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The Association of Chronic Stress Secondary to Occupational Racism and Shift Work with  
Diabetes

A dissertation Submitted in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy in Nursing

by

Deborah Frances Curtis

2018

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## ABSTRACT OF THE DISSERTATION

The Association of Chronic Stress Secondary to Occupational Racism and Shift Work with  
Diabetes

by

Deborah Frances Curtis

Doctor of Philosophy in Nursing

University of California, Los Angeles, 2018

Professor Wendie A Robbins, Chair

**Purpose:** The potential role of work place bias (WPB) and shiftwork in relationship to diabetes has not been studied in African American (AA) female nurses. Shiftwork (SW) has been shown to be associated with weight gain but this has not been studied in AA women in relationship to diabetes or WPB. The primary aim of this pilot study was to examine the relationship between WPB and diabetes in AA women. A sub-aim was to evaluate the potential mediating effects of chronic stress and moderating effects of SW.

**Conceptual Framework:** This study is based on three theoretical frameworks: the theory of allostatic load; intersectionality; and ecosocial epidemiology.

**Methods:** This was a cross sectional correlational study (n= 96) that examined the associations between WPB, SW, chronic stress and diabetes in AA registered nurses. Data acquisition was by self-report questionnaires, blood and saliva biomarkers of chronic stress and anthropometric measures.

**Results:** Institutional WPB was associated with diabetes in the population of AA\_nurses,  $X^2 (2) = 7.21, p = .03$ , and BMI,  $r = 0.25, p = .02$ . Institutional WPB was associated with Waist to Hip

Ratio (WHR),  $r = 0.21$ ,  $p = .02$ . WHR was associated with HbA1C,  $F(1,89) = 7.38$ ,  $p = .01$  and interpersonal work place bias,  $r = 0.21$ ,  $p = .02$ .

More than half of the study population were shift workers. Although SW was not associated with diabetes or obesity in this population, it was associated with WHR,  $X^2(1) = 5.59$ ,  $p = .02$ . Job strain was associated with institutional WPB  $r = -1.32$ ,  $p = .032$  and ERI associated with both institutional and interpersonal WPB  $r = .142$ ,  $p = .001$  and  $r = .149$ ,  $p = .002$  respectively.

Allostatic load was not related to WPB but was associated with length of employment,  $r = 0.25$ ,  $p = .02$ .

**Conclusions:** We found a significant relationship between interpersonal WPB and WHR, a proxy for visceral adiposity, suggesting WPB may have role in the onset of diabetes. This was not a function of socioeconomic status in this population of AA nurses, 70 % earned an annual salary of \$75,000-\$150,000 per year. Additional findings for this population of AA nurses suggest that body mass index is associated with institutional WPB but not associated with interpersonal WPB. When shiftwork was added to the model it moderated the relationship suggesting there is a combined effect of SW and WPB on BMI. In this population, we did not find a clear indication of allostatic load based on the biomarkers used; however, we did find a significant relationship between job strain, effort reward imbalance and institutional WPB. This relationship suggests this population is experiencing stress from WPB and warrants further study.

The dissertation of Deborah Frances Curtis is approved.

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2018

## Dedication Page

This research is dedicated to my mother, my husband, my two children and grandchildren.

Without your love and support this degree would not be possible.

To my Grandmother, Father and my two sons, Emanuel and Ronald; may you continue to watch over me from heaven.

Na hatimaye, kwa rafiki yangu milele, bila upendo wako, faraja, na msaada, hakuna chochote kinachowezekana. Ninakupenda na yote niliyo nayo.....KOZD

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## **List of Acronyms**

AA	African American
AL	Allostatic Load
ALM	Allostatic Load Model
BMI	Body Mass Index
CAR	Cortisol Awakening Curve
DBP	Diastolic Blood Pressure
EOD	Everyday Experience of Discrimination
ERI	Effort Reward Imbalance
HA1C	Hemoglobin A 1 C
HDL	High Density Lipo Protein
HPA	Hypothalamus Pituitary Adrenal
JCQ	Job Content Questionnaire
LDL	Low density Lipo Protein
LSS	Life Stress Scale
SAM	Sympathetic Adrenal Medulla
SBP	Systolic Blood Pressure
TC	Total Cholesterol
T2DM	Type 2 Diabetes Mellitus
WHR	Waist to Hip ratio
WPB	Workplace Bias

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The Relationship between Workplace Racism and Obesity in African American Women: A Pilot Study. Poster Presentation. Interdisciplinary Fall Workshop. Southern California Education and Research Center. 9/2017

The Relationship between Workplace Racism and Obesity in African American Women: A Pilot Study, Podium Presentation. WIN Conference April 2018, Spokane Washington.

## CHAPTER 1

### INTRODUCTION

The widespread prevalence of obesity related T2DM has led to the term “diabesity” (diabetes+obesity) first coined by Dr. Francine Kaufman (Kressler, 2015). Diabesity is defined as obesity accompanied by metabolic dysfunction ranging from mild insulin resistance to T2DM. Diabesity may be accompanied by abdominal obesity, dyslipidemia, hypertension, and systemic inflammation (Farag & Gaballa, 2011). This group of symptoms is also associated with allostatic load indicating diabesity may be a result of chronic stress (Juster, McEwen, & Lupien, 2010)

#### **Obesity**

Obesity has reached epidemic proportions in populations around the world with the rate of global obesity doubling since 2008 (World Health Organization [WHO], 2013). The World Health Organization reports that more than 1.4 billion adults in the world are overweight and of that number, approximately 300 million are women (World Health Organization 2013). In the United States, over 72 million adults are obese (Centers for Disease Control and Prevention [CDC] 2012). Although obesity rates are increasing across all ethnicities and in both genders, it is disproportionately higher in African American (AA) women. This disparity persists after controlling for income, suggesting it is independent of socioeconomic status (CDC, 2011).

Obesity poses a serious health threat and increases morbidity and mortality. One serious health consequence of obesity is Type 2 Diabetes Mellitus (T2DM). The burden of diabetes on healthcare in the United States for all persons diagnosed is enormous, costing approximately 245 billion in health care dollars, 176 billion in direct medical costs, and 69 billion in reduced

productivity for all ethnicities per year (Yang et al., 2013). In the United States, over 15.7 million people are diagnosed with T2DM and over half of these are women (Vinicor, 2011). African American, Hispanic, Native American, and Pacific Islanders are 2-4 times more likely than Whites to be diagnosed with this disease (Vinicor, 2011). African American women, when compared to their White counterparts, are 2.7 times more likely to develop or be diagnosed with diabetes or prediabetes (Office of Minority Health, 2012).

### **Allostatic load**

It is well known that cumulative exposures to psychosocial and environmental stressors lead to allostatic load (AL) and subsequent poor health outcomes including obesity and diabetes (Duru, Harawa, Karmah, & Norris, 2012; Mays, Cochran, & Barnes, 2007; McEwen & Stellar, 1993). Stress activates the hypothalamic pituitary adrenal (HPA) axis, the sympathetic nervous system and the sympathoadrenal medullary (SAM) system, which releases endogenous cortisol and catecholamines (Chong, Uhart, NcCaul, Johnson, & Wand, 2008). In chronic or continuous stress, allostasis is exhausted and the physiologic response becomes maladaptive (McEwen & Seeman, 2009). Excess cortisol results in a gain in visceral obesity which then results in insulin resistance and hyperinsulinemia (Pasquali, 2012).

### **Racism and Stress**

Chronic stress may result from many life and situational factors. One source of stress is from both perceived and internalized racism which results in poor health outcomes (Cozier, et al., 2014; Mays, 2007). Another possible source of chronic stress may result from occupational racism. Occupational racism may be a source of chronic stress in AA women and hence the disproportionate incidence of diabetes in this population. Although studies on occupational racism and diabetes among African American women have not been published, there is



evidence of the effect of occupational racism on other health outcomes. Occupational racism among African American women may be the result of institutional racism and/or interpersonal racism. Institutional racism can be the result of negative racial and gender perceptions of African American women preventing career opportunities or advancement within institutions (Carbado, Crenshaw, Mays, & Tomlinson, 2013). Effort reward imbalance and lack of career advancement is associated with institutional discrimination and results in job stress (Carbado, Crenshaw, Mays, & Tomlinson, 2013).

Perceived discrimination in a predominantly Caucasian profession may increase role strain and job stress (Mays, Coleman, & Jackson, 1996). Nursing is a Caucasian female dominated profession, with 72.4% Caucasian and 10.9% AA, practicing in urban areas of the United States (Health Resources and Services Administration, [HRSA], 2013). Most nurses practice in hospitals, which are White male dominated institutions in terms of chief executives and physicians (Table 1)(United States Department of Labor, 2018) (White & Chanoff, 2011); and AA nurses practice in white female dominated areas (HRSA, 2013), this places the African American woman in a position where she is likely to experience role stress, job stress and discrimination. The experiences of discrimination in the workplace then lead to chronic stress resulting in poor health outcomes (Mays, Coleman, & Jackson, 1996).

Table 1: Summary of occupations found in hospital organizations and work area (extracted from United States Department of Labor, 2018).

Occupation	White (men and Women) (percent)	Women (percent)	African American (percent)
Chief Executives	90	28	3.8
Medical and Health Service Managers	69.8	77.9	14
Human Resources Worker	72.1	80.2	11.8
Pharmacist	68.5	57.5	8.2
Registered Nurse	76.7	89.9	12.3
Nurse Practitioner	84.7	92.2	10.6
Physicians Surgeon	72	40	8.2

Discriminatory experiences in this population have been related to poor health outcomes, particularly cardiovascular disease risk factors (Richman & Jonassaint, 2008). Hypertension and racism has been established in the literature (Din-Dzietham, Nembhard, Collins, & Davis, 2004; Mezuk, Kershaw, Hudson, Lim, & Ratliff, 2011). It was found that African Americans, particularly African American women who reported a higher frequency of discrimination, had a higher odds ratio of hypertension OR = 1.4 (95% CI: 1.0-1.9) for each increment of stress OR = 1.2 (95% CI: 0.8-1.5) (Din-Dzietham, Nembhard, Collins, & Davis, 2004). The stress of discrimination has both direct and indirect effects on health. The indirect effects are due to lack of socioeconomic status attainment through educational achievement, academic performance, job promotion, neighborhood choices and access to healthcare (Williams, 1999). The direct effects of racism can occur through neurochemical messaging affecting cardiac reactivity and renal function. Long-term stress secondary to discrimination can lead to a dysfunction in neurochemical messaging resulting in endothelial stiffness (Wyatt et al., 2003).

### **Shift work and Stress**

Shift work can be described as rotating shifts or permanent shifts where the employee works unusual hours of the day. Shift work results in physiological stress secondary to its effects on the circadian rhythm (Kivimäki, Batty, & Hublin, 2011) which in turn triggers biological changes, resulting in a higher risk of diabetes (Kivimäki, Batty, & Hublin, 2011). In addition, poor diet, insufficient sleep, and low physical activity all are associated with shift work, and are risk factors for developing insulin resistance (Kivimäki, Batty, & Hublin, 2011).

Women working shiftwork are at an increased risk for poor health due to poor sleep quality and fatigue. Women have an increased burden due to domestic duties related to childcare and household chores. In a survey of 500 women workers, it was reported that in one week

women spend 31.2 hours in the workplace and a minimum of 19.2 hours performing domestic duties. This double workload reduces the total sleep time and results in increased sleepiness and fatigue (Chung & Wolf, 2009).

### **Significance**

The prevalence of obesity and diabetes in AA women in the United States has reached epidemic proportions (American Diabetes Association [ADA], 2011). Prevention strategies have failed to decrease the incidence of newly diagnosed cases of T2DM in AA women (Gucciardi, Chan, Manuel, & Sidani, 2013). Health promotion and self-management interventions have also failed to decrease the rising prevalence of obesity and T2DM in AA women (Kumanyika, Whit-Glover, & Haire-Joshu, 2014). This suggests that the underlying causal mechanisms for obesity and diabetes in AA women are poorly understood.

#### Significance to Occupational Health Nursing

One of the initiatives of the National Institute for Occupational Safety and Health (NIOSH) is Total Worker Health<sup>®</sup>. It is defined as “a strategy integrating occupational safety and health protection with health promotion to prevent worker injury and illness and to advance health and well-being” (NIOSH, 2014, paragraph 1), which when analyzed implies that employers or organizations have an obligation to provide programs that promote employee well-being. Well-being is described by the Centers for Disease Control and Prevention (CDC), “as the presence of positive emotions and moods and the absence of negative emotions” (CDC, 2013, para. 5). The implication of the NIOSH initiative and CDC definition is that occupational stressors and employee physical and mental health issues are significant factors in the workplace. Identification of the association of occupational stress in employees is the first step in the remediation of these stressors. Hence, the goal of this study is to identify occupational stressors

in a cohort of African American women and relate these stressors as associative factors for obesity and diabetes. Identification of such stressors paves the way for the implementation of an occupational health wellness initiative that includes improving workplace practices and thereby improving worker health.

### Identified Literature Gap

A significant gap in the literature exists for the potential relationship between perceived stress, shift work, and occupational racism in association with central obesity and T2DM in African American women. Since African Americans make up a large majority of shift workers and female shift workers reportedly sleep less than their male counterparts because of domestic and childcare responsibilities, AA women may be at higher risk for stress related metabolic disorders (Roszkowski & Jaffe, 2012).

### **Research Questions, Aims, Hypotheses**

The purpose of this research is to explore relationships between obesity and T2DM, work based racial discrimination and shift work among AA women. The study population includes AA females employed as registered nurses in southern California. The study research questions and hypotheses to be explored in this study population of African American women are as follows:

**Research Question 1:** Is there a relationship between Work Place Bias and Hemoglobin A1C in African American female nurses?

*H<sub>a</sub>:* African American female nurses who report Work Place Bias will have higher levels of Hemoglobin A1C

**Research Question 2:** Is there a relationship between Work Place Bias reported by African American female nurses and obesity as measured by Body Mass Index and/or Waist to Hip Ratio?

*H<sub>a</sub>*: African American nurses who report Work Place Bias will have higher Body Mass Index.

