IS SLEEP BEHAVIOR INFLUENCED BY PERCEIVED DISCRIMINATION?

A Thesis in
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By
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Abstract

Prior research on the influence of perceived discrimination on sleep quality outcomes and the potential impact of socio-demographic factors on this influence has been limited. This study uses an observational study design to analyze data from the cross-sectional annual 2007-2010 Behavioral Risk Factor Surveillance Survey. The study employs Poisson regression to examine the influence of perceived discrimination on sleep behaviors and then the impact of socio-demographic factors on the hypothesized link between perceived discrimination and sleep quality outcomes.

Overall the results indicate that individuals that report perceived discrimination have more days of poor quality sleep in comparison to those respondents that do not report perceived discrimination. This result remains even when covariates race, gender, annual household income, employment status, and education are accounted. More specifically race and annual household income indicate significant p-values in relation to sleep outcomes when in the presence of all of the mentioned covariates.

As a result of this study practitioners will more readily include perceived discrimination as a factor influencing sleep behaviors of minority patient populations that experience perceived discrimination, primarily Black patients. Also from the results, practitioners may consider the role of socioeconomic status on the link between perceived discrimination and sleep behaviors.
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Chapter 1

INTRODUCTION

Sleep is as essential to proper health as diet and exercise (National Sleep Foundation, 2012) and is responsible for the critical mechanisms of physical and mental restoration (Vgontzas & Kales, 1999). Yet sleep disorders are prevalent in the general population. Vgontzas et al. (1999) suggest that sleep disorders are linked to significant medical, psychological, and social disturbances. On average, one in five adults fails to get the proper amount of sleep (American Academy of Sleep Medicine, 2012). The National Sleep Foundation recommends adults get 7-9 hours of sleep per night (National Sleep Foundation, 2012). While sleep quantity is important, sleep quality is also important (National Institute of Health, 2009). Consistently poor sleep quality or quantity is linked to an increased risk of medical conditions such as high blood pressure and heart disease (National Institute of Health, 2009). The most common sleep complaint among Americans is insomnia (National Sleep Foundation, 2012). Often, short-term insomnia is a result of stress (Vgontzas & Kales, 1999). Medical dictionaries define stress as physical, mental, or emotional strain and stressors as the stimulant to stress (American Institute of Stress, 2012) (Webmd, 2012) (Medical-Dictionary, 2012). One such social stressor that has not yet been examined in relation to sleep outcomes is perceived discrimination.

Perceived racial discrimination contributes to observed differences among the races in health status (Williams, Yu, Jackson, & Anderson, 1997). Both Blacks and Whites experience perceived discrimination, but exposure is disproportionately greater for Blacks (Williams, Yu, Jackson, & Anderson, 1997). Contributing to this disproportional stress exposure is that Blacks occupy a low societal position because, generally, Blacks have lower socioeconomic status
compared to Whites (Williams, Yu, Jackson, & Anderson, 1997). Thus, the primary objective of this study is to explore the link between the perceived discrimination and sleep quality outcomes.
Chapter 2

BACKGROUND

Approximately 31 million people in the United States suffer from sleep disorders, which is equal to 10% of the current U.S. (including Puerto Rico) population of 310 million people (Ram, Seirawan, Kumar, & Clark, 2009; U.S Census Bureau, 2010). Nonetheless, sleep possesses underlying mechanisms that allow for physical and mental restoration properties (Vgontzas & Kales, 1999), without which adverse effects on health may occur. Since sleep is significant to health and sleep disorders are a growing problem in current society, this study’s examination of perceived discrimination will strive to address this issue in relation to sleep outcomes.

One of the most common sleep complaints is insomnia, affecting one fifth of patients who consult general physicians (Vgontzas & Kales, 1999). The National Sleep Foundation found that more than half of those individuals who complained about this condition blamed stress as the reason for their insomnia. Insomnia is defined as the inability to remain or fall asleep (National Sleep Foundation, 2012). According to The National Sleep Foundation, stress induced insomnia is contingent upon the duration and severity of the stressor. Research links insomnia to depression, anxiety, and other conditions; to anticipation of major events (i.e. weddings); and/or to disturbing occurrences (National Sleep Foundation, 2012). Since stress is a subjective phenomenon (National Sleep Foundation, 2012), perceived discrimination could potentially be categorized as a disturbing occurrence. Moreover, stressors that can be characterized as unpredictable and uncontrollable, such as perceived discrimination, are particularly harmful to health (Pascoe & Richman, 2009). The connection between stress and negative health outcomes is not new. Research suggests that among mothers with a low-birth-weight birth, a significant
association exists between perceived poor sleep quality and stress (Lee & Hsu, 2012). Using the Pittsburgh Sleep Quality Index, another study determined that in comparison to good sleepers, poor sleepers had significantly larger responses to cognitive stress (Heffner et al., 2012). Furthermore, independent of the socio-demographic profile or the existence of comorbid medical conditions, African Americans who experience poor sleep quality may be at greater risk for diabetes (Zizi et al., 2012).

