you had trouble falling asleep or staying asleep or sleeping too much?” and daytime fatigue: “Over the last 2 weeks, how many days have you felt tired or had little energy?” Answers for both questions ranged from 0-14. However,

the distributions were bimodal, with peaks at 0 and 14. Thus, Sleep Disturbance and Daytime Fatigue were dichotomized into those who report complaints ≥6 days and those who report complaints <6 days. This is consistent with other classification approaches where a frequency of three or more events per week has been used to denote abnormality [42].

Covariates used to adjust for socioeconomic factors included race/ethnicity (White vs. Black/African-American), education, employment and income. Previous analyses of these data at the national level (including states other than Michigan and Wisconsin) have found that education, gender, employment and income are significant predictors of sleep complaint in this sample [37]. Depressed mood was measured with the item, "Over the last 2 weeks, how many days have you felt down or depressed" which was categorized as none (0 days), mild (<6 days) and moderate/severe (≥6 days).

Complete-case analysis was implemented for both Sleep Disturbance and Daytime Fatigue; thus, only participants who provided complete data were included for each analysis. We the estimated a series of nested logistic regression models for each of our two dichotomous outcomes of Sleep Disturbance and Daytime Fatigue. All sampling was weighted appropriately for representativeness, using weighting scores specifically developed for BRFSS 2006 [41]. Three models were tested: (1) Racism + Race/Ethnicity + Sex; (2) Racism + Race/Ethnicity + Sex + Age + Education + Income + Employment; (3) Racism + Race/Ethnicity + Sex + Age + Education + Income + Employment + Depression.

RESULTS

Characteristics of the sample are reported in Table 1. The sample was majority female (60% among Whites and 68% among Blacks). Sleep Disturbance and Daytime Fatigue were reported in approximately 20% of the sample (19% and 21%, respectively), which is consistent with rates of reports of these complaints from the larger, national 2006 BRFSS sample [37,43]. Perceived racism was reported by a minority of Whites (3%), and three times as many Black (21%) participants.

We estimated two series of nested logistic regression models. First, separate Model 1 analyses were performed, with both Sleep Disturbance and Daytime Fatigue as the dependent variable. To determine whether White and Black groups should be analyzed separately, a Race x Racism interaction explored whether the relationship between Racism and both Sleep Disturbance and Daytime Fatigue differed by race. This interaction was not significant (Reference=White/Same or Better; Black/Worse OR = 0.81 (0.33-2.03), $p>0.05$ for Sleep Disturbance and OR = 0.78 (0.33-1.85), $p>0.05$ for Daytime Fatigue); thus, Black and White groups were analyzed together.

In Model 1, adjusting only for sex and race, the OR for Sleep Disturbance associated with perceived racism was 2.61 (95% CI 1.79-3.80; p<.0001), indicating that those who reported that they were treated worse were over two and a half times more likely to have sleep disturbance than those who were treated the same or better. After socio-demographic and socioeconomic variables (age, education, income and employment) were entered into Model 2, this relationship was attenuated but remained significant at OR = 1.97 (95% CI 1.35-2.89; p<.001). In Model 3, which includes depressed mood, this relationship was further attenuated but remained significant at OR = 1.61 (95% CI 1.03-2.51; p<.05). The OR for Sleep Disturbance across models is also seen in Figure 1.

In Model 1, adjusting only for sex and race, the OR for Daytime Fatigue associated with perceived racism was 2.07 (95% CI 1.45-2.94; p<.0001), indicating that those who reported that they were treated worse were over twice as likely to report daytime fatigue than those who were treated the same or better. Adjusting for socio-demographic and socioeconomic variables in model 2 (age, education, income and employment), this relationship was attenuated but remained significant at OR = 1.57 (95% CI 1.11-2.23; p<.05). In Model 3, which includes depressed mood, this relationship was further attenuated and was no longer significant, at OR = 1.18 (95% CI 0.81-1.72; p>.05). The OR for Sleep Disturbance and Daytime Fatigue across models is also seen in Figure 1.