**Research Question 3:** What is the effect of shiftwork on the relationship between Work Place Bias and measures of obesity, and Hemoglobin A1C?

*H<sub>a</sub>*: There will be a difference in the relationship between Work Place Bias, obesity and Hemoglobin A1C with shiftwork and non-shiftwork?

**Research question 4:** What is the relationship between Work Place Bias and Allostatic load?

*H<sub>a</sub>*: There will be a relationship between Work Place Bias scores and allostatic load.

### **Theoretical Framework**

This study is based on a reformulation of three theoretical frameworks: the theory of allostatic load; intersectionality; and ecosocial epidemiology. Allostatic load describes the biological response to chronic stress and its physiological consequences (Juster, McEwen, & Lupien, 2010). The second theoretical framework guiding this study is intersectionality; this theory posits that the effects of gender and race are not separate or additive but interactive (Bauer, 2014). This theory is ideal for health disparities research in African American women as it is rooted in black feminism and critical race theory (Crenshaw, 1991). Ecosocial theory, an emerging theory developed by Nancy Krieger, integrates biological and social processes with a historical and ecological approach to explain social inequalities and resultant health disparities (Krieger, 2011).

### **Methodology**

This was a cross sectional correlational study to examine the association of occupational racism, and shift work with obesity and T2DM. Obesity and T2DM are collectively referred to as diabetes. The study population included African American women employed as registered nurses in Southern California. Areas of employment included hospitals, ambulatory care clinics,

and nursing education. Level of education ranged from associate degree to doctorate degree. Participants were recruited from nursing organizations, hospital wide email, referrals, and direct approach.

This study used several instruments for data collection. To determine discrimination at work, the Workplace Bias scale was used (Burkard, Boticki, & Madson, 2002). The Job Content Questionnaire and Effort Reward Imbalance scales were used to determine the relationship of job strain, effort reward imbalance and allostatic load (CDC, 2014.)

Biological parameters measured included anthropometric measurements, blood pressure, a lipid profile, hemoglobin A1C, C - reactive protein (CRP), and salivary cortisol awakening curves(Steptoe et al., 2014). Allostatic load was calculated from anthropometric measurements, blood pressure, hemoglobin A1C, and the lipid profile; the score was used in a correlation model with job strain, effort reward imbalance and workplace bias(Steptoe et al., 2014).

### **Organization of Chapters**

This dissertation consists of six chapters. Chapter 1 is the introduction, Chapter 2 is a literature review of the current state of the science. The discussion will examine the relationship between obesity, T2DM, shift work and occupational racism. The review also includes a discussion on chronic stress, allostatic load, and neuroendocrine dysfunction in relationship with obesity and T2DM. Chapter 3 is a discussion of the theoretical frameworks that guided this research. Chapter 4 is a discussion of the methodology, inclusion and exclusion criteria, and measurement tools that were used to carry out the research. In addition, operational definitions have been provided for all of the variables. In chapter 5, the statistical analyses and results are provided. The discussion is provided in chapter 6.

## **Chapter 2**

### **LITERATURE REVIEW**

Obesity and type 2 diabetes (T2DM) collectively referred to as diabetes, have reached epidemic proportions in the United States (Best, 2008). At the current trend, the rates of obesity are projected to reach up to 44% of the US population by 2030 with newly diagnosed T2DM cases increasing by multiples of 10 and 20 in the years 2020 and 2030 respectively (Health, 2012). Based on current projections, it is estimated that health care cost of treatment will rise by 66 billion dollars per year and the loss of economic productivity is estimated to reach 390-580 billion dollars in the United States (Trust for America's Health, 2012). The burden of obesity and diabetes result in increased risk for chronic diseases, including cardiovascular disease and stroke (Frag & Gaballa, 2011). The health care cost associated with obesity and diabetes in the United States is approximately 147 billion and 116 billion dollars per year respectively (ADA, 2011).

African American women are of interest due to the high prevalence and rising incidence of obesity and T2DM in this population. Based on previous studies, this may be due to exhaustion of the hypothalamic pituitary axis secondary to allostatic load. Allostasis is a condition resulting from exposure to chronic stress. One source of chronic stress may be secondary to the cumulative effects of working shift work (Kivimäki, Batty, & Hublin, 2011) and exposure to work based racial discrimination (Din-Dzietham, Nembhard, Collins, & Davis, 2004; Mays, Coleman, & Jackson, 1996).

#### **Aims**

The aim of this literature review is to examine the effects of occupational and psychological stress on the HPA axis stimulation in African American women who are shift workers and the association of chronic stress with obesity related T2DM. The collective effects

of shift work, occupational strain, and work based racial discrimination may lead to HPA axis overload leading to the disparate rise in obesity and T2DM in AA women. To date there are no known published studies that have examined the collective effects of these variables in African American women.

## **Methods**

A literature search was performed on CINAHL, PubMed, and Psych info using the keywords African American women, Type 2 diabetes, obesity, HPA axis, and occupational strain. The filters added included middle age, female gender, and publications within the last 5 years, which reduced the number of articles. Article titles were evaluated for appropriateness to this literature review, abstracts were read and evaluated. Other search terms used were HPA axis and obesity, occupational strain and diabetes, occupational stress and obesity, occupational strain and racism, diabetes and racism, race based racism at work and diabetes or obesity, shift work and obesity or shift work and diabetes, which yielded additional publications. Other sources of literature were from cited references and if the researchers looked at HPA axis and stress, obesity and type 2 diabetes and shift work or job stress.

## **Stress**

Stress plays a role in health and disease and is a major factor in the development of central obesity, which leads to adverse health outcomes (Pasquali, 2012). Hans Selye coined the concept of stress in 1936. In 1950, he published his synopsis of the human adaptation to stress. In his landmark paper, Selye describes the three stages of the adaptation theory and he defines stress as the interaction between damage and deference. In the three stages, response to stress differs. In the first, there is an alarm phase where there is a fight or flight response. In this stage, the endocrine system is activated to prepare for a reaction. In the second stage, resistance, the



organism has adapted to the stressor, the endocrine activation is reversed, and homeostasis prevails (Selye, 1950). In the third stage, the stage of exhaustion, the endocrine activation is once again activated and catecholamines and glucocorticosteroids are released into the blood. Selye attributed this reactivation to an organism's finite ability to adapt to stressors. Prolonged, unrelenting stress will cause exhaustion and the inability to adapt resulting in illness (Selye, 1950)

### Hypothalamic Pituitary Axis and Stress

A peak in the morning level characterizes the diurnal cortisol response pattern in human physiology with a gradual decline during the day and a nadir during sleep (Frag, et al., 2008; Looser, et al., 2010). When an individual is faced with stress, there is a surge in cortisol secondary to HPA-Axis activation from a sympathetic nervous system response (Ebrecht, Mohamed-Ali, Feldman, Kirschbaum, & Steptoe, 2003; Frag et al., 2008).

This cortisol surge was evident in a study conducted with female Swiss nurses; the researchers found a positive correlation with perceived stress and elevations in cortisol and heart rate. Additionally, the research revealed during periods of low stress, cortisol followed a normal diurnal pattern (Looser, et al., 2010). A similar study (Frag, et al., 2008) found that perceived stress was positively correlated with cortisol surges and predicted changes in the normal diurnal pattern. However, cortisol measured at seven different time points did not differ by BMI category, thus BMI is not a significant predictor of cortisol variability. The authors attribute this lack of variability in obese and overweight women to neuroendocrine dysfunction secondary to chronic stress. In the Whitehall II study, it was found that chronic stress does not result in a large cortisol surge, instead the cortisol levels are low, and inflammatory cytokines were prevalent (Ebrecht, Mohamed-Ali, Feldman, Kirschbaum, & Steptoe, 2003). In those with cortisol surges,

levels of psychological stress and feelings of hopelessness were higher. In participants with low levels of cortisol, they found a higher waist to hip ratio and high scores on the quality of life assessment indicating poor mental health (Ebrecht, et al., 2003).

These studies suggest that cortisol expression is dependent on the level and acuity of stress and that chronic stress is associated with obesity. The above studies did not address cultural differences in cortisol response; however, they did discover a positive interaction with obesity, perceived stress, and quality of life (Ebrecht, et al., 2003; Farag & Gaballa, 2011; Looser, et al., 2010). Chronic stress results in physiological dysfunction eliciting a phenomenon referred to as allostatic load (AL) (Peek, et al., 2010).

#### Allostatic load

Allostatic load, a term used to describe exhaustion of adaptive physiology to chronic stress, is associated with poor health outcomes (Chyu & Upchurch, 2011). An AL score can be calculated based on several biomarkers and the score is associated with health outcomes and racial disparities (Chyu & Upchurch, 2011; Deuster & Remaley, 2011; Peek, et al., 2010). Chyu & Upchurch (2011) used 10 biomarkers from the National Health and Nutrition Examination Survey (NHANES) data of 1999-2004 to calculate the AL score for 55,765 women who self-identified as White, Black, or Mexican American. Their findings suggest that Black women age earlier and have an earlier onset of health deterioration when compared to women of other ethnicities. In Black women, aged 40-49 and 50-59, AL scores were higher in comparison to White women by 14% and 24%, respectively (Chyu & Upchurch, 2011). This percentile increase further supports the notion that Black women carry a greater stress burden than White women.

Another study looked at Black and White Americans and compared health risks based on AL scores. The participants had similar income and education and smoking behavior was

matched. They found African Americans had higher AL scores ( $3.4 \pm 1.9$ ,  $p < 0.01$ ) than Whites ( $2.4 \pm 1.9$ ,  $p < 0.01$ ). The odds ratio for an African American having a score  $\geq 3$  was 2.2 (CI: 1.04-4.6,  $p < 0.05$ ). Allostatic load scores did not differ by gender (men  $2.8 \pm 2.0$ , women  $3.3 \pm 2.0$ ), education ( $\geq$  college degree  $3.1 \pm 2.0$ , lower than college degree  $3.2 \pm 1.9$ ), or income ( $\geq$  \$50,000/year  $3.1 \pm 2.0$  < \$50,000/ year  $3.2 \pm 1.9$ ). The only significant finding for differences in AL score was ethnicity. In addition, they found that women experienced more tension, more body fat and lower VO2 max (maximum oxygen consumption) or exercise tolerance. African American men and women both had lower exercise tolerance, lower triglyceride levels and lower morning cortisol levels (Deuster & Remaley, 2011). The low fasting cortisol levels are consistent with the findings of Tull, Sheu, Butler & Cornelius (2005) from a study conducted in Dominica, in Afro-Caribbean women. In their cross-sectional study, they found women who reported high levels of perceived stress had low morning cortisol levels (Tull et al., 2005). These studies provide evidence that higher AL scores have been consistently reported in AA men and women (Chyu & Upchurch, 2011). Additionally, women with high scores have higher body fat and less exercise tolerance (Deuster & Remaley, 2011). One explanation for the disparity between AA men and women and Whites may be chronic exposure to discrimination and occupational strain, which are known stressors that affect health (Mays, Cochran, & Barnes, 2007)

#### Occupational Strain and Obesity

Psychosocial stress can result from occupational strain or work stress, which occurs when job demands are high and control is low (Karasek, 1979; Kivimäki, et al., 2006). The effects of work stress on body weight differ between men and women. The differing effects were seen in a secondary analysis of the Whitehall II study data, a large cohort study conducted in London civil service workers (Kivimäki, et al., 2006). In the Whitehall II study, work stress and BMI were

examined in both men and women. In both sexes, there was an increase in BMI with increased stress.

However, the increase in women was greater,  $1.1\text{kg/m}^2$  compared to men  $0.6\text{kg/m}^2$  illustrating the important connection between job stress and increased BMI in women (Kivimäki, et al., 2006). A meta-analysis was able to show that changes in job strain and BMI tended to co-occur, and an increase in job strain resulted in an increase in obesity and the reverse was true. However, when researchers stratified the data on socioeconomic status, there was a lack of significance. As a result, job strain has been only weakly linked with socioeconomic status (Nyberg, et al., 2011).

Another prospective study found a significant correlation between job-related stress, BMI, and waist circumference. This study provides evidence that chronic work stress predicts general and central obesity (Brunner, Chandola, & Marmot, 2007). Job strain and stress has been positively correlated with central obesity (Brunner, et al., 2007) and central obesity with T2DM (James, Rigby, & Leach, 2004). Women who reported high job stress and low control had a higher incident rate of T2DM (Heraclides, Witte, Chandola, & Brunner, 2009). The correlation of work stress, obesity, and T2DM is secondary to activation of the HPA axis leading to a release of cortisol, which leads to visceral adiposity and insulin resistance (Heraclides, et al., 2009). The aforementioned studies contribute to the evidence that job strain is associated with weight gain and therefore contribute to adult obesity. Job stress results in neuroendocrine dysfunction leading to visceral obesity and insulin resistance (Heraclides, et al., 2009).

### **Shift work**

Shift work (permanent or rotating shifts) contributes to cardiovascular risk factors that include metabolic disturbances (Bacquer, Risseghem, Clats, Kittel, & Braeckman, 2009). In a

large observational, prospective study over a 6-year period, 20% of the workers were shift workers and 84% of the 20% worked rotating shifts. The incidence rate of metabolic syndrome, defined by abdominal obesity, hypertension, impaired glucose tolerance, and dyslipidemia, was 32.7% and 21.6% in rotating shift workers and day workers respectively (Bacquer, et al., 2009). Moreover, the incidence rate was higher in long-term shift workers indicating a dose response relationship (Bacquer, et al.,2009). The effects of shift work on nurses was studied in two phases of a large prospective cohort study. The researchers found an increase in the risk for type II diabetes in shift workers. When shift workers were compared to day workers as well as years of shift work, researchers found a positive correlation between weight gain and diabetes risk with years of shift work (Pan, Schernhammer, Sun, & Hu, 2011). This study provides evidence of a dose-response relationship between shift work and the development of diabetes (Pan et al., 2011). The strengths of the research include the longitudinal design and large sample size. The limitations include self-report data, homogeneity of participants, which included primarily White female nurses. The lack of ethnic and socioeconomic diversity inhibits results from being generalizable to a more diverse population.