Previous research has conceptualized perceived discrimination as a social stressor that rouses physiological responses (Mays, Cochran, & Barnes, 2006) and the continued arousal of these physiological responses results in negative health outcomes. One such negative health outcome related to sleep is cardiovascular regulation (Levy et al., 2012). The consequences of inadequate cardiovascular regulation include hypertension, coronary lesions, stroke, arrhythmias, coronary heart disease, obstructive sleep apnea, and increased cardiovascular mortality (Levy et al., 2012). Furthermore, animal models provide evidence connecting sleep apnea to atherosclerosis and dysmetabolism (Levy et al., 2012). Aside from inadequate cardiovascular regulation, sleep quality an independent risk factor for poor mental and physical health (Heffner et al., 2012).

U.S. study found that 80% of African-American respondents reported racial discrimination at some time in their lives (Nazroo, 2003). African-Americans generally report experiences with higher magnitudes of perceived discrimination than their White counterparts (Williams, Yu, Jackson, & Anderson, 1997). Research indicates social class does not insulate privileged African-Americans from physiological response to experiences of race-related discrimination (Braithwaite, Taylor, & Treadwell, 2009).
Perceived discrimination has not yet been included in conversations about factors influencing sleep behavior, despite a growing body of research that suggests an association between perceived discrimination and adverse health impacts (Braithwaite, Taylor, & Treadwell, 2009). One of the pioneering researchers in perceived discrimination, David R. Williams, argues “modifying identified risk factors alone will only lead to the emergence of new intervening mechanisms to maintain the same outcome,” and he goes on to name racism as a basic cause for racial health disparities (Nazroo, 2003, p. 283). In other words, interventions will be ineffective if they do not consider strategies to address perceived discrimination. Williams’s proposed solution to addressing racial differences in health is to deal with the “macrosocial factors and racism” so that interventionist do not have to continually reinvent health interventions tailored to the current health disparity (Nazroo, 2003, p. 283). Increasing the effectiveness of interventions will benefit practitioners by increasing their awareness of factors eroding health equity, and patients who will reap the benefit of improved health outcomes.

Before examining the potential relationship between perceived discrimination and sleep behaviors, it is important that this thesis define terms of perceived discrimination, sleep behaviors, and socio-demographic factors. On the basis of multiple definitions listed in the literature, perceived discrimination will be used to describe the subjective differential treatment based on race (Williams, 2008; Clark, Anderson, Clark, Williams, 1999; Nazroo, 2003). Sleep behavior suggests the number of days an individual reports poor quality sleep over a 30-day period. Lastly, socio-demographic factors will refer to the combination of annual household income, employment status, and educational attainment.

Researchers have long attributed central responsibility for racial variations in health to differences between the races in socio-economic status (Williams et al., 1997). The 1990 census
revealed that in comparison to Whites, African-Americans had 63% lower median family incomes, were more than twice as likely to be unemployed, were three times as likely to be poor, and were twice as likely not to have graduated from college (Williams et al., 1997). An estimated 50% of African-Americans blame ethnic discrimination for substandard housing, lack of skilled labor, lower wages for their population, and managerial jobs, and (Clark et al., 1999). Attributing differences in socioeconomic status to perceived discrimination does not mitigate the impact of African-Americans residing in an inferior social position. One such impact is stress responses, which is influenced by socio-demographic factors such as, education and income (Williams, Yu, Jackson, & Anderson, 1997).

Research has found that traditional measures of stress and perceived discrimination play incremental roles in accounting for differences between the African-Americans and Whites in health status (Williams, 2008). Responses to perceived discrimination can be categorized as psychological stress and physiological stress. Experiences of racial discrimination can alter the proper psychological and physiological processes and, thus, adversely impact health (Williams et al., 1997). “An individual’s perception of a life experience is a critical component of the experience of stress,” (Williams et al., 1997, p. 347). Psychological stress responses to perceived discrimination include anger, paranoia, anxiety, helplessness/hopelessness, frustration, resentment, and fear (Clark, Anderson, Clark, & Williams, 1999). Chronic psychological stress responses to perceived discrimination can lead to detrimental physiological stress responses (Clark et al., 1999). In the physiological stress response, the changes that occur in the neuroendocrine system increase cardiac activity (Clark et al., 1999).
**Sleep and Stress**