DISCUSSION

The present study was one of the first to examine a specific form of racial discrimination (i.e., in healthcare settings) in relation to sleep disturbance and daytime fatigue. Perceived racism was associated with over a two-fold increased risk of having sleep disturbance even after adjusting for several risk factors known to covary with perceptions of racism and disturbed sleep. Perceived racism also was associated with increased risk of having significant daytime fatigue; however, this effect was largely accounted for by depressed mood. These results suggest that the fatigue associated with depressed mood accounted for the fatigue associated with perceived racial discrimination, and the sleep disturbance associated with depressed mood only partially explained the sleep disturbance that was associated with the perceived racial discrimination, suggesting that racism contributes unique variance to sleep disturbance

These findings support previous studies that have found that perceived racial discrimination has a negative impact on sleep [39,40] and that sleep disturbance is important factor in the relationship between perceived racism and depressed mood [40]. Perceived racism is a newer factor identified in the social

environment that has significant bearing on Sleep Disturbance. Past studies that have identified the proximal nature of the effect depression upon insomnia [44] may have captured a contribution of perceived racism. This study adds to this literature by evaluating perceived racism relative to sleep-related problems and showing that perceived racism has an impact on sleep at night over and above age, sex, race, and a number of socioeconomic factors, and (in the case of Sleep Disturbance) depressed mood. Sleep problems could conceivably be added to the list of negative outcomes of racial discrimination.

There were a number of limitations to this study. First, the sleep problems and daytime fatigue reported in BRFSS are self-reported, general measures. They do not suggest any particular sleep-related pathology, such as sleep apnea or insomnia, and may not be predictive of objective sleep problems. In addition, the BRFSS does not include a measure of sleep duration. However, general measures of subjective sleep quality and daytime fatigue capture the full range of nighttime and daytime problems associated with poor sleep, at even a subclinical level of severity. Second, the sample of this study was primarily comprised of White individuals, and data were gathered only in the states of Michigan and Wisconsin, where these measures were administered. Despite a nominally larger percentage of Black individuals reporting perceived racial discrimination than White individuals, there was no significant Race x Racism interaction, indicating that the relationship between perceived racism and sleep problems did not differ across groups. Given that the sample was primarily White, it is unclear whether these results are generalizable to environments that have a larger Black presence.

Acknowledgement of the influence of the social environment upon sleep[11] grows rapidly. As others have indicated, a broad socio-ecological approach is critical to investigating the social determinants of sleep attainment. Future research should further explore the impact of perceived racism in other regions, using both subjective and objective measures of sleep disturbance, and also examine the underlying factors that specifically link perceived racism to increased sleep disturbances.

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Table 1. Subject Characteristics

	All (N=7093)	White (N=6469)	Black (N=624)
Age			
Mean (Standard Deviation)	50.9 (15.6)	51.3 (15.6)	47.5 (15.2)
Sleep Disturbance			
No (%)	81.14	81.64	75.96
Yes (%)	18.86	18.36	24.04
Daytime Fatigue			
No (%)	78.67	79.07	74.52
Yes (%)	21.33	20.93	25.48
Perceived Racism			
Same or Better (%)	95.22	96.75	79.33
Worse (%)	4.78	3.25	20.67
Sex			
Male (%)	39.41	40.08	32.37
Female (%)	60.59	59.92	67.63
Education			
Less than High School (%)	5.85	5.15	13.14
High School Graduate (%)	31.71	31.78	30.93
Some College (%)	30.31	30.16	31.89
College Graduate (%)	32.13	32.91	24.04
Income			
< $10,000 (%)	3.09	2.63	7.85
$10,000-$15,000 (%)	4.54	4.14	8.65
$15,000-$20,000 (%)	5.94	5.38	11.7
$20,000-$25,000 (%)	9.25	8.55	16.51
$25,000-$35,000 (%)	15.49	15.38	16.67
$35,000-$50,000 (%)	17.86	18.24	13.94
$50,000-$75,000 (%)	19.77	20.44	12.82
$75,000 + (%)	24.07	25.24	11.86
Employment			
Employed (%)	54.41	55.08	47.44
Self-Employed (%)	7.6	7.73	6.25
Unemployed <1 Year (%)	2.02	1.86	3.69
Unemployed >1 Year (%)	2.06	1.7	5.77
Homemaker (%)	6.82	7.08	4.17
Student (%)	1.89	1.76	3.21
Retired (%)	20.46	20.82	16.67
Unable to Work (%)	4.75	3.97	12.82
Depression			
Mean (Standard Deviation)	1.25 (2.92)	1.20 (2.86)	1.71 (3.46)

Table 2. Odds Ratios (and 95% Confidence Intervals) for Sleep Disturbance using logistic regression across models