The strong points of the study included the ability to predict physiological and biological variables of metabolic syndrome by rotating shift work. The limitations of the study included small sample size, geographically isolated sample, and no correlation to ethnicity, diet, or exercise.

The above studies contribute to the evidence that shift work results in metabolic dysfunction (Bacquer et al., 2009; Pan et al, 2011).

## **Racial Discrimination**

Psychological stress secondary to racial bias contributes to health disparities amongst ethnic groups and can result in poor health outcomes (Mays, Cochran, & Barnes, 2007; Richman & Jonassaint, 2008). Previous research has identified two types of racism, internalized and interpersonal that result in poor health outcomes among AAs. Internalized racism is defined as racism against one's own race secondary to beliefs or internalization of racist stereotypes (Tull, Sheu, Butler, & Cornelius, 2005). Interpersonal racism is defined as maltreatment or bias that occurs from one person to another with the receiver perceiving the maltreatment as discrimination (Hunte, 2011).

One study indicated women who experience high levels of internalized racism have a higher waist to hip ratio and BMI than those with low levels (Tull, et al., 2005). Another study found a positive relationship between interpersonal discrimination and its effects on body weight as well as an association between discrimination and obesity and HPA axis dysfunction (Hunte, 2011).

A large prospective longitudinal study examined the association of perceived racism with change in weight and waist circumference in a sample of 43,103 black women. They found a positive correlation with perceived racism coupled with a major discriminatory event and an increase in BMI and waist circumference (Cozier, Wise, Palmer, & Rosenberg, 2009). In addition, women who reported high levels of perceived stress in the home and work environment had a larger increase in weight and waist circumference (Cozier, et al., 2009). Although cortisol was not measured in this study, the authors attributed the alterations in weight and waist circumference to activation of the HPA axis and cortisol release in response to stress based on information from human and animal studies on stressors and weight gain (Cozier, et al, 2009).

These studies contribute to the evidence that racism adds to stress related obesity validating the need for further research in this area. The work environment has a major impact on health and over half of our waking hours are spent at work.

### **Occupational Racism**

Workplace discrimination can lead to chronic stress thereby influencing health (An, Braveman, Dekker, Egerter, & Grossman-Kahn, 2011). Research has demonstrated there is an association of psychosocial stress and adverse health in African American women and perceptions of race based discrimination in the workplace is a source of job related stress (Cozier, et al, 2009; Din-Dzietham, Nembhard, Collins, & Davis, 2004; Heraclides, Witte, Chandola, & Brunner, 2009; Mays, Coleman, & Jackson, 1996; Mezuk, Kershaw, Hudson, Lim, & Ratliff, 2011). There are no known current studies on race-based discrimination at work and obesity in Black Americans; however, hypertension and racism have been studied in this population.

One study, conducted in the metropolitan area of Atlanta Georgia using cross sectional data from the metro Atlanta heart disease study, investigated the association of hypertension with intergroup and intragroup race based discrimination among Black men and women. In this study, 356 Black men and women were asked about racism or discrimination. Of the 356, 35% reported inter group racism. The characteristics of those who experienced intergroup race based discrimination at work included higher education and income. Additionally, perceived stress, in the intergroup, was higher and positively correlated with a higher BMI and blood pressure. Gender did not influence study findings (Din-Dzietham, et al., 2004).

Conversely, a larger study conducted in a geographically diverse population, did not find a statistically significant association with workplace discrimination and hypertension (Mezuk, et

al., 2011). However, they did find that Blacks, particularly Black females, reported a higher frequency of discrimination and subsequently had a higher odds ratio for hypertension (OR: 1.68; 95% CI: 1.12-2.52). Their study did not draw any inferences to weight and discrimination or diabetes and discrimination; nevertheless, it demonstrates that Black women experience a higher frequency of race based discrimination at work (Mezuk, et al., 2011).

Although the relationship between obesity and work-based discrimination among black women has not been well studied, there is evidence of its effects on health. Discriminatory experiences in this population have been related to poor health outcomes (Mays, Coleman, & Jackson, 1996), particularly cardiovascular disease risk factors (Richman & Jonassaint, 2008). Acts of discrimination, whether at work or in the home environment, contribute to psychological stress resulting in HPA dysfunction (Hunte, 2011).

### **Synthesis of the Literature**

Based on the review of the literature, it is evident that stress results in HPA activation which in turn releases cortisol (Ebrecht, Mohamed-Ali, Feldman, Kirschbaum, & Steptoe, 2003; Looser, et al., 2010). When individuals are challenged by stress, there is a cortisol surge except for in cases where an individual is subjected to repeated stresses (Ebrecht, et al., 2003). In the occurrence of chronic stress, cortisol is depleted and the individual has a flattened diurnal cortisol curve and a higher rate of visceral obesity (Tull, Sheu, Butler, & Cornelius, 2005). Allostatic load, the term for the exhaustive phase of the general adaptation syndrome, results from chronic stress and is associated with increased body fat and exercise intolerance (Chyu & Upchurch, 2011). AL scores, calculated from biological, physiological, and psychological markers, are increased in Black men and women when compared to Whites. African American women score higher for allostatic load and they age 1.5 times faster than their Caucasian age-



mates, a condition referred to as weathering (Geronimus, Hicken, Keene, & Bound, 2006; Mays, Cochran, & Barnes, 2007)). In AA women, the greater burden of stress was found to be independent of socioeconomic status, with male or female sex being the only predictor of elevated scores (Chyu & Upchurch, 2011; Deuster & Remaley, 2011; Geronimus, Hicken, Keene, & Bound, 2006).

Additional stressors challenging workers and contributing to obesity and T2DM are occupational strain and shift work. Evidence supports that job strain results in an increase in BMI and central obesity without regard to socioeconomic status. There is also evidence that shift work predicts future T2DM and there is a dose response relationship (Bacquer et al., 2009; Pan et al, 2011).

Racial discrimination contributes to psychological stress in Black Americans. It was found that Blacks report experiences of internalized and interpersonal racism (Cozier, Wise, Palmer, & Rosenberg, 2009; Tull, et al., 2005). Both types of racism contribute to an increase in BMI and waist to hip ratio and each were positively correlated with abnormalities in cortisol levels. Cortisol production was decreased (Tull, et al., 2005) or had abnormal peaks indicative of a surge (Cozier, et al., 2009); surges in cortisol were correlated with perceived stress following an experience of discrimination.

Published studies of the association between African American women subjected to work based discrimination and obesity were not found. Race based discrimination at work has been studied in African American men and associated with hypertension (Din-Dzietham, et al., 2004). Hypertension is a known cardiovascular risk factor and is associated with metabolic disorders and stress (Bacquer, et al, 2009). A review of the literature adds to the evidence that psychosocial stress from race-based discrimination contributes to hypertension and obesity in

African American men (Din-Dzietham, et al., 2004). Based on the literature intergroup discrimination is highest amongst those with higher education and income therefore low socioeconomic status is not a factor (Din-Dzietham et al., 2004). Mezuk, et al. (2011) found hypertension was associated with African American females who reported higher levels of discrimination (Mezuk, et al, 2011).

### **Gaps in the Literature**

Studies on diabetes, stress, work and racism are lacking in AA women. Previous studies have examined the correlation of chronic stress and hypertension or obesity or diabetes in large cohorts of European Caucasian men and women (Heraclides et al., 2009; Kivimäki et al., 2006) and chronic stress and obesity related to shift work in primarily Caucasian nurses (Pan et al., 2011). The percentage of African Americans who are employed as shift workers is 24.8% in comparison to Caucasians who comprise 16.7% of employed shift workers (Sloan Work and Family Research Network, 2009).

Hence, this is an important area of research, in which identification of an association can lead to interventions to decrease the risk factors and incidence of T2DM. Decreasing T2DM can decrease the costs and burdens associated with this chronic illness. In addition, understanding the association of chronic stress with diabetes can aid in decreasing presenteeism, the phenomenon of coming to work while ill, and absenteeism.

## Chapter 3

### THEORETICAL FRAMEWORK

A reformulation of three theoretical frameworks were used to inform this study on the association of work based racial discrimination and shift work with obesity and type 2 diabetes in African American women. The first, allostatic load, was used to explain the physiologic response to chronic stress (McEwen & Stellar, 1993). The second, intersectionality, grounded in critical race theory and feminism, explained the moderating effects of race and gender (Crenshaw, 1991). Thirdly, ecosocial theory was used to explain the combined effects of racism and environment and associated health inequities (Krieger, 2011). Together, these three theories formed the theoretical underpinnings of this study. The purpose of this chapter is to introduce the three theoretical frameworks and how they were applicable to the current study. The three theories were combined to encompass the meta paradigm of nursing; health environment, and the client (Rosemberg, Li, & Seng, 2017). Allostatic load incorporates the physiological underpinnings of health, while intersectionality focuses on the marginalized status of the client, and ecosocial theory incorporates the environment.

#### **Stress and Allostatic load**

Stress plays a role in health and disease and is a major factor in the development of central obesity, which leads to adverse health outcomes (Pasquali, 2012). Physical illness due to stress, according to Clarke (1984), is individualized and depends on the stimuli, the circumstances and the individual. Clarke suggests that individual responses to stimuli are different and individuals may respond differently on different occasions. However, Clarke's research supports Selye's (1950) explanation that stress occurs within the individual and the stressor stimulates the response. The focus should be on the stress response and not the stressor.

Clarke presents a phenomenological definition of stress, which incorporates demand and coping into its definition. Demand is the stimulus, either internal or external and coping is the response of the individual. From these two constructs, the definition of stress becomes the mismatch between demands and coping and if severe and prolonged, it may lead to illness and or behavioral changes (Clarke, 1984).

Severe and prolonged stress has been linked to the term allostatic load, which is a condition that ensues secondary to maladaptive function of physiological mechanisms that restore homeostasis (McEwen, 1998). There are various levels of allostatic load according to McEwen (1998). In this review article, the author identified four types, and the first is frequent stress. Frequent stress results in frequent stimulation of the hypothalamic pituitary adrenal axis (HPA-Axis) resulting in frequent episodes of hypertension and increased blood sugar. In the second type, there is a failure to adapt to the repeated stress and the individual is subjected to prolonged effects of HPA-axis stimulation. There is a failure of recovery to baseline in the third type of allostatic load. Once the stress terminates the reaction to the stress continues. In this type, the risk of morbidity is elevated. The fourth type is marked by a failure of the HPA-axis to respond to the stressor; this results in a rise in inflammatory cytokines due to a low production of cortisol (Figure 1). Repeated stress in the home, workplace, or environment can result in the progression to one of the four levels of allostatic load causing long-term health effects progressing to chronic disease (McEwen, 1998). Allostatic load is both a physiological and a theoretical construct to explain the relationship between environmental stressors and disease. As a physiological construct, it allows researchers to examine the relationship between chronic repeated stress and maladaptive neuroendocrine response resulting in disease to the host

organism. As a theoretical construct, it serves to suggest the relationship between environmental stressors and disease (Carlson & Chamberlain, 2005).

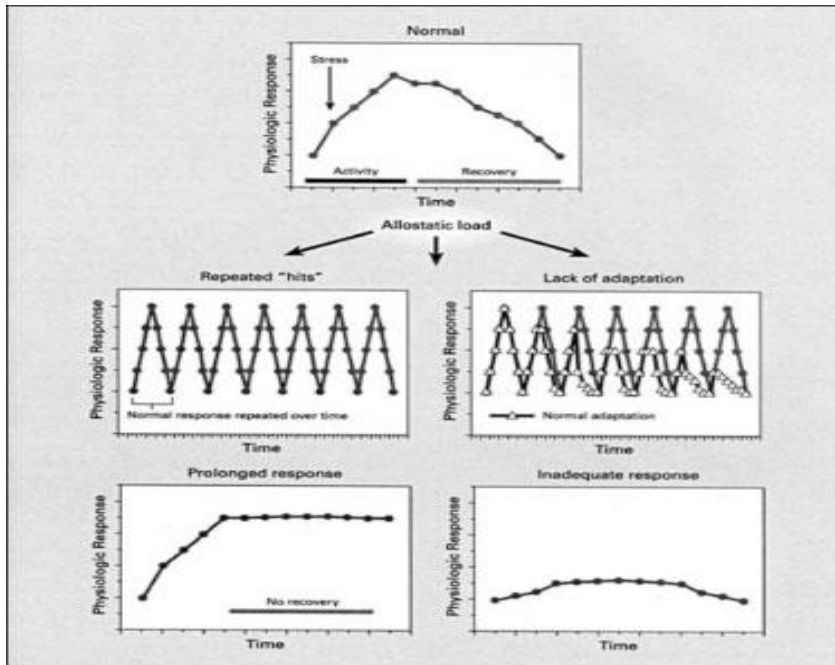


Figure 1: The four types of allostatic load: The top panel illustrates the normal allostatic response, in which a response is initiated by a stressor, sustained for an appropriate interval, and then turned off. The remaining panels illustrate four conditions that lead to allostatic load: 1) **Repeated "hits"** from multiple novel stressors; 2) **Lack of adaptation**; 3) **Prolonged response** due to delayed shut down; and 4) **Inadequate response** that leads to compensatory hyperactivity of other mediators: e.g., inadequate secretion of glucocorticoid, resulting in increased levels of cytokines that are normally counter-regulated by glucocorticoids). Figure drawn by Dr. Firdaus Dhabhar, Rockefeller University. Reprinted from McEwen (22) by permission from the *New England Journal of Medicine*. Copyright 1998 Massachusetts Medical Society. All rights reserved (McEwen & Seeman, 2009)

The Allostatic load model (ALM) explains the link between stress and disease it is the result of repeated allostasis. Allostasis is defined as stability through change. One goal of the model is to propose that Allostasis has short-term benefits; however, repetition will result in disease. Thus, the ALM describes the biological processes that occur in repeated stress induced environments and the stress induced elevations resulting in metabolic functions increasing the risk for metabolic syndrome and cardiovascular disease (Figures 2 and 3) (Carlson & Chamberlain, 2005; McEwen & Seeman, 2009). Although in figure 2, McEwen uses the term

brain perception, current research focuses on the cognitive appraisal process which modulates the stress response (Brondolo, Blair, & Kaor, 2018). Repeated discrimination results in stress thereby interfering with healthy behaviors and physiological processes to maintain health. In addition, it has been theorized repeated stressors and HPA axis stimulation results in changes in the brain and thus a change in the individual to cognitively process the threat and therefore physiologic and psychologic responses are diminished (Juster, McEwen, & Lupien, 2010), hence allostatic load.