Insomnia is the most common sleep disorder (Ram, Seirawan, Kumar, & Clark, 2009), reportedly occurring more frequently in women (Vgontzas & Kales, 1999). Difficulty initiating sleep, otherwise known as insomnia, often occurs due to mental and physiological hyperarousal (Vgontzas & Kales, 1999). Often, short-term insomnia occurs as a result of stressful life events (Vgontzas & Kales, 1999), and a variety of events, such as work-related, interpersonal, or financial difficulties, are examples of situational challenges that can be connected to short-term insomnia (Vgontzas & Kales, 1999). The most common cause of chronic insomnia is psychological distress (Vgontzas & Kales, 1999). Research indicates insomniacs report greater difficulty coping with daily stressors than those individuals that do not report sleep disturbances (Morin, Rodrigue, & Ivers, 2003). Generally, individuals diagnosed with insomniacs are believed to internalize their emotions when handling a conflict or external stress, which, as a result, generates a combination of emotional arousal and physiological activation (Vgontzas & Kales, 1999) (Morin, Rodrigue, & Ivers, 2003) (Basta, Chrousos, Vela-Bueno, & Vgontzas, 2007).

The link between sleep and stress has significant implications for health outcomes (i.e. physiological and psychological risks). Previous research suggests a potential bi-directional association between sleep and stress (Garde, Albertsen, Persson, Hansen, & Rugulies, 2012). While researchers have not yet determined conclusively, the direction of the association, this study will focus on stress influencing sleep quality outcomes. More specifically, the stressors of perceived discrimination and socio-demographic factors have the potential to identify specific details about the possible link between stressors and sleep outcomes. Therefore my aims are to:
1. Assess the relationship between poor quality sleep days and perceived racial discrimination
   a. I hypothesize that individuals who report having physical or emotional reactions to racism will have more days of poor quality sleep

2. Assess the relationship between poor quality sleep days and perceived racial discrimination while accounting for race.
   a. I hypothesize that Blacks will have more days of poor quality sleep compared to Whites.

3. Assess the relationship between poor quality sleep days and perceived racial discrimination while accounting for race and socio-demographic factors
   a. I hypothesize that individuals with lower socio-demographic status will have more poor quality sleep days and that socioeconomic status will confound the relationship between race and poor quality sleep days.
Chapter 3

CONCEPTUAL FRAMEWORK AND HYPOTHESIS

*Racial battle fatigue*

Coping mechanisms are relevant in the examination of sleep outcomes because those mechanisms indicate whether an individual has further exasperated him or herself mitigated the stressor. One such coping style that has been linked to African-Americans is known as *racial battle fatigue*. The *racial battle fatigue* theoretical framework, developed by William A. Smith, details an active coping mechanism that focuses on the social psychological stress response associated with being African-American. In the African-American context of differential exposure to race-related stressors at the societal, institutional, interpersonal, and individual levels, this active coping mechanism can impair the health of the individual (Smith, Allen, & Danley, 2007). Researchers have determined that *racial battle fatigue* is a coping mechanism used by many African-Americans to deal with the mundane environmental stressors, [i.e racism] (Smith, Allen, & Danley, 2007). Similar to *racial battle fatigue*, posttraumatic stress disorder examines the natural response to living and working under mundane conditions of heightened distress (Smith, Allen, & Danley, 2007)

*Racial battle fatigue* addresses the physiological and psychological strain exacted on racially marginalized groups and the loss of energy dedicated to coping with racial microaggressions and racism (Smith, Allen, & Danley, 2007). According to Smith et al., racial microaggressions are subtle miniature assaults of racism. Though a widely accepted conceptualization of perceived racial discrimination has not yet been established (Williams, Yu, Jackson, & Anderson, 1997), literature that attempts to link perceived discrimination to health largely refers to the biopsychosocial model (Hausmann, Jeong, Bost, & Ibrahim, 2008), which
describes a link between discrimination and health (Hausmann, Jeong, Bost, & Ibrahim, 2008) by attributing exaggerated physiological and psychological stress responses to environmental stimulus (Clark et al., 1999). Stress exposure is disproportionately higher among African-Americans due to low structural location in society (Williams, Yu, Jackson, & Anderson, 1997). While Whites are not excluded from having perceived racial discrimination, they are less likely to have experienced discrimination as frequently and intensely as African-Americans (Williams et al., 1997). The magnitude of this imbalanced experience contributes to a long history of institutional racism (Clark, Anderson, Clark, Williams, 1999; Naroo, 2003).

Applied to sleep outcomes, the racial battle fatigue concept could explain expected differences among racial groups in terms of sleep outcomes. Sleep time and quality may be compromised as a result of coping with racial microaggressions and racism.

**The Role of Socio-economic Status**

In relation to socioeconomic status, generally high income and education improve health status (Williams, Yu, Jackson, & Anderson, 1997). The reduction of, observed racial differences in health occurs after adjusting for income and education (Williams et al., 1997). However, research has also found that even after researchers adjust for socioeconomic status, the differences in health status between two racial groups remained (Williams et al., 1997). Hence, research calls for greater exploration of the adverse effects of non-economic forms of racial discrimination and health.