Variable	Model 1	Model 2	Model 3
Race (reference = White)			
Black	0.94 (0.68-1.29)	**0.68[a] (0.48-0.96)**	0.74 (0.51-1.07)
Racism (reference = Same or Better)			
Worse	**2.61[d] (1.79-3.80)**	**1.97[c] (1.35-2.89)**	**1.61[a] (1.03-2.51)**
Sex (reference = Male)			
Female	**1.56[d] (1.32-1.84)**	**1.47[d] (1.23-1.74)**	**1.43[c] (1.18-1.72)**
Age			
Age		**0.99[b] (0.98-1.00)**	**0.99[a] (0.98-1.00)**
Education (Reference = College Graduate)			
Less than High School		**1.85[c] (1.31-2.60)**	**1.48[a] (1.00-2.19)**
High School Graduate		**1.68[d] (1.34-2.11)**	**1.62[d] (1.27-2.07)**
Some College		**1.40[b] (1.12-1.75)**	**1.34[a] (1.06-1.71)**
Income (Reference = $75,000+)			
<$10,000		**2.26[c] (1.42-3.60)**	1.47 (0.82-2.62)
$10,000-$15,000		**2.26[d] (1.50-3.41)**	1.57 (0.98-2.50)
$15,000-$20,000		**1.80[b] (1.25-2.60)**	1.32 (0.88-1.97)
$20,000-$25,000		**1.88[c] (1.37-2.59)**	1.39 (0.96-2.02)
$35,000-$35,000		1.28 (0.96-1.72)	1.06 (0.79-1.43)
$35,000-$50,000		1.30 (1.00-1.69)	1.15 (0.87-1.52)
$50,000-$75,000		1.03 (0.78-1.34)	1.00 (0.76-1.33)
Employment (Reference = Employed)			
Self-Employed		1.07 (0.77-1.49)	0.97 (0.70-1.35)
Unemployed <1 Year		**1.74[b] (1.03-2.96)**	1.24 (0.65-2.40)
Unemployed >1 Year		**2.30[a] (1.34-3.95)**	1.87 (1.00-3.50)
Homemaker		1.19 (0.89-1.58)	1.21 (0.88-1.66)
Student		0.91 (0.54-1.53)	1.05 (0.62-1.79)
Retired		1.27 (0.97-1.67)	**1.35[a] (1.01-1.80)**
Unable to Work		**3.77[d] (2.68-5.30)**	**2.20[c] (1.46-3.32)**
Depression			
Depression			**1.32[d] (1.27-1.37)**

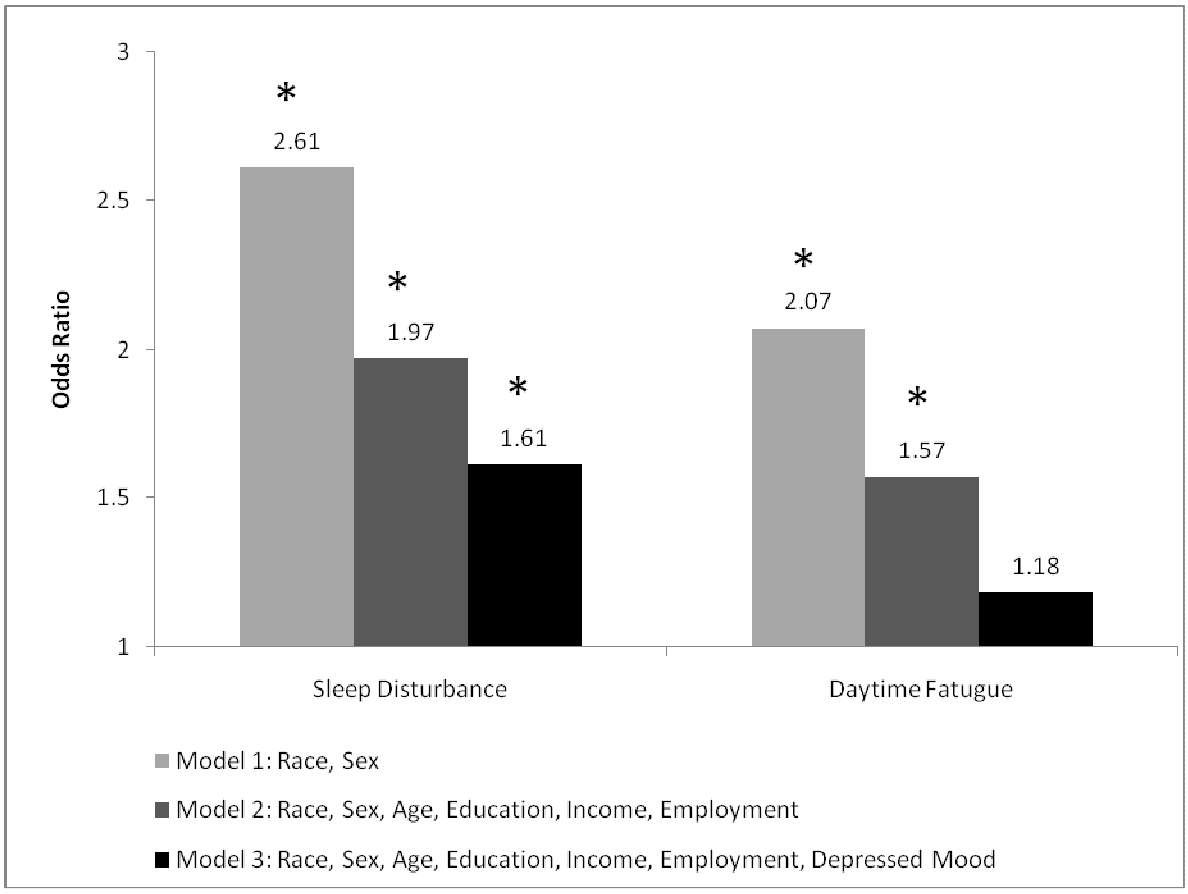
a = p<0.05; b = p<0.01; c = p<0.001; d = p<0.0001; **BOLD** = significant