One of the underlying assumptions of the ALM is that Allostatic load will increase over time and is a function of age; however, excessive stress results in an atypical response (Carlson & Chamberlain, 2005). Studies have shown that black women have a higher Allostatic load score and show signs of weathering at an earlier age than their Caucasian age-mates (Geronimus, Hicken, Keene, & Bound, 2006). Numerous studies have suggested that African American women suffer disproportionately from higher rates of metabolic disturbances and these disparities cannot be explained by socioeconomic status or genetics (Chyu & Upchurch, 2011; Geronimus, 2006; Hogue & Bremner, 2005, Logan & Barksdale, 2008). Allostatic load secondary to repeated experiences of discrimination may provide an explanation for poor health found amongst African Americans (Logan & Barksdale, 2008). However, allostatic load does not sufficiently account for why African American women are affected more than African American men. To account for this disparity the theory of Intersectionality is used to guide this study.

### **Intersectionality**

Intersectionality is both a theoretical framework and an analytical methodology used to explain how sociodemographic factors intersect at the micro level to explain privilege and oppression at the macro socio structural level. Kimberlé Crenshaw, an African American legal

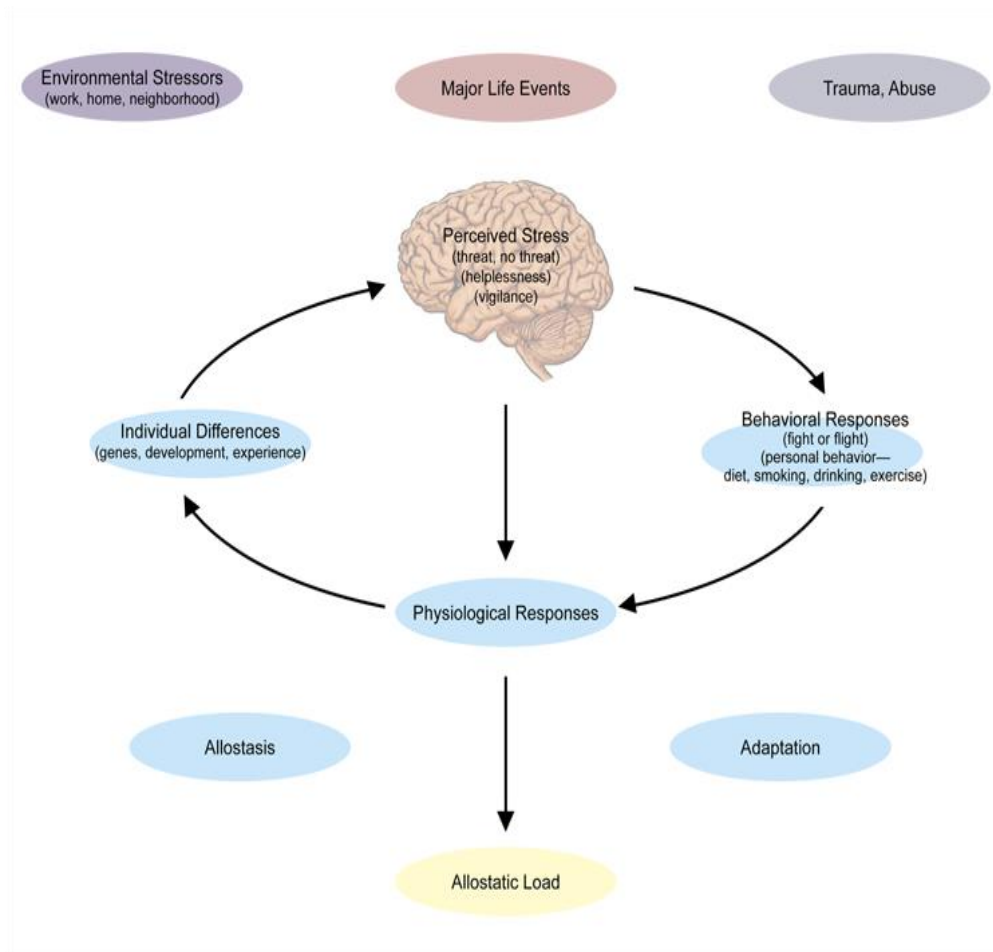
scholar and feminist, first coined the term. According to Bowleg (2012), there are three core tenets encompassed in this theoretical framework, they are as follows:

1. *Social identities are not independent and unidimensional but multiple and intersecting*
2. *People from multiple historically oppressed and marginalized groups are the focal or starting point.*
3. *Multiple social identities at the micro level (i.e., intersections of race, gender, and SES) intersect with macrolevel structural factors (i.e., poverty, racism, and sexism) to illustrate or produce disparate outcomes (Bowleg, 2012, p. 1268)*

The first of the tenets of Intersectionality suggests that race and gender should be considered as multiplicative rather than independently. One identity of either race or gender does not explain the health disparity. The second tenet accounts for the historical oppression and marginalization of the oppressed group, in this research the African American woman, and allows the researcher to examine the health of the oppressed group without a comparison to the norms of the non-oppressed group. The third tenet of intersectionality serves the purpose of describing how interactions due to race and gender influence and correspond to the compound or overlapping discrimination experienced by AA women (Bowleg, 2012).

Intersectionality is grounded in both critical race theory and feminism (Carbado, Crenshaw, Mays, & Tomlinson, 2013). Critical race theory had its beginnings in Frankfurt, Germany; it is largely based on Marxism's ideology of class and inequality (Popkin & Stoll, 1993). Modern critical theory has been influenced by the work of Jürgen Habermas and Paulo Freire from the Frankfurt School or the Institute for Social Research. The goal of the theorist from this Marxist based belief system is to uncover inequalities and liberate change (Fontana,

2004). The goal of intersectionality in nursing research is to enlighten and eliminate social inequalities thereby reducing health disparities (Rogers & Kelly, 2011).



**Figure 2: The Stress Response and Development of Allostatic load**

Perception of stress is influenced by one's experiences, genetics, and behavior. When the brain perceives an experience as stressful, physiologic and behavioral responses are initiated leading to allostasis and adaptation. Over time, allostatic load can accumulate, and the overexposure to neural, endocrine, and immune stress mediators can have adverse effects on various organ systems, leading to disease. *Reprinted from McEwen (22) by permission from the New England Journal of Medicine. Copyright 1998 Massachusetts Medical Society. All rights reserved (McEwen & Seeman, 2009)*



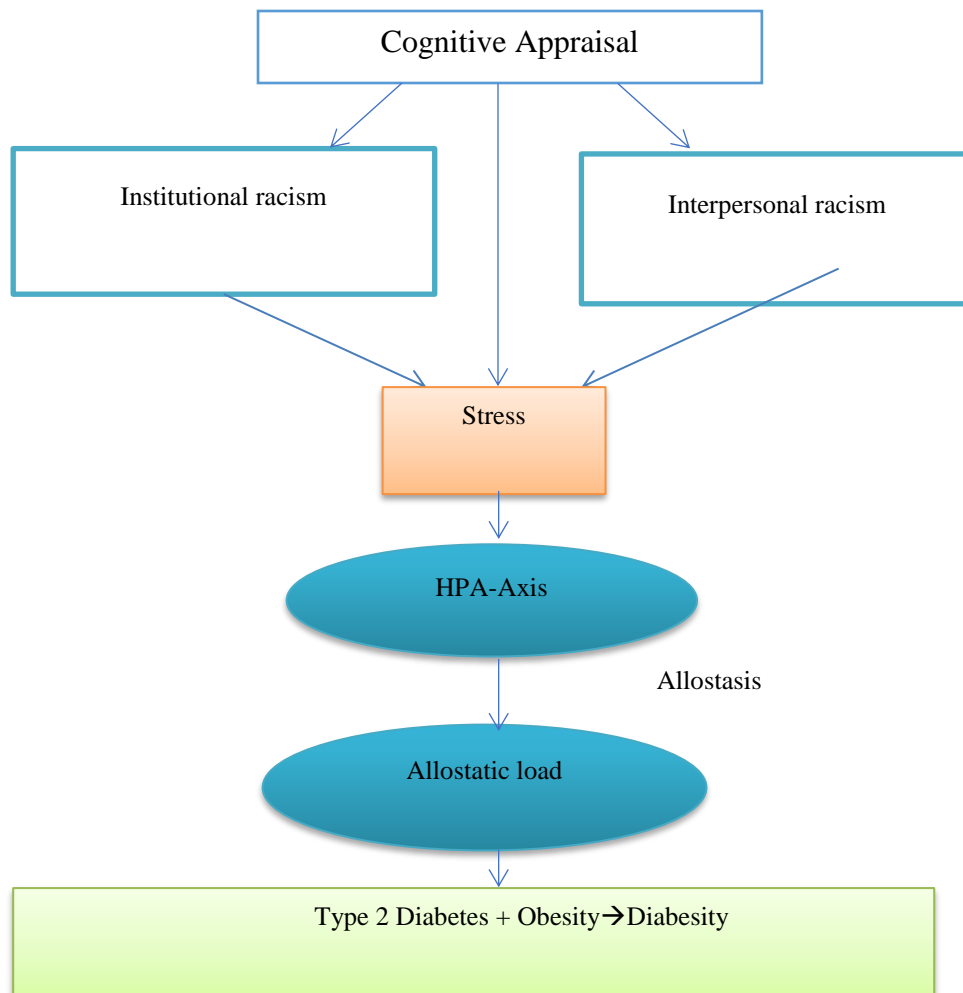


Figure 3: Conceptual model of allostatic load: This model shows the contribution of institutional and interpersonal racism to stress. Stress then activates the HPA-axis leading to allostasis and Allostatic load. The outcome of Allostatic load is type 2 diabetes and obesity which leads to diabesity.

The feminist approach is founded on complex relationships; it is thought to encompass multiple theories, and continues to emerge and evolve as a tradition. The underlying goal of a feminist approach is to advance the status of women (Campbell & Bunting, 1991). In the feminist view the researcher is viewed as an intricate part of the research and the participants, the women, are the knowers of knowledge. According to Campbell and Bunting, subjective data is considered a valid form of knowledge in this theory, and all knowledge that is obtained must be

interpreted within the context of its discovery. This implies a qualitative methodology; however, Intersectionality has also been used successfully in quantitative research (Bauer, 2014).

Critical race theory and feminism complement each other and have a common goal of freedom for the oppressed (Campbell & Bunting, 1991). Gender remains the central focus of the feminist theorist while the marginalized are the focus of critical race theory; in both philosophies promotion of social equality and liberating change is the primary outcome of research (Campbell & Bunting, 1991).

Intersectionality includes both philosophies and serves to reveal and eliminate health disparities in not only race and gender but also sexual orientation, socioeconomic status, and disability as well as any other marginalized group (Bowleg, 2012). This theory is ideal for the study of workplace racism in African American women; it accounts for the multiplicative moderating effects of race and gender and the historical and everyday racism experienced by African American women (Bauer, 2014).

### **Ecosocial Epidemiology Theory**

Ecosocial epidemiology theory is a framework which explains the social determinants of health inequities and social factors that contribute to social inequalities in health. This theory is based on four main constructs: the first is embodiment; the second is pathways of embodiment; third is cumulative interplay between exposure, susceptibility, and resistance; and the fourth is accountability and agency (Krieger, 2011).

Embodiment refers to how people embody their lived experience. The meaning of this construct is how a person's health is physiologically affected or shaped by the society in which they live and their lived experience (Krieger, 2011). This construct encompasses the social

construct of race and its implications on health due to cultural practices and beliefs, namely discrimination (Krieger). According to Krieger, “embodiment is an integrated approach to analyzing the multilevel processes, from societal and ecological to subcellular, that co-produce population distributions of health, disease, and well-being (Krieger, 2011, p 222).” This construct is important to this research in that it helps to explain the chronic effects of racism on neuroendocrine function and its association with diabetes (Krieger, 2001; Krieger, 2011).