By accounting for the impact of socioeconomic status on the relationship between perceived discrimination and sleep, this study will uniquely explore the impact socioeconomic status has on the proposed relationship between perceived discrimination and sleep behavior.
As previously mentioned, the *racial battle fatigue* hones in on the adverse outcomes of a coping mechanism linked to African-Americans. Perceived discrimination and the subsequent coping response to environmental stimuli are theorized to play a role in the complex interplay among an array of psychological, behavioral, constitutional, and socio-demographic factors (Clark et al., 1999). Although the *racial battle fatigue* phenomenon addresses the biological implications of stress, an empirical evaluation of the relationship between perceived discrimination and sleep does not exist.

To address the gap, this study empirically evaluates the relationship between sleep and perceived discrimination. A greater knowledge about the possible link between sleep behavior and perceived discrimination is likely to encourage other researchers and interventionists to consider perceived discrimination as a factor influencing sleep behavior. It has already been established that discrimination negatively affects health; furthermore, socioeconomic status is a factor influencing health status.

Research also has already determined that perceived discrimination works in the same capacity as stress in impacting sleep patterns (Williams, Yu, Jackson, & Anderson, 1997). The primary research question is whether sleep behavior is influenced by perceived discrimination among African-American adults. The secondary research question is whether socioeconomic status has an influence on the relationship between perceived discrimination and sleep behavior. Since empirical work has not yet addressed these questions, this thesis will attempt to do so.

The conceptualization of the *racial battle fatigue* phenomenon suggests that adults experiencing perceived discrimination will actively cope with that experience of discrimination with lesser average sleep as a result. The depiction of Model I demonstrates directionality,
suggested that perceived discrimination will have a negative influence on sleep outcome. Model II repeats this depiction, but also emphasizes the idea that race may influence sleep. The third model repeats the same depiction of Model II while accounting for race and socioeconomic factors. Finally, Model IV builds on Model III by adding the examination of an interaction between race and perceived discrimination. See descriptions and depictions of each model below:

Model I. Perceived discrimination & Sleep

Hypothesis 1: I hypothesize that individuals who report having physical or emotional reactions to racism will have more days of poor quality sleep

Model II. Race
Hypothesis 2: I hypothesize that Blacks will have more days of poor quality sleep compared to Whites.

Model III. Race & Socio-demographic Characteristics

Hypothesis 3: No difference exists in the comparison of sleep behaviors between high socioeconomic Black adults and low socioeconomic status Black adults.

Model IV. Race Moderator

Figure not show, builds on model III to also include a race*perceived discrimination interaction term to identify whether race moderates the relationship between sleep and reactions to racism while accounting for socio-demographic variables.

Hypothesis 4: Race will not moderate the relationship between sleep and reactions to racism while accounting for socio-demographic variables.
Chapter 4

DATA AND RESEARCH METHODS

Study Population

This analysis uses extant data from the 2007-2010 Behavioral Risk Factor Surveillance Survey. Overall, 1,729,103 White and Black men and women from Rhode Island, Nebraska, Virginia, Indiana, Georgia, and Kentucky completed the subset module for the reaction to racism. These states were selected because they participated in the reactions to racism module. For the sample, age ranged from a minimum of 18 to the maximum of 99. Socioeconomic status was measured by combining annual income, employment status, and final educational attainment. Sleep is measured by the number of days that the participant experienced poor sleep quality.

Figure 1. States included in survey: Indiana, Nebraska, Rhode Island, Georgia, Virginia, Kentucky
**Data Source**

Extant data from The Centers for Disease Control’s 2007-2010 Behavioral Risk-Factor Surveillance Survey were analyzed. The Behavioral Risk-Factor Surveillance System survey is the world’s largest ongoing telephone health survey, with more than 350,000 adults interviewed annually (Behavioral Risk-Factor Surveillance System, 2008). This state-based survey system in the United States and assesses risk behaviors and health conditions. More specifically, this survey focuses on preventive health practices and health care access primarily related to chronic disease and injury (Behavioral Risk-Factor Surveillance System, 2008). Data is collected monthly from all 50 states, including the District of Columbia, Puerto Rico, the U.S. Virgin Islands, and Guam (Behavioral Risk-Factor Surveillance System, 2008). Currently, the questionnaire has three parts: 1) the core component, consisting of the fixed core, rotating core, and emerging core; 2) optional modules; and 3) state-added questions. The fixed core is a standard set of questions asked by all states and includes queries about current behaviors that affect health (e.g., tobacco use, women’s health) and questions on demographic characteristics (BRFSS, 2012). Optional CDC modules are sets of questions on specific topics (reactions to race) that states elect to use on their questionnaires (BRFSS, 2012). For this paper, questions from the core component and optional modules were used.