Table 3. Odds Ratios (and 95% Confidence Intervals) for Daytime Fatigue using logistic regression across models

Variable	Model 1	Model 2	Model 3
Race (reference = White)			
Black	0.93 (0.68-1.28)	**0.70[a] (0.49-0.99)**	0.75 (0.50-1.11)
Racism (reference = Same or Better)			
Worse	**2.07[d] (1.45-2.94)**	**1.57[a] (1.11-2.23)**	1.18 (0.81-1.72)
Sex (reference = Male)			
Female	**1.60[d] (1.37-1.86)**	**1.49[d] (1.26-1.75)**	**1.45[d] (1.21-1.74)**
Age			
Age		**0.99[c] (0.98-1.00)**	**0.99[a] (0.98-1.00)**
Education (Reference = College Graduate)			
Less than High School		1.38 (0.98-1.95)	0.97 (0.64-1.48)
High School Graduate		**1.40[b] (1.13-1.73)**	**1.30[a] (1.04-1.64)**
Some College		**1.34[b] (1.09-1.65)**	**1.28[a] (1.03-1.60)**
Income (Reference = $75,000+)			
<$10,000		**1.77[a] (1.11-2.81)**	0.87 (0.47-1.60)
$10,000-$15,000		**3.30[d] (2.21-4.94)**	**2.42[c] (1.43-4.09)**
$15,000-$20,000		**2.84[d] (2.01-4.02)**	**2.23[d] (1.55-3.22)**
$20,000-$25,000		**2.32[d] (1.70-3.17)**	**1.71[b] (1.21-2.42)**
$35,000-$35,000		**1.65[c] (1.23-2.20)**	**1.39[a] (1.02-1.88)**
$35,000-$50,000		**1.60[c] (1.24-2.06)**	**1.42[b] (1.10-1.85)**
$50,000-$75,000		1.26 (0.98-1.61)	1.26 (0.98-1.64)
Employment (Reference = Employed)			
Self-Employed		0.92 (0.67-1.26)	0.78 (0.57-1.08)
Unemployed <1 Year		1.12 (0.65-1.91)	0.67 (0.37-1.22)
Unemployed >1 Year		**1.80[a] (1.12-2.90)**	1.33 (0.67-2.62)
Homemaker		1.16 (0.89-1.52)	1.20 (0.90-1.59)
Student		0.79 (0.48-1.30)	0.92 (0.55-1.52)
Retired		1.06 (0.83-1.37)	1.12 (0.85-1.46)
Unable to Work		**3.92[d] (2.80-5.50)**	**2.31[d] (1.55-3.46)**
Depression			
Depression			**1.44[d] (1.37-1.51)**

a = p<0.05; b = p<0.01; c = p<0.001; d = p<0.0001; **BOLD** = significant

Figure 1.



Odds Ratios for Sleep Disturbance and Daytime Fatigue for those who experience perceived racism, across Model 1 (Demographics), Model 2 (Demographics and Socioeconomics) and Model 3 (Demographics, Socioeconomics and Depressed Mood) (* = $p<0.05$).