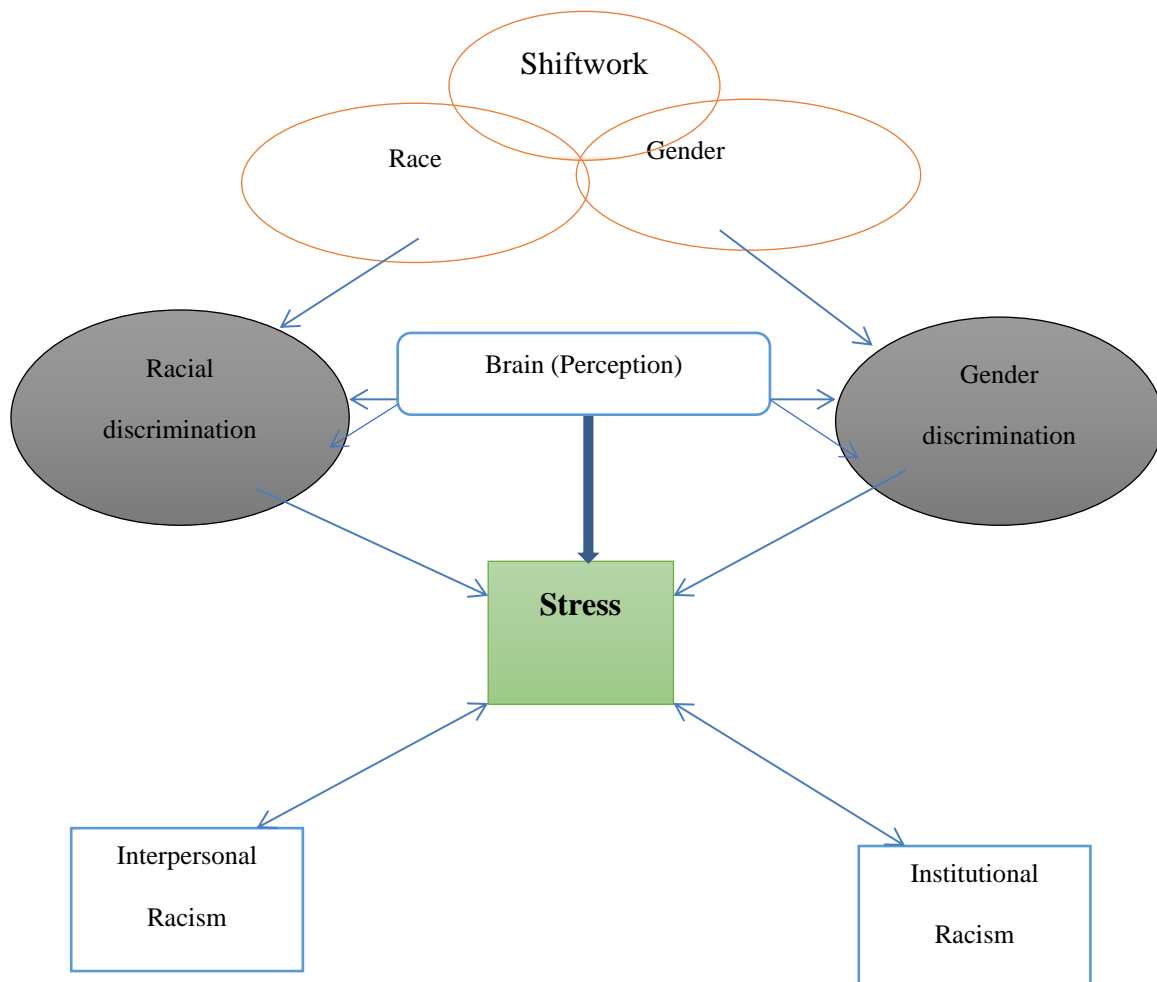


Figure 4: Conceptual model of intersectionality: Intersectionality of race and gender adds a cumulative effect to racial and gender discrimination leading to chronic stress. This added effect of being a woman and an African American adds to institutional and interpersonal racism leading to poor health outcomes (Crenshaw, 1991).

The second core construct, the pathway to embodiment, explains the evolutionary history and social development. The premise of this construct is that multiple factors and social processes lead to biological dysfunction (Krieger, 2011). Thus, examining the cumulative effects of social processes is important to understand changes in biological function. Hence it is important to not only measure occupational racism but also to measure everyday experiences of racism and shift work to determine the cumulative effects these variables have on the individual (Krieger, 2011).

The third core construct, the cumulative interplay between exposure, susceptibility, and resistance, is focused on exposure and disease distribution. In this construct, the ecological niche, time, and space are factors in the development of disease. This construct also considers the individual response to exposure, such as resistance, resilience, and coping. This is relevant in that the years of employment and years on alternate shifts as well as the work environment (the exposures) will lead to biological dysfunction, particularly neuroendocrine dysfunction (Figure 5). In addition, this construct helps to explain the absence of a response to exposure secondary to coping and social support (Krieger, 2011).

The fourth construct, accountability and agency, describes the state or the institution which creates the discrimination and social inequalities that is responsible for the biological dysfunction of the individual. The accountability is on the researcher to identify and treat these health disparities among the oppressed and to become activist for those who are marginalized (Krieger, 2011). Thus, the purpose of this research is to identify an association among occupational racism, shift work and diabetes and in future research design an intervention to alleviate the chronic stress of racism and increase awareness of the chronic and cumulative effects of discrimination and shift work on African American women.

## Conclusion

Three theoretical frameworks will guide this study, allostatic load, intersectionality, and ecosocial theory (Figure 6). Allostatic load explains the person-environment interaction and physiologic response to stress and metabolic disturbances (Carlson & Chamberlain, 2005). Intersectionality is used to allow us to conceptualize and analyze health disparities in African American women while addressing the multiplicative nature of gender and race (Bauer, 2014). Ecosocial theory explains the ecological, biological, and social determinants of health inequalities and holds the researcher accountable to identify and bring awareness of health disparities in marginalized populations (Krieger, 2001).

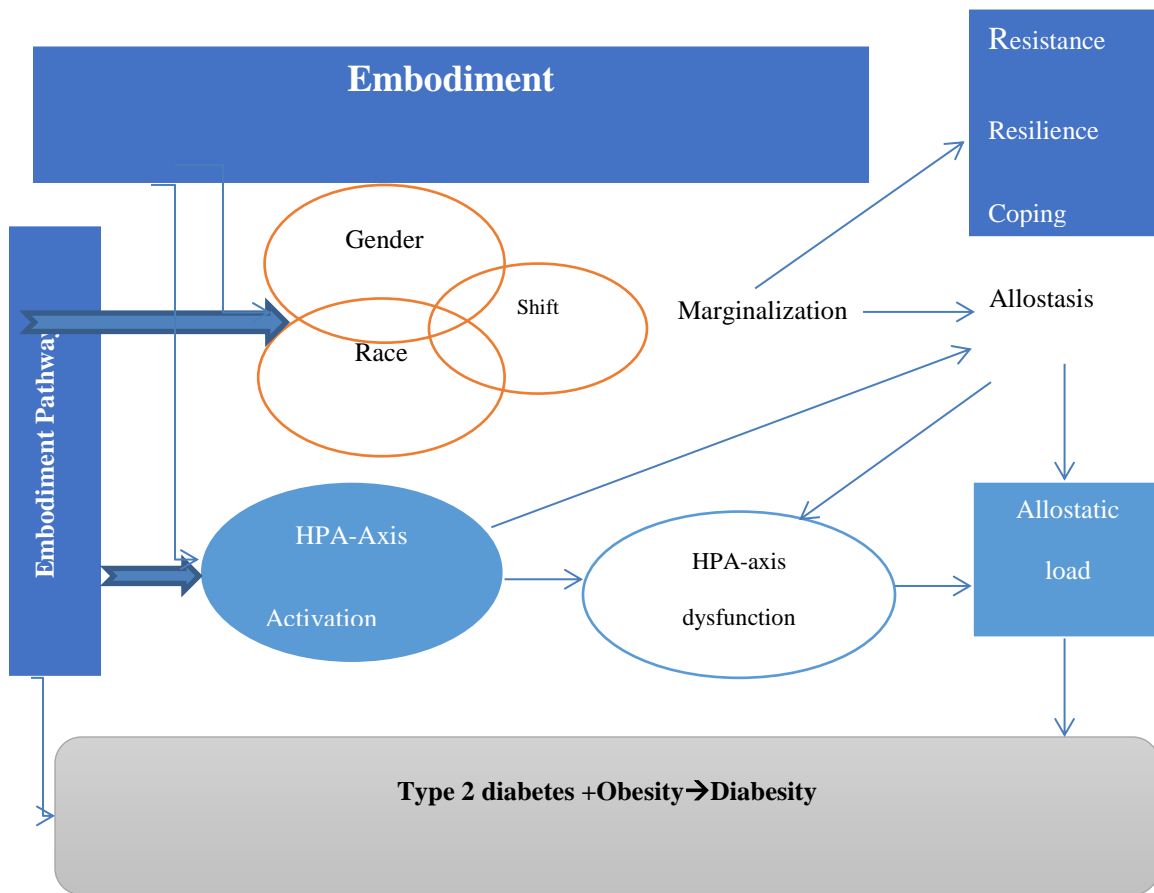


Figure 5: Conceptual model of ecosocial epidemiology theory. This model represents three of the four constructs of ecosocial theory and its relationship to the marginalization and poor health outcomes.

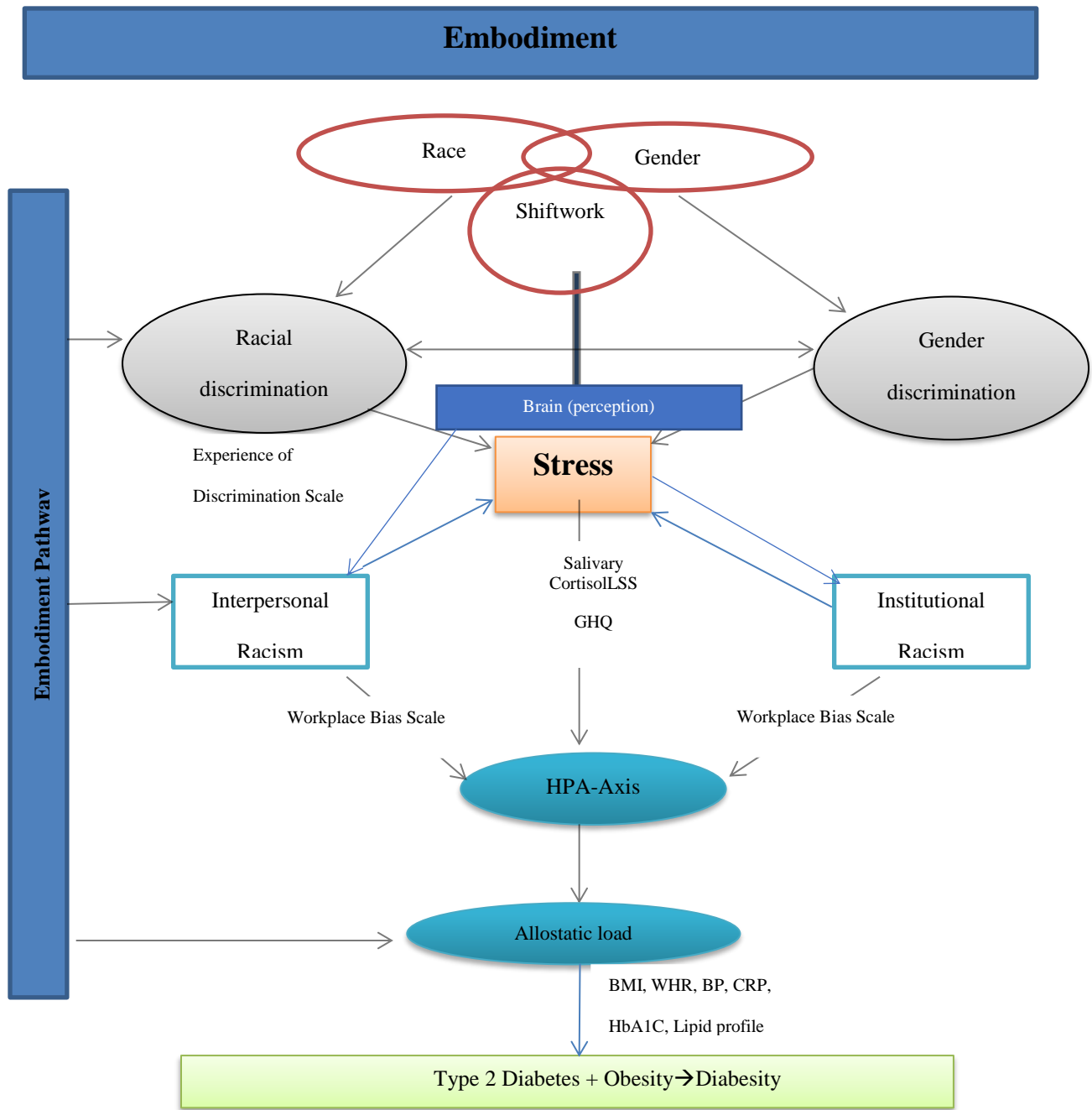


Figure 6: Relationship between the three guiding theories for this research. Racial discrimination will be measured with the Experience of Discrimination scale and the Work Place Bias scale. Job stress will be measured with the JCQ and ERI questionnaires. Stress will be measured by self-report using the General Health Questionnaire and LSS. Biomarkers of stress will be measured from salivary cortisol and C-Reactive protein. Allostatic load scores will be calculated from anthropometric measurements and physiological biomarkers.

## **Chapter 4**

### **METHODOLOGY**

This research study used a cross-sectional, correlational study design to look at the association of diabetes with chronic stress secondary to occupational racism and shift work in African American nurses. This chapter describes the methodology that was used to complete the study with a description of the participants, recruitment strategy, measurement tools and the statistical analysis.

#### **Target Population**

The sample for this study was African American women employed as registered nurses who work and reside in southern California. The following inclusion criteria were used to recruit and enroll participants: women, who self-identify as African American, ages 25-65, actively employed as a registered nurse for a minimum of one year, employed at their current job for a minimum of one year, work a minimum of 20 hours a week, reside in southern California, and willing to participate in the study. Participants were excluded from this study if they did not meet the inclusion criteria and were not actively employed due to illness or disability. Other factors for exclusion were currently pregnant or nursing, currently taking steroid prescription medications, oral contraceptives, or hormone replacement therapy. A screening tool was used to determine eligibility (Appendix A).

#### **Recruitment**

A total of 100 participants were recruited into the study, four did not complete a significant portion of the questionnaires, therefore data analysis was performed on the remaining 96 participants. Participants were recruited via email from the Council of Black Nurses Los Angeles, the Ronald Reagan and Santa Monica medical centers of the University of California

Los Angeles, and the Pan African Nursing Student and Alumni Association and the sorority of Phi Eta Chi. A direct approach and word of mouth was used to recruit until the target sample size was reached. Participants were provided with a description of the study and instructions on how to contact the primary investigator. On initial contact, a screening questionnaire was used to determine eligibility and if inclusion criteria were met, informed consent was obtained at that time (Informed Consent, Appendix B).

### **Sample**

The total sample size for analysis was 96 participants. The participant pool were all registered nurses who met the enrollment criteria. Participants were given a \$25.00 gift card for completing the questionnaire (n=41), which was later raised to \$50.00 to improve enrollment efforts (n=59) and participants were given an additional \$25.00 for providing saliva samples (n=60).

### **Operational Definitions**

#### African American or Black

African American was defined as people who self-identify as AA either alone or in combination with another race (e.g.: Hispanic, nonhispanic, Caucasian). This definition is congruent with the United States Census Bureau of 2010 (Rastogi, Johnson, & Drewery, 2011).

This was measured by self-report on the screening questionnaire.