**Measures**

All individuals in the sample were racially classified by others as either White or Black and were 18 or older. Creator of the perceived discrimination variables used in this thesis, Dr. Camara Phyllis Jones proposes that [race be formally understood as the social interpretation of our physical appearance in a given place and time, and suggests that it can be measured by a person’s response to the question “How do other people usually classify you in this country?”] (Jones C. P. et al., 2008 p. 496 para 2) Distinct from self-identification of race/ethnicity, Jones...
suggests that racial classification by others could provide insight into the impacts of racism on health (Jones C. P. et al., 2008).

**Sleep Quality**: The outcome of interest, sleep quality was measured as the number of days in the past 30 when sleep was reported as disturbed or was of poor quality.

**Perceived discrimination**: This variable was separated into physical reactions to racism and emotional reactions to racism.

- Physical reactions to racism is measured by whether within the past 30 days the participant experienced physical symptoms as a result of how that individual was treated based on race.
- Emotional reactions to racism is measured by whether within the past 30 days the participant felt emotionally upset, for example angry, sad, or frustrated, as a result of how that individual was treated based on race.

**Demographic characteristics**: included gender, age, racial classification (White or Black).

**Socio-demographic factors**: included education, annual household income, and employment status.

**Statistical Analysis Approach**

Descriptive statistics, including normal probability plots, means, standard deviations, and frequencies, examine the characteristics of the sample population. T-test and Anova were employed to assess the relationships among the outcome of interest, (days of poor quality sleep), occurrences of perceived discrimination, race, and socio-demographic factors.

Graph 1 shows that the distribution of sleep quality as a non-normal distribution. The diagonal line seen in this graph represents the normal distribution. However the line representing the respondents does not align with the normal distribution. Thus, it was determined that a linear
model was not the appropriate model. The data was treated as Poisson distributed (count data). Poisson regression was employed to assess the relationship between the number of days with poor sleep quality and covariates of interest. Model I examines the bivariate relationship between poor quality sleep days and perceived discrimination (yes or no). Model II includes race, and Model III includes race and all social-demographic variables. Model IV includes the same variables as model III with the addition of a race* reactions to racism interaction term. Incidence rate ratios reflect the exponentiated parameter estimates and the increase in the rate of sleep days compared to the reference group.
Chapter 5

RESULTS

Table 1 displays socio-demographic information about the sample. The variables included in the table are: sleep, age, race, gender, education, annual household income, employment status, and reactions to racism. The mean age of participants is 56.6 years (se .05). The results indicate that a majority of sample participants were White females and those who earned a high school diploma or more. The employment status is nearly equal with 47.52% unemployed and 52.48% employed. The household income demonstrates that 9.90% of the participants had incomes less than $15,000; 15.87% had incomes ranging between $15,000 and less than $25,000; 11.68% had incomes equal to or greater than $25,000 but less than $35,000; 29.47% had incomes equal to or greater than $35,000 and less than $75,000; and 33.08% had incomes of $75,000 or more. Thus, the largest household income group in the sample earned $75,000 or more in the past year. A total of 4.74%, or 3,173 individuals in the sample, reported experiencing reactions to racism. Lastly, the overall average number of poor quality sleep days reported was 12 days (se .05).

Table 2 displays the means and standard deviations for the sleep quality variable in relation to each given demographic variable. All p-values for each covariate (race, gender, education, employment, and reaction to racism) were less than .05 suggesting the existence of significant relationships between sleep and each covariate. Black respondents had on average one day more than Whites of poor quality sleep with a 12.89 days and Whites with a 11.90 days (p-value .00). Females had a slightly more days on average of poor sleep quality with a mean of 12.12 days in comparison to males with a poor sleep quality mean of 11.77 days (p-value .00). For education, those respondents without a high school diploma on average had over 2 days
more of poor quality sleep in comparison to individuals who earned a high school diploma or more. Below a high school diploma displayed a mean of (14.60) and respondents with a high school diploma or more [11.76] (p-value .00). Unemployed respondents have more days of poor quality sleep on average (12.78), with a little over one day more of reported poor quality sleep in comparison to the employed respondents (11.46).

Table 3 & 4 demonstrate that as the annual household income increased, the mean for days of poor quality sleep decreased. Respondents with an annual household income of <$15,000 had a mean of 15.42; respondents earning ≥$15,000 to <$25,000 had a mean of 13.48; respondents earning ≥$25,000 to <$35,000 had a mean of 12.00; respondents earning ≥$35,000 to <$75,000 had a mean of 11.41; and respondents earning ≥$75,000 had a mean of 10.90 (p-value .00). Lastly, respondents claiming to not have had a reaction to treatment based on race had a mean of 11.79 in comparison to those respondents who claimed to have had a reaction to treatment based on race with a mean of 15.41 (p-value .00). Thus respondents who claimed to have a reaction to racism had on average over 3.5 days more of poor quality sleep in comparison to individuals who responded that they had not had a reaction to racism.

Table 5 (see pg. 27) displays Poisson incidence rate ratios for model I, II, and III related to each specific aim. Also included in table 5 is model IV which essentially repeats model III while also examining the interaction between race and perceived discrimination.

**Results for Aim 1:** Model I displays the relationship between the number of poor quality sleep days and perceived discrimination. The results indicate that in comparison to the reference group (individuals who did not perceive discrimination), those individuals claiming to have had a reaction to perceived discrimination have more poor quality sleep days. Individuals who report
having reactions to racism had a 1.31 (CI 1.2, 1.4 and p-value .000) increase in incident rate ratio (IRR) compared to those who did not report experiencing reactions to racism.

**Results for Aim 2:** Model II demonstrates the relationship between poor quality sleep days and perceived discrimination while accounting for race. Similar to model I, model II shows that individuals who report having reactions to racism had a significant incidence rate ratio value of 1.33 (IRR) compared to those who do not report experiencing reactions to racism (while holding all other variables constant). While the study controlled for reactions to racism, Blacks have slightly more poor quality sleep days (IRR=0.93, CI (.88, .99, p-value .033), in comparison to the Whites, which is a statistically significant result.

**Results for Aim 3:** Finally, Model III will indicates the study’s assessment of the relationship between poor quality sleep days and perceived discrimination while including the race and socio-demographic factors noted in models I and II. Like Model II, the race variable displayed a significant p-value for the relationship between the race variable and the sleep variable, indicating an incidence rate ratio value of .90 (CI .85, .96, p-value .002). For the sex variable the incidence rate ratio for females in comparison to males (the reference group) was 1.02 (CI .98, 1.06, p-value .214). For the employment variable the incident rate ratio for the employed respondents in comparison to the unemployed respondents (reference group) was .98 (CI .95, 1.02, p-value .525). For the education variable the incident rate ratio for respondents that had earned a high school diploma or more in comparison to respondents that had not earned a high school diploma was .95 (CI .89, 1.01, p-value .127). In addition, as income increases, days of poor quality sleep decrease dramatically. In comparison to annual household income reference group (<$15,000), annual household incomes ≥$15,000 to <$25,000 indicated IRR= .93, CI (.86, .99), p-value .039; annual household incomes ≥$25,000 to <$35,000 indicated IRR= .82, CI (.76,
annual household incomes $\geq$35,000 to <$75,000 indicated IRR=.80, CI (.75, .86), p-value .000; annual household incomes $\geq$75,000 indicated IRR=.75, CI (.69, .80), p-value .000. However, the inclusion of income does not change the relationship between sleep quality and race or reactions to racism.

**Results Model IV** Lastly, Model IV indicates the interaction term (race variable* reaction to racism variable) was not statistically significant (IRR=0.95 CI 0.82, 1.1, p-value .538). Model IV shows similar results for all variables seen in Model III, see table 5 on page 27.
Chapter 6

DISCUSSION

In summary, individuals who reported perceived discrimination were more likely to indicate greater days of poor sleep quality. When race and socio-demographic factors were included, Blacks displayed more days of poor quality sleep and higher income individuals displayed fewer days of poor quality sleep. These results imply perceived discrimination, race, and socio-demographic factors could be viable and potential predictors for examining sleep quality outcomes.

The findings in this report suggest that perceived discrimination exists for a small percentage of individuals within the sample (n=63,494). The sample is overwhelmingly White with Blacks representing a minority proportion of the total sample. Research indicates that in comparison to Whites, Blacks are more likely to report racial discrimination (Braithwaite, Taylor, Treadwell, 2009). Due to the relatively small sample of Blacks, the results on perceived discrimination are inconclusive. Also, a majority of the sample was female, which prompts the question of whether gender may influence the number of perceived racial discrimination reports by respondents.

While prior research on the influence of racial discrimination on health outcomes has grown, (Braithwaite, Taylor, & Treadwell, 2009) speculation as to the immediate health threat of perceived racial discrimination still exists. Experts in the field predict that without studies that directly address racial discrimination, racial disparities will not be eliminated (Braithwaite, Taylor, & Treadwell, 2009). Racial discrimination results in poor physical and mental health outcomes and has further damaging consequences on society by minimizing Blacks as potential contributors to the overall society (Braithwaite, Taylor, & Treadwell, 2009). A 2007 article examines recent evidence on how the psychosocial stress produced by subjective experiences of
racial discrimination can have an adverse influence on health and health enhancing behaviors (Ahmed, Mohammed, & Williams, 2007). Another article published in the *American Journal of Public Health* explores the extent to which stress induced by racially biased scenarios influences physical and mental health outcomes (Williams, Neighbors, & Jackson, 2003). Moreover, experts suggest that without investigation of the root causes of race-associated differences in health outcomes, public health scientists are reinforcing the idea that biologically based differences, used to support the enslavement of Africans, exist between the two races.