#### Shift workers

The definition of shift work was defined as those working outside the regular work hours of 7 a.m. to 6 p.m., and included persons working permanent evening and night shifts and those who rotate shifts (Roger & Colligan, 1997). Shift work was ascertained by self-report. The effects of shift work were not directly measured in terms of sleep quantity or quality.



## Racial Discrimination

Racial discrimination was measured using two scales, the Experience of Discrimination (EOD) Scale (Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005) and the Work Place Bias Scale (WPB) (Hughes & Dodge, 1997). For this research and dissertation, the terms racism and discrimination are used interchangeably.

Racial discrimination, as defined by the U.S. Equal Employment Opportunity Commission, occurs when persons are treated unfavorably according to race or phenotypic characteristics (United States Equal Employment Opportunity Commission [EEOC], 2013). The EOD was used to assess the degree of everyday experience of discrimination to determine the mediating effects on workplace discrimination. This scale can also be used to control for confounders to show that African American women may not experience everyday discrimination but are affected in the workplace by racial bias (Jones & Shorter-Gooden, 2003). The workplace bias scale (WPB) measured interpersonal and institutional discrimination and was used to associate work place discrimination with factors that contribute to diabetes. The scores on these measurement tools were also used to determine the relationship of work place discrimination with Allostatic load and shiftwork.

## Overweight and Obesity

Overweight and obesity as defined by the Centers for Disease Prevention and Control is based on a formula using the individual's weight and height to calculate the body mass index (BMI) (CDC, 2014). The BMI is an indicator of total body fat. According to the CDC, overweight is defined as a BMI between 25 and 29.9 kg/m<sup>2</sup> and obesity is defined as a BMI greater than or equal to 30kg/m<sup>2</sup> (CDC, 2014). Height and weight were measured using the SECA 703s calibrated medical scale with a stadiometer or height bar.

## Prediabetes and Diabetes

The American Diabetes Association (ADA) defines prediabetes and diabetes based on the hemoglobin A1C value. Hemoglobin A1C is a measurement of the percentage of glycosylated hemoglobin in the blood and the percentage reflects the average blood sugar for the past three months. The ADA uses the following values of hemoglobin A1C to classify diabetes, prediabetes, and individuals who do not have diabetes as follows: normal <5.7%, prediabetes is 5.7-6.4%, and diabetes is greater than or equal to 6.5%. (ADA, 2011). To detect the presence of prediabetes and diabetes the Hemoglobin A1C was measured initially (n=41) from a venous blood draw and sample analyzed by Lab Corp. The remaining samples were measured using point of care testing (n = 54). The POCT used for Hemoglobin A1C was the A1C Now, this device is certified by the National Glycohemoglobin Standardization Program and has a 99% agreement with venous blood analyzed in a laboratory (PTS Diagnostics, 2018). The average blood sugar was calculated using the following formula  $eAG = (27.7 \times A1C) - 46.7$  where eAG is the estimated average glucose (Nathan, et al., 2008)

### Diabesity

Diabesity is defined as obesity related T2DM and is associated with cardiovascular and metabolic disorders, such as hypertension, insulin resistance and visceral adiposity (Farak & Gaballa, 2011). Diabesity will be measured using anthropometric measurements, and hemoglobin A1C. The criteria for determining diabesity was WHR greater than 0.85, BMI greater than 25, and hemoglobin A1C  $\geq 5.5\%$  (Kressler, 2015).

## **Measures**

### **Demographics**

A general questionnaire was used to determine demographics of the participants. This short survey asked about age, income, degree, type of and racial composition of the workplace and if they were a shift worker or not. The variables were dichotomous except for length of employment which was a continuous variable (Appendix E-1).

### **General Health and Health Practices Questionnaire**

A general health questionnaire and health practices questionnaire was used to gather health history and health practices (unknown source, 2014). This self-report data was used to identify and control for potential confounders. The survey was used to gather information on diet, exercise, health maintenance, and social practices (Appendix E-2).

### **Life Stress Scale**

Because recent life events can elicit a stress response, it was important to assess for recent life events. The Life Stress Scale (LSS) (Appendix E-3) was used to determine if the participant had undergone recent traumatic events (Gray, Litz, Hsu, & Lombardo, 2004). Recent events eliciting a stress response is a potential confounder and may influence BMI, glucose and salivary cortisol levels (Granger et al., 2007).

In a study of 3951 (Neylon et al., 2013), the life stress test was found to have a standardized Cronbach's  $\alpha$  of 0.92. The life stress test evaluates several domains such as financial concerns, social conflicts, educational issues, job insecurity and change in health. A potential stressor is assigned a life change unit and the higher the score the more stressful the event. Two examples from the LSS are death of a spouse in the past year is assigned a value of 100 and minor violations of the law is assigned a score of 11. The participant places a check

mark on life events that are applicable from the past year; there are answers 43 different life events that are considered. All the check marks are assigned a value and those values totaled for a grand sum that can range from 11-600. If the total score is 11-150, then the participant has a low risk of becoming ill soon and if the score is 150-299, the risk is moderate to high and if 300-600 there is a high to very high risk of becoming ill. Thus, the higher the score the greater the impact of stress on health. This measure is used as a confounder in the study. If the participant has a high-risk score on the life stress scale, it could be a contributor to cardiovascular risk (Neylon et al., 2013) (Appendix E-3).

### **Effort Reward Imbalance**

The Effort Reward Imbalance (ERI) instrument was used to measure the psychosocial work environment; the tool is used specifically to measure esteem, salary, and job security. The ERI is a self-report questionnaire consisting of two scales in the short version, effort (6-items; scores range 4-24), and reward (11-items; scores range from 11-55) (Appendix C-4). The effort scale assesses responsibilities and workload; a high score on the effort indicates high effort (Jonge, Bosma, Peter, & Siegrist, 2000).

The reward scale assesses job security, support and esteem; a lower score indicates low rewards. This measure was used to determine the presence and degree of job stress and to control for job stress as a potential covariate. The internal consistency and validity of the ERI questionnaire was established in a large European epidemiological study that involved five countries (Siegrist, Li, & Montano, 2004). The scale has been used in populations of nurses and African Americans. In a psychometric analysis by Siegrist and Montano, they found an internal consistency or Cronbach's  $\alpha$  of greater than 0.80 (Siegrist et al., 2004).

Participants completed the questionnaire and the scores were evaluated by the Principal Investigator (PI). The Likert scale is arranged from 1 (strongly disagree) to 4 (strongly agree). Questions 1-6 were totaled to find the numerator of the ratio and questions 7 to 16 were totaled to find the denominator (Siegrist et al., 2004). The ratio was multiplied by a constant of 1.67 to account for the uneven number of items. The k value or constant is based on the ratio of reward items to effort items or 10/6. The ER ratio of greater than one is indicative of high effort to rewards and of less than one indicates reward is greater than effort (Siegrist et al., 2004). The effort reward imbalance ratio was used as a continuous variable in both a hierarchical regression and correlation analysis (Appendix E4).

### **The Job Content Questionnaire**

The job content questionnaire is a self-administered, 49 question, 5-scale instrument. It has been widely used across all economic sectors and extensively used with different occupations (Appendix E-5). The five subscales included in the tool are: (1) Decision latitude, (2) Psychological demands, (3) social support, (4) physical demands and (5) job insecurity (Karasek et al. 1998).

The Job Content Questionnaire has been used in studies examining the effects of race on job control and health practices. The instrument has established validity and reliability and is reported in several studies (Choi, et al., 2012; Jonge, Bosma, Peter, & Siegrist, 2000; Karasek, 1990). The use of this instrument informed the current pilot study of the existence of job and iso strain and if there is an association with factors that contribute to diabetes. This is important since previous studies have found an association with work place racism, job insecurity and low social support which contribute to job strain. This instrument was used to determine the presence

of job strain in AA nurses in this study. The scores were used to control for job strain as a potential confounder since it can be a result of WPR and has been associated with obesity.

Participants were able to complete the questionnaire and scores were totaled using the formulas described in the Job Content users guide (Karasek, 1990). Job strain and iso-strain were calculated using the following formulas:

$2 * \text{demands} / \text{decision latitude} = \text{job strain}$

$2 * \text{demands} / (\text{decision latitude} + \text{total support}) = \text{iso-strain}$

The job strain ratio and iso strain ratio were used as covariates in the correlation analysis (Karasek, 1979) (Appendix E5).

### **Workplace Bias Scale**

The workplace racial bias scale measures both institutional and interpersonal racism while at work (Appendix E-6). It is a 13-item scale; institutional bias has 7 items and interpersonal has 6 items. All items are rated on a 4-point Likert scale from 1 (strongly agree) to 4 (strongly disagree). It has been used and is appropriate for use in all adults and has been validated in college educated African American women. It has a Cronbach's alpha of 0.85 for institutional racism and 0.83 for interpersonal racism in African Americans (Hughes & Dodge, 1997). The importance of this scale is to the measure work place racism in AA women. This instrument developed by Hughes, is appropriate for this study as it has been validated in the target population. (Hughes & Dodge, 1997). The scores from the two subscales and the total score were used as continuous variables in the correlation analysis (Appendix E6).

## **Everyday Experience of Discrimination Scale**

The Everyday Experience of Discrimination scale (EOD) (Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005) is a tool used to evaluate perceptions of discrimination in a United States population of African American, Latino and White working-class adults (Appendix E-7). The questionnaire includes statements concerned with perceptions of discrimination, such as: “*you are treated with less courtesy than other people are*” or “*you receive poorer service than other people at restaurants or stores*”. The 9-item everyday discrimination scale is valid and reliable and is significantly associated with stress (Krieger et al., 2005). This tool will be used to differentiate everyday experiences of discrimination from workplace prejudice discrimination. This potential confounder was adjusted for in the analysis.

The scores were calculated based on a 6-point Likert scale from 5 (almost every day) to 0 (never), with a summed ranging from 0-45. The higher the score the greater the experience of everyday discrimination. The scores were used as a continuous variable as a covariate in the correlation analysis (Appendix E7).

## **Physiological Measurements**

### **Weight and Height**

The BMI is used as a proxy for the measurement of adiposity and elevated values are associated with cardiometabolic disease. The BMI was calculated from the formula weight in kg/height in m<sup>2</sup> (CDC, 2014). Weight and height was measured using the Seca 703s scale with stadiometer. Each participant was weighed and measured with their shoes off and 1 pound was deducted to account for clothing. The Seca 703s is a medical scale and is graduated in 0.1 to 0.2 lb. increments and can weigh up to 660 pounds. The built-in stadiometer can measure height up

to 90 inches in graduations of 1/8 of an inch. The scale has a reported accuracy of  $\pm 0.15\%$  from 150 pounds to the maximum load (Seca, 2018).

### Waist to Hip Ratio

Waist to hip ratio is used to determine the distribution of adiposity and is a good measurement of visceral abdominal adiposity, which is highly associated with metabolic disorders (Myint, Kwok, Luben, & Wareham, 2014). Measurement of waist to hip ratio was performed on each participant using the Seca 203 measuring tape. The Seca 203 measures from 0 to 80 inches and is graduated by 1/8-inch increments (Vogel, 2017). The waist circumference was measured using the waist circumference measurement guidelines (my healthywaist.org). The participant was asked to pull up their shirt and lower their pants below the umbilicus and stand with feet shoulder width apart. The top of the iliac crest was located and imaginary line was drawn halfway from the back to the abdomen. The measuring tape was placed at the level of the imaginary line and measurement was read at the end of expiration (Jensen et al., 2014). This measurement was repeated two times to ensure accuracy. The hip circumference was measured with the participant standing with feet together and arms at the side. The tape was placed at the widest part of the buttocks. The tape was pulled snugly but not tight enough to compress the hips.

The waist to hip calculation was performed by dividing the waist measurement by the hip measurement to obtain the waist to hip ratio (World Health Organization, 2011). If the waist to hip ratio was greater than 0.85 then the participant was assigned one point for the measure of diabetes and one point for the measure of allostatic load.



## Blood Pressure

Blood pressure was measured using the Omron BP786 with a standard adult cuff HEM-FL31 for arm circumference from 9-17 inches. The accuracy of the Omron BP is reported to be  $\pm 3$ mmHg or within 2% of the actual reading. The pulse measured and displayed is within  $\pm 5\%$  of the actual value. The cuff measures BP by use of the oscillometric method (Omron, 2015). The participants were asked to sit quietly for five minutes before the blood pressure cuff was applied and then to sit for two minutes before the measurement was started. All blood pressures were taken on the left arm with the participant sitting up straight with arm resting on a table with feet flat on the floor (Pickering et al., 2005). Two pressure readings were taken and the average blood pressure was used in the data analysis. If the systolic and diastolic blood pressure were in the 75<sup>th</sup> percentile, the systolic and diastolic reading was assigned one point each towards the allostatic load score.

## Salivary Cortisol

Salivary cortisol was measured to determine the cortisol awakening response (CAR) in 41 participants. The normal cortisol awakening curve is characterized by a rise in cortisol levels approximately 30-45 minutes after awakening (Clow, Hucklebridge, Stalder, Evans & Thorn, 2010). Collection times varied depending on the shift worked and if the participant were scheduled to work on the day of collection. The participants were given instructions to collect salivary samples at the following times:

Sample 1: on awakening

Sample 2: 15 minutes after awakening

Sample 3: 30 minutes after awakening

Sample 4: 60 minutes after awakening

The samples were collected by the cuvette method, where a cuvette was placed in the buccal cavity for 1-5 minutes until saturated with saliva. The participants were provided with the sampling kit and given verbal and written instructions after the informed consent was obtained. The cuvette was stored in a plastic container and stored in the participant's freezer until it was retrieved by the researcher (Granger et al., 2007). The samples were sent to the Institute for Interdisciplinary Salivary Bioscience Research at Arizona State University for processing. Salivary sampling ceased after 60 samples collected because many samples were unusable due to improper storage or labeling. Samples that were mislabeled or received at room temperature were discarded and not sent for analysis. The salivary results were discarded because physiologically improbable cortisol awakening curves were obtained. Based on the graph of the curves the samples were not collected and/or labeled in the correct order by the participants.