**Limitations**

The findings in this cross-sectional study are subject to numerous limitations. One such limitation is determining the causality of perceived discrimination in influencing sleep quality. In order to make a thorough determination about the prevalence of perceived discrimination, researchers need to examine a sample that includes a greater number of Blacks. A small sample of Blacks will not provide sufficient power for an evaluation of the prevalence of perceived discrimination within the Black population. Another limitation is that the survey does not include a variety of states. Geographic location may influence the number of reported perceived discrimination. Lastly, the diversity of the respondents on demographic traits such education, household income, and, employment status may have been low due to response rates that were generally under 50%.

Another potential limitation is that sleep quality could have a bi-directional association to perceived discrimination. For example individuals that are sleep deprived may be more sensitive to discrimination and thus sleep may be influencing perceptions of discrimination. In other words, determining the direction of the association between sleep quality outcomes and perceived discrimination is limited. The data is not conducive for determining the direction of
the relationship; thus, future studies should strive to include measurements that will allow for a better determination of the directionality in the relationship between perceived discrimination and sleep quality.

To address racial discrimination, researchers need to devote energy to understanding health equity. Health equity aims to address the underlying causes of health disparities by examining the differences among populations in exposures, opportunities, and risks. The present analysis was constrained due to the low numbers of Black participants and the prevalence of the U.S. population has yet to be determined.

**Conclusions**

Overall perceived discrimination appears to have an influence on sleep quality outcomes. Though the field is still in the early stages of understanding the complex influence racial discrimination has upon various health outcomes, generally racial discrimination has adverse health effects (Braithwaite, Taylor, & Treadwell, 2009). This preliminary study further illuminates the possibility of a significant association between perceived discrimination and poor quality sleep outcomes even when socio-demographic factors are accounted. Thus, my recommendation is that future studies include perceived discrimination as an influential variable in reference to sleep quality outcomes.
<table>
<thead>
<tr>
<th>Table 1. Demographic Characteristics (n=63,494)</th>
<th>Percent (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sleep</strong> Mean(se): 12.0 (.05)</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong> Mean(se): 56.6 (0.63)</td>
<td></td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>94.35% (59,960)</td>
</tr>
<tr>
<td>Black</td>
<td>5.57% (3,534)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>36.61% (24,500)</td>
</tr>
<tr>
<td>Female</td>
<td>63.39% (42,429)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
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</tr>
<tr>
<td>Below high school diploma</td>
<td>9.30% (6,226)</td>
</tr>
<tr>
<td>High school diploma or more</td>
<td>90.70% (60,703)</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>52.48% (35,124)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>47.52% (31,805)</td>
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<tr>
<td><strong>Annual Household Income</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;$15,000</td>
<td>9.90% (6,628)</td>
</tr>
<tr>
<td>≥$15,000 to &lt;$25,000</td>
<td>15.87% (10,620)</td>
</tr>
<tr>
<td>≥$25,000 to &lt;$35,000</td>
<td>11.68% (7,817)</td>
</tr>
<tr>
<td>≥$35,000 to &lt;$75,000</td>
<td>29.47% (19,722)</td>
</tr>
<tr>
<td>≥$75,000</td>
<td>33.08% (22,142)</td>
</tr>
<tr>
<td><strong>Reaction to Racism</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4.74% (3,173)</td>
</tr>
<tr>
<td>No</td>
<td>95.26% (63,756)</td>
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</table>
Table 2. Ttest poor sleep quality days by candidate covariates

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Error</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>11.90</td>
<td>.052</td>
<td>.00*</td>
</tr>
<tr>
<td>Black</td>
<td>12.89</td>
<td>.222</td>
<td></td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11.77</td>
<td>.084</td>
<td>.00*</td>
</tr>
<tr>
<td>Female</td>
<td>12.12</td>
<td>.062</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Hs diploma</td>
<td>14.60</td>
<td>.018</td>
<td>.00*</td>
</tr>
<tr>
<td>Hs diploma or more</td>
<td>11.76</td>
<td>.051</td>
<td></td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>12.78</td>
<td>.082</td>
<td>.00*</td>
</tr>
<tr>
<td>Employed</td>
<td>11.46</td>
<td>.062</td>
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<tr>
<td><strong>Reaction to Racism</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>11.79</td>
<td>.051</td>
<td>.00*</td>
</tr>
<tr>
<td>Yes</td>
<td>15.41</td>
<td>.217</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Mean Annual Household Income