#### Point of Care Testing

Blood was collected at the time of enrollment after informed consent was obtained. The samples were collected at random times throughout the day. Samples were obtained at least two hours post-prandial to prevent false elevation of triglycerides. Fasting is not required for either the lipid profile (Langsted, Freiberg, & Nordestgaard, 2008) or hemoglobin A1C levels (HHS, 2014).

#### Lipid Profile

The lipid profile of participants was initially obtained through a venous blood draw (n=41), the samples were stored at room temperature and delivered to Lab Corp within 12 hours of venipuncture. The remaining participants n=54 were obtained through a finger stick using point of care testing (POCT). The cardiochek PA analyzer was used to measure the lipid profile, and through analysis it has shown to have an 81-90% agreement with venous blood samples

analyzed in the laboratory (PTS Diagnostics, 2018) Participants were tested for total cholesterol, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, triglycerides, and glucose using the CardioChek® plus analyzer (PTS Diagnostics, 2018). The test strips require 40µl of blood per test and results are ready in 5 minutes. The sensitivity and specificity for POCT of cholesterol was greater than 75% in one study of 250 men and women (Parkih, Mochari, & Mosca, 2009).

The CardioChek analyzer meets the guidelines for total analytical error through the National Institute of Health National Cholesterol Education Program. With each new package of test strips (every 14 tests) the CardioChek control solution was run to ensure accuracy of the test (PTS Diagnostics, 2018).

### Hemoglobin A1C

Hemoglobin A1C was initially measured from a venous blood draw (n=41). A venipuncture was performed and blood collected in a lavender top EDTA tube; the sample was stored at room temperature and delivered to the laboratory for processing within 12 hours of collection. The sample was processed by Lab Corp laboratory for analysis. After a methodology change, hemoglobin A1c was assessed using point of care testing. The A1C Now Plus system was used for the additional samples (n=54). The analysis was performed by finger stick and 5 µl of capillary blood was collected and placed with in the sample dilution kit. The sample was mixed well with the diluent and placed onto the test cartridge and results read in 5 minutes. The hemoglobin A1C test adds to this research by determining if the participant has values which fall within the range of normal, prediabetes or diabetes, these values are defined by the ADA. The hemoglobin A1C was used as a categorical value in the chi square analysis, and t-test. It was used as a continuous variable in the correlation models and a quartile variable for calculation of

allostatic load. The point of care hemoglobin A1C test has been shown to be equivalent to whole blood laboratory analysis with a sensitivity of 81.8% and specificity of 93.2 (Schwartz, Monsur, Hammad, Bartoces, & Neale, 2009).

#### C - reactive protein

The C-reactive protein (CRP) was collected by venous puncture and whole blood was placed in a laboratory collection tube with a serum separator gel. The blood was stored at room temperature and delivered to Lab Corp for analysis within 12 hours of collection. The CRP adds to the allostatic load score and is a variable in the determination of systemic inflammation. Systemic inflammation is characteristic of both diabetes and allostatic load (Orenes-Pinero et al., 2015). The CRP value was lost as a variable with the change in methodology as CRP was not available to the PI via point of care testing.

#### Allostatic load Score

The allostatic load score was calculated from the following biological and physiological markers:

Waist to hip ratio	Systolic blood Pressure
Glycated hemoglobin (Hgb A1C)	Diastolic Blood Pressure
BMI	High density Lipoprotein
Low Density Lipo protein	Total cholesterol
	Triglycerides

Each biomarker is assigned a point value of one toward the allostatic load score. The points are assigned if the value is within the highest risk quartile or greater than 75<sup>th</sup> percentile. In the case of HDL, the lowest quartile was used or values less than the 25<sup>th</sup> percentile (Chyu & Upchurch, 2011). The maximum score for the purposes of this research is nine. In this study, the allostatic load score based on the above variables will be correlated with scores from the questionnaires.

## **Sample Size**

A power analysis was performed using G\*power version 3.1. to determine the sample size for all research questions. In all cases the analysis was calculated for a power of .80 and one-tailed alpha of 0.05 with a large effect size (Faul, Erdfelder, Buchner, & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007). Based on G\*power for all statistical test the largest sample size required to achieve sufficient power is 40 participants. Because of the number of covariates, the sample size was increased to 90.

## **Statistical Analyses**

Statistical analyses were performed with SPSS version 25 (IBM SPSS Statistics for Windows, 2015). Testing for assumptions for all statistical test was performed prior to the analyses.

## **Hypotheses Testing**

This pilot study explored the relationships between WPB and diabetes in AA women. A sub-aim was to explore the potential mediating effects of chronic stress and moderating effects of SW.

**Research Question 1:** Is there a relationship between Work Place Bias and Hemoglobin A1C in African American female nurses?

*H<sub>a</sub>*: The AA female nurses who report WPB will have higher levels of hemoglobin A1C

Independent Variable: WPB score

Dependent variable: Hemoglobin A1C

Statistical Test Pearson Correlation

**Research Question 2:** Is there a relationship between Work Place Bias reported by African American female nurses and obesity as measured by Body Mass Index and/or Waist to Hip Ratio?

*H<sub>a</sub>:* AA nurses who report WPB will have higher BMI

*H<sub>a</sub>:* AA female nurse who report high levels of WPB will have higher WHR.

Independent variables: WPB scores, institutional and interpersonal

Dependent variables: BMI and WHR

Weight classification based on BMI <20 underweight, 20-24.9 normal weight, 25-29.9 overweight, 30-34.9 obese, and  $\geq 35$  morbid obesity, type 2 diabetes based on hemoglobin A1C values < 5.7% = no diabetes, 5.7-6.4% prediabetes, and >6.5% diabetes.

Statistical test Chi square

Correlation Analysis

Continuous variables BMI, WHR, WPB scores

**Research Question 3:** What is the effect of shiftwork on the relationship between Work Place Bias and measures of obesity, and Hemoglobin A1C?

*H<sub>a</sub>:* There will be a difference in the relationship between WPB, obesity and hemoglobin A1C with shiftwork and non-shiftwork

*H<sub>0</sub>:* There will be no difference in the relationship between WPB, obesity and diabetes with shiftwork or non-shiftwork.

Independent variables: shiftwork and workplace bias

Dependent variables: Weight classification based on BMI <20 underweight, 20-24.9 normal weight, 25-29.9 overweight, 30-34.9 obese, and  $\geq 35$  morbid obesity, type 2 diabetes based on hemoglobin A1C values < 5.7% = no diabetes, 5.7-6.4% prediabetes, and >6.5% diabetes.

Statistical Test: Logistic Regression

**Research question 4:** What is the relationship between Work Place Bias and Allostatic load

Independent Variable: Work Place Bias score?

$H_a$ : There will be a relationship between WPB scores and allostatic load

$H_0$ : There will be no relationship between WPB and allostatic load

Dependent variables: Allostatic load score

Statistical test: Pearson correlation coefficient for bivariate coefficients

#### Limitations

Since this is a cross-sectional prospective design, the ability to establish a relationship of diabetes and obesity to work stress and shift work may be difficult to establish thus no causal inferences will be made. The change in methodology midway through the study may affect the results as some of the variables have changed. The loss of the C-reactive protein changed the allostatic load score from nine to eight; therefore, the risk factor for systemic inflammation was lost.

## CHAPTER 5

### Results

This chapter presents a description of the sample characteristics and results of the statistical testing that addressed the research questions. The demographic data is presented first followed by the results of the hypotheses testing. The statistical analysis was performed using SPSS version 25 (IBM SPSS Statistics for Windows, 2015). The research questions for this project were as follows:

Research Question 1: Is there a relationship between WPB and hemoglobin A1C in AA female nurses?

*H<sub>a</sub>*: The AA female nurses who report WPB will have higher levels of hemoglobin A1C

Research Question 2: Is there a relationship between WPB reported by AA female nurses and obesity as measured by BMI and/or WHR?

*H<sub>a</sub>*: AA nurses who report WPB will have higher BMI.

*H<sub>a</sub>*: AA nurses who report WPB will have higher WHR.

Research Question 3: What is the effect of shiftwork on the relationship between WPB and measures of obesity, and hemoglobin A1C?

*H<sub>a</sub>*: There will be a difference in the relationship between WPB, obesity and hemoglobin A1C between shift workers and non-shift workers.

Research Question 4: Is there a relationship between WPB and allostatic load?

*H<sub>a</sub>*: There will be a relationship between WPB scores and allostatic load.



## Demographics

Self-report demographic data showed that 77% of the participants ranged in age from 30-59 years. Most participants reported having a BSN or MSN degree in nursing, an annual income of \$100,000 to \$150,000 per year. The average length of employment was  $M = 8.9$ ,  $SD = 8.4$  years. The average number of sick days was  $M = 5.6$ ,  $SD = 6.0$ . The score on the General Health Scale (unknown, 2014), used to assess health practices and perceptions of the work environment, averaged  $M = 25.5$ ,  $SD = 7.6$  out of a possible score range of 8 to 40. Most of the participants were employed in an area or organization where less than 30% of the employees were African American (Table 2).

Over half of the population were shift workers and of the shift workers there was a close to equal distribution of night and day shift and more than half worked a permanent shift. Most reported routine health maintenance and over half of the group reported they participated in regular exercise defined as greater than or equal to five hours per week. The average amount of weekly exercise was  $M = 2$  hours 18 minutes,  $SD = 2$  hours 39 minutes. Participants were asked to report their current stress level and it was found to be  $M = 18.94$ ,  $SD = 4.80$  out of a range of 5-25. The Life Stress Scale (LSS) was used to determine if personal factors over the past year contributed to the main effects of interest. The average LSS score was found to be  $M = 204.73$ ,  $SD = 134.13$ . The LSS score is a tool to assess stressful life events over the past year whereas the current stress scale asks about their current stress level at the time of the completion of the questionnaire. The average Life Stress score reported fell into the moderate to low range (Holmes & Rahe, 1967).

Table 2: Demographic Characteristics N=96

		Frequency	Percent
Age	18-29	8	8.3
	30-39	29	30.2
	40-49	26	27.1
	50-69	22	22.9
	60+	8	8.3
Highest Nursing Degree	ADN	9	9.8
	BSN	33	35.8
	MSN	37	40.2
	DNP or PhD	13	14.1
Gross Annual Income	35,001-50,000	5	5.2
	50,001-75,000	14	14.6
	75,001-100,000	27	28.1
	100,001-150,000	45	46.9
	150,001-200,000	1	1.0
Percent African American in Work Area	Less than 10%	31	32.3
	10-20%	28	29.2
	21-30%	21	21.9
	31-40%	8	8.3
	41-50%	2	2.1
	51-100%	4	4
Percentage of African Americans in the organization	<10%	31	32.3
	10-20%	35	36.5
	21-30%	16	16.7
	31-40%	4	4.2
	41-50%	2	2.1
	51-100%	5	5.1

### Psychosocial Work Characteristics

The Effort Reward Imbalance (ERI) scale was used to determine the psychosocial work environment. Almost all participants scored a ratio greater than one indicating high effort and low rewards. The average score on the ERI was  $M= 1.16$ ,  $SD = .03$ . The Job Content Questionnaire was used to evaluate the presence of job strain and iso-strain. The average job

strain score was  $M = 0.53$ ,  $SD = .02$  and average iso-strain was found to be  $M = 0.37$   $SD = .01$  (Table 3). With both measures a value of one indicates high job or iso-strain (Karasek et al., 1998).

Table 3: Descriptive Statistics for Effort Reward Imbalance and Job Content Questionnaire

	N	Mean	Std. Deviation
Effort	91	17.07	3.87
Reward	91	24.75	3.68
Effort Reward Imbalance	91	1.17	.28
Psychological Demands	90	25.66	6.25
Skill Discretion	90	26.21	5.95
Decision Authority	90	25.77	8.34
Decision Latitude	90	51.78	12.46
Supervisor Support	89	9.52	2.99
Coworker Support	89	8.83	2.26
Total Support	89	20.61	4.74
Job Strain Ratio	91	.53	.17

## Discrimination

The Work Place Bias scale was used to determine the experiences of workplace racism, both institutional and interpersonal. The average score for institutional WPB was higher than interpersonal WPB (Table 4) and was significantly different ( $t = 38.584$ ,  $90$ ;  $p < 0.05$ ). The total workplace bias score is the sum of the institutional and interpersonal scores and was found to be  $M = 34.70$   $SD = .85$  out of a possible score of 12-48 (Hughes & Dodge, 1997). Determination of everyday discrimination was used as a confounder; this variable was used to differentiate everyday discrimination from workplace racism. The average for everyday discrimination was found to be  $M = 20.00$ ,  $SD = 1.13$  out of a total possible score from 0-45, where 0 is no experience and 45 is a frequent experience of discrimination.

Table 4: Descriptive statistics for measures of discrimination

	N	Mean	Std. Deviation
Work Place Bias Institutional	96	19.79	4.54
Work Place Bias Interpersonal	96	15.36	3.56
Every Day Discrimination	96	20.80	10.67

## Anthropometrics

Anthropometric and physiological descriptive statistics are shown in Table 5. The average Body Mass Index was found to be  $M = 31.88$ ,  $SD = 5.78$  and the waist to hip ratio was  $M = 0.87$ ,  $SD = .09$ . The average serving of fruit and vegetables per day was found to be  $M = 2.68$ ,  $SD = 1.47$  and  $M = 2.81$   $SD = 1.43$  respectively.

Table 5: Descriptive Statistics for Anthropometrics, physical measurements and dietary practices

	N	Mean	Std Deviation
Body Mass Index	96	31.88	5.78
Waist to Hip Ratio	96	.87	.09
Hemoglobin A1C	93	5.92	.79
Total Cholesterol	80	184.24	40.70
Triglycerides	80	154.07	80.30
High Density LipoProtein	80	54.82	16.87
Low Density Lipo Protein	80	97.77	32.79
Systolic Blood Pressure	93	132.97	19.55
Diastolic Blood Pressure	94	81.93	9.46
Allostatic Load Score	95	4.13	4.59
Fruit Intake/Day	93	2.68	1.47
Veg/Day	93	2.81	1.43

Allostatic load score was calculated from the upper quartile of BMI, WHR, total cholesterol, LDL, SBP, DBP and hemoglobin A1C and the lower quartile of HDL for a total score of 8 (Logan & Barksdale, 2008). To calculate diabetes, one point was assigned to each of

the following variables: BMI > 25; WHR >0.85; and Hemoglobin A1C >5.5 for a total score of 3 (Chobanian et al., 2003). A score of three indicates diabetes. In this sample, 35.4 % of the participants met the criteria for diabetes (Verna, Kaur, Misha, & Himanshu, 2015).