<table>
<thead>
<tr>
<th>Annual Household Income</th>
<th>Mean poor sleep quality days</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;$15,000</td>
<td>15.42</td>
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<tr>
<td>≥$15,000 to &lt;$25,000</td>
<td>13.48</td>
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<td>≥$25,000 to &lt;$35,000</td>
<td>12.00</td>
</tr>
<tr>
<td>≥$35,000 to &lt;$75,000</td>
<td>11.41</td>
</tr>
<tr>
<td>≥$75,000</td>
<td>10.90</td>
</tr>
</tbody>
</table>

Table 4. Anova poor sleep quality days & annual household income

<table>
<thead>
<tr>
<th>Source</th>
<th>Partial SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>Prob &gt; F</th>
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<tbody>
<tr>
<td>Model</td>
<td>77096.4436</td>
<td>4</td>
<td>19274.1109</td>
<td>198.12</td>
<td>.00*</td>
</tr>
<tr>
<td>Household income</td>
<td>77096.4436</td>
<td>4</td>
<td>19274.1109</td>
<td>198.12</td>
<td>.00*</td>
</tr>
<tr>
<td>Residual</td>
<td>3849884.42</td>
<td>39574</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3926980.87</td>
<td>39578</td>
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<td></td>
<td></td>
</tr>
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</table>
Table 5: Poisson incidence rate ratio models for the relationship between sleep and candidate covariates

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
<th>Model IV</th>
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<tbody>
<tr>
<td><strong>Reaction to racism</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Yes</td>
<td>1.31*</td>
<td>1.33*</td>
<td>1.27*</td>
<td>1.29*</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Black</td>
<td>.93*</td>
<td>.90*</td>
<td>.91*</td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
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<tr>
<td>Male</td>
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<td>1.02</td>
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<td>Female</td>
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<td></td>
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<td><strong>Education</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Hs diploma</td>
<td>1.0</td>
<td></td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Hs diploma or more</td>
<td>.95</td>
<td></td>
<td>.95</td>
<td></td>
</tr>
<tr>
<td><strong>Household income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$15,000</td>
<td>1.0</td>
<td></td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>≥$15,000 to &lt;$25,000</td>
<td>.93*</td>
<td></td>
<td>.92*</td>
<td></td>
</tr>
<tr>
<td>≥$25,000 to &lt;$35,000</td>
<td>.82*</td>
<td></td>
<td>.82*</td>
<td></td>
</tr>
<tr>
<td>≥$35,000 to &lt;$75,000</td>
<td>.80*</td>
<td></td>
<td>.80*</td>
<td></td>
</tr>
<tr>
<td>≥$75,000</td>
<td>.75*</td>
<td></td>
<td>.74*</td>
<td></td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>1.0</td>
<td></td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>.99</td>
<td></td>
<td>.98</td>
<td></td>
</tr>
<tr>
<td><em>Interaction</em></td>
<td></td>
<td></td>
<td></td>
<td>.95</td>
</tr>
<tr>
<td>(Reaction * Race)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note, the interaction terms between race and reactions to racism for model III is not significant as shown in this table.
Graph 1. Poor Sleep Quality Days Distribution
References


*Behavioral sleep medicine (1540-2002)*, 10 (1), 28-40. doi: 
10.1080/15402002.2012.636272 


doi:10.1097/JGP.0b013e31824361de 


Appendix A. VARIABLE DESCRIPTIONS

Covariates of interest

Socio-Demographic Factor Variables:

Individual demographic characteristics included gender, age, racial classification (White or Black).

- Education Question: *What is the highest grade or year of school you completed?*
  
  Answer: 1 = Less than high school diploma, 2 = High school diploma or more

- Income Question: *Annual household income categories*
  
  Answer: 1 = ≤$15,000, 2 = $15-25,000, 3 = $25-35,000, 4 = $35-50,000, 5 = ≥$50,000

- Employment Question: *Are you currently...?*
  
  Answer: 1=Employed, 2=Unemployed

Main effect of interest

Perceived Discrimination Variables:

- Physical Reaction Question: *Within the past 30 days, have you experienced any physical symptoms, for example, a headache, an upset stomach, tensing of your muscles, or a pounding heart, as a result of how you were treated based on your race?*
  
  Answer: values 1 = yes, 2 = no, 7 = don’t know/not sure, 9 = refused

- Emotional Reaction Question: *Within the past 30 days, have you felt emotionally upset, for example, angry, sad, or frustrated, as a result of how you were treated based on your race?*
  
  Answer: values 1 = yes, 2 = no, 7 = don’t know/not sure, 9 = refused

Outcome of interest

Poor Sleep Quality Variable:

- Question: *How many days did you not get enough sleep in past 30 days?*
  
  Answer: Values 1-30 number of days, 88 = None, 99 = refused