### Relationship of Workplace bias and Hemoglobin A1C

Pearson’s product-moment correlation was run to assess the relationship between hemoglobin A1C and work place bias. There was not a significant relationship between hemoglobin A1C and workplace bias: institutional, interpersonal or total bias ( $p > 0.05$ ). The average glucose from the hemoglobin A1C was also used in the correlation analysis and yielded similar results.

Table 6: Correlations between Hemoglobin A1c, Institutional and Interpersonal Workplace Bias, Average Blood Glucose and Everyday Experiences of Discrimination.

	Hemoglobin A1C	Work Place Bias Institutional	Work Place Bias Interpersonal	Average Blood Glucose	Every Day Discrimination
<u>Hemoglobin A1C</u>	1	-.006	-.002	1.000**	.023
<u>Work Place Bias Institutional</u>		1	.683**	-.006	.707**
<u>Work Place Bias Interpersonal</u>			1	-.002	.693**
<u>Average Blood Glucose</u>				1	.023

\*\*Pearson Correlation is significant at the 0.01 level (2-tailed).

A chi square test for association was conducted between women who had hemoglobin A1C values that met the criteria for prediabetes or diabetes, defined as a hemoglobin A1C greater than or equal to 5.7%, and work place bias institutional and interpersonal scores greater than 12; a score greater than 12 is indicative of perceived bias. There was a statistically

significant association between diabetes and institutional workplace bias  $\chi^2(2) = 7.205, p = .027$ .

There was a moderately strong association between the two variables  $\phi = .267, p = .036$ . With interpersonal WPB there was not a significant association.

In a hierarchical regression model hemoglobin A1C and WPB are not significant but when waist to hip ratio is added to the model it reaches statistical significance. Therefore, in this model, a relationship exists between waist to hip ratio and HA1C as a function of waist to hip ratio.

Table 7: Hierarchical Regression of HA1C with Institutional and interpersonal Work Place Bias and WHR.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.007 <sup>a</sup>	.000	-.022	.80733	.000	.002	2	90	.998	
2	.277 <sup>b</sup>	.077	.045	.78015	.077	7.379	1	89	.008	1.707

Model1 WPB and HA1C, Model 2 WPB, HA1C and WHR

### Relationship of Workplace Bias, Body mass index and waist to Hip ratio

A relationship was found between institutional WPB and body mass index ( $p = 0.017$ ) but not between interpersonal WPB and BMI. Waist to hip ratio, a measure of visceral adiposity, was associated with interpersonal WPB ( $p = .048$ ) in a one tailed bivariate correlation (Table 8).

Table 8: Correlations between BMI and WHR with institutional and interpersonal WPB

		Work Place Bias	Work Place Bias	Waist to Hip	Body Mass
		Institutional	Interpersonal	Ratio	Index
Spearman's rho	Work Place Bias	1.000	.656**	.093	.248**
	<u>Institutional</u>				
	Work Place Bias		1.000	.171*	.054
	<u>Interpersonal</u>				
	Waist to Hip Ratio			1.000	.319**

\*\* . Correlation is significant at the 0.01 level (1-tailed). \* . Correlation is significant at the 0.05 level (1-tailed).

To control for covariates that may influence BMI, everyday discrimination and life stress scores were used in stepwise hierarchical regression to evaluate the change in the slope of the regression equation. The full model of everyday discrimination, life stress score, interpersonal workplace bias and institutional workplace bias, to predict BMI (Model 4) was statistically significant,  $\Delta R^2 = .078$ ,  $F(1,85) = 7.250$ ,  $p = .009$  (Table 9). The correlation coefficients for the four models are shown in Table 10, the only correlation that was significant was BMI and WPB,  $p < 0.05$ .

Further analysis to differentiate between racial discrimination versus weight discrimination, BMI was categorized as normal weight, overweight, and obesity. A one way ANOVA was used to analyze the relationship between institutional and interpersonal WPB scores and weight. There was no significant difference in WPB score within or between groups for institutional WPB  $F(2, 95) = .755$ ,  $p > .05$  and for interpersonal WPB  $F(2, 95) = .082$ ,  $p > 0.05$ . In addition, to determine if BMI was associated with age, a  $X^2$  was performed and in this population age was not associated with being normal weight, overweight or obesity  $X^2(8) = 5.80$ ,  $p = .67$ .

### **Relationship of Shift Work with BMI and Waist to Hip Ratio**

A Chi square test was conducted to look at the association of shift work and diabetes. There was not a significant association between shift work and diabetes,  $\chi^2(1) = .578$ ,  $p = .447$  or shiftwork and obesity  $\chi^2(1) = .506$ ,  $p = .447$ . However, the association between shift work and waist to hip ratio was statistically significant  $\chi^2(1) = 5.594$ ,  $p = .018$ .

Table 9: Model Summary Hierarchical Regression to test for impact of covariates

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.042 <sup>a</sup>	.002	-.010	5.6240	.002	.158	1	88	.692
2	.096 <sup>b</sup>	.009	-.013	5.6349	.008	.659	1	87	.419
3	.108 <sup>c</sup>	.012	-.023	5.6611	.002	.198	1	86	.657
4	.299 <sup>d</sup>	.089	.046	5.4659	.078	7.250	1	85	.009

a. Predictors: (Constant), Every Day Discrimination,

b. Predictors: (Constant), Every Day Discrimination, Life Stress Scale

c. Predictors: (Constant), Every Day Discrimination, life stress score, Work Place Bias Interpersonal

d. Predictors: (Constant), Every Day Discrimination, life stress score, Work Place Bias Interpersonal, Work Place Bias Institutional

A hierarchical multiple regression was used to evaluate the effect of shift work on Institutional WPB and BMI, to see if there would be a change in the R<sup>2</sup> value. Being a shift worker (n=60) moderated the effect of institutional WPB on BMI; there was an increase of 7.7%, which was statistically significant ( $F(1,58) = 4.165, p = .037$ ). The model for WHR and HA1C and the interaction of shiftwork and WPB did not reach significance.

### Relationship Between WPB, AL, Job Strain and ERI

In a correlation analysis there was a positive correlation between length of employment and allostatic load  $r = .245, p = .019, n = 91$ . A Pearson correlation was performed to analyze the relationship of work place stressors and allostatic load. None of the predictors were statistically significant with allostatic load. Job Strain Ratio was found to be statistically significant with ERI  $p = <.001$  and institutional WPB bias  $p = .037$ . Effort Reward Imbalance (ERI) was found to be significantly associated with both interpersonal and institutional WPB  $p = .001$ , and  $.002$  respectively. Effort Reward imbalance was significantly associated with Job Strain Ratio  $p < .01$ .



To determine the relationship between the significant variables, a regression analysis was conducted; the full model did not reach significance and hence none of the independent variables were associated with allostatic load (Table 12).

### **The Relationship between racial composition of the workplace and workplace bias.**

A chi square analysis was used to determine the relationship between institutional and interpersonal workplace bias and racial composition of the work area and organization. The chi square was statistically significant for institutional workplace bias and racial composition of the work area and organization, ( $p = .024$  and  $.020$ ) respectively. For interpersonal workplace bias only, racial composition of the organization was statistically significant ( $p = .024$ ).

Racial composition of the work area or organization did not have a statistically significant association with body mass index, waist to hip ratio or hemoglobin A1C. Using the Kruskal-Wallis nonparametric testing of the hypotheses, it is recommended to retain the null hypothesis as the distribution of the outcome variable was the same across all categories of racial composition of work area and organization.

Table 10: Hierarchical Multiple Regression predicting BMI from LSS, EOD, Interpersonal and Institutional WPB.

Variable	Model 1		Model 2		Model 3		Model 4	
	B	$\beta$	B	$\beta$	B	$\beta$	B	$\beta$
Constant	31.039		30.538		29.413		24.646	
EOD	.022	.042	.028	.053	.003	.006	-.104	-.200
LSS			.004	.087	.004	.089	.004	.100
Interpersonal WPB					.106	.067	-.140	-.088
Institutional WPB							.542	.436*
R <sup>2</sup>	.002		.009		.012		.089	
F	.158		.409		.336		2.083*	
$\Delta R^2$	.002		.008		.002		.078	
$\Delta F$	.158		.659		.198		7.250	

\* $p < 0.05$ ,  $N = 96$

Table 11: Pearson Correlations of Allostatic Load Score, Job Strain Ratio, Effort Reward Imbalance and both Institutional and Interpersonal Work Place Bias

	ALLOSTATIC LOAD SCORE	Job Strain Ratio	Effort Reward Imbalance	Work Place Bias Interpersonal	Work Place Bias Institutional
ALLOSTATIC LOAD SCORE	1.000	-.101	-.017	-.064	.037
Job Strain Ratio		1.000	-.245**	-.020	-.132*
Effort Reward Imbalance			1.000	.232**	.149*
Work Place Bias Interpersonal				1.000	.530**

\*\* .Pearson Correlation is significant at the 0.01 level (1-tailed).

\*.Pearson Correlation is significant at the 0.05 level (1-tailed).

Table 12: Regression Analysis Model Summary of Allostatic load, ERI, JS, Interpersonal and Institutional WPB

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.261 <sup>a</sup>	.068	.024	2.025	.068	1.540	4	84	.198

a. Predictors: (Constant), Job Strain Ratio, Work Place Bias Interpersonal, Effort Reward Imbalance, Work Place Bias Institutional

## Chapter 6: DISCUSSION

It is well documented in the literature that African Americans have a higher prevalence of obesity and obesity related disease such as type 2 diabetes (Lewis 2011; Williams, 2012) however the etiology is usually attributed to low socioeconomic status. This assumption does not explain the prevalence of obesity in women with higher income and educational status. In college educated African American women who earn a higher income the rate of obesity and diabetes remain higher than other racial groups (CDC, 2011). In this dissertation research, it was hypothesized that this disparity would be associated with work place bias and shift work which cumulatively contribute to chronic stress and metabolic dysfunction.

This study was guided by a reformulation of three theoretical models, Allostatic Load, Intersectionality and Ecosocial Epidemiology, to inform this study and explain this health disparity. This study broadens our understanding of the impact of bias on cardiovascular risk factors such as diabetes, and the stress that arises from chronic exposure to workplace bias. To date, no previous studies were found to quantitatively measure the cumulative effects of stress from racial discrimination and shiftwork with biological markers and anthropometric measures in African American female nurses in the workplace.

This chapter is divided into three sections, first the demographic characteristics of the study population are discussed related to the existing literature. Second, the significant findings from the four research questions are discussed. Third, future research and limitations are presented. The four research questions are as follows:

Research Question 1: Is there a relationship between Work Place Bias and Hemoglobin A1C in African American female nurses?

Research Question 2: Is there a relationship between Work Place Bias reported by African American female nurses and obesity as measured by Body Mass Index and/or Waist to Hip Ratio?

Research Question 3: What is the effect of shiftwork on the relationship between Work Place Bias and measures of obesity, and Hemoglobin A1C?

Research Question 4: Is there a relationship between Work Place Bias and Allostatic load?

### **Demographics**

The study population included women who self-identified as African American and who worked as a registered nurse. The sample was heterogeneous in terms of career trajectory, some were educators, others, were advanced practitioners, and others worked in the hospital at the bedside. Other differentiating factors were shiftwork and primary shift assigned either day, evening or night shift. More than half of the sample were shift workers and of the shift workers there was a nearly equal distribution of rotating shift workers and day or night shift workers.

Most of the sample held either a bachelor of science or a master of science degree. Most of the population earned an income of greater than \$100,000 /year, well above the national poverty line (Cochran, 2017). The women in this sample were educated and earned a modest income therefore obesity and diabetes cannot be attributed to low socioeconomic status. The sample was homogeneous in terms of obesity which is consistent with other studies that have examined obesity in AA women (Cox et al., 2013; Flegal, Kruszon-Moran, Carroll, Fryar, & Ogden, 2016; Lynch & Kane, 2014). Cozier et al., found that 77% of AA women were overweight or obese and 14% were extremely obese (Cozier, Wise, Palmer, & Rosenberg, 2009). In the United States Health Report only 16% of AA females over 20 years of age were of normal weight (CDC, 2017).

Within this sample of AA nurses (N=96) their average length of employment ranged from 1-28 years, M= 8.9, SD= 8.43. In terms of the work organization, that is the employer, and work area (the unit on which they work), they reported working in an organization or area with less than 30% of African Americans. This is consistent with the literature in that AA's of higher socioeconomic status tend to work in an area where there are lower numbers of African Americans and hence they are more at risk for stress due to heightened vigilance (Mays, Coleman, Jackson 1996; Williams 2016). According to the Bureau of labor statistics latest survey, AA are not well represented in professional and executive health related positions, the percentage of AA remains less than 15 percent (Table 1) (United States Department of Labor, 2018). Incidental findings in this study revealed a statistically significant positive correlation with Work Place racial composition and WPB scores.

### **Association of Hemoglobin A1C with WPB**

We hypothesized there would be an association between hemoglobin A1C and Work Place racism. Although we did not find a statistically significant association we did find relationships that suggest WPB may contribute to elevated glycated hemoglobin levels. The relationship between visceral adiposity and hemoglobin A1C is well established in the literature (Wagner, Tennen, Feinn, & Osborn, 2015). Visceral adiposity is a known risk factor for elevated hemoglobin A1C. In this study, we found statistical significance with interpersonal WPB and WHR, a proxy for visceral adiposity, however the relationship between interpersonal WPB and hemoglobin A1C did not reach significance.

The lack of statistical significance may be due to several factors which are discussed below. The first reason may be the young age of the population sampled in this study, most of which were between 30-49 years of age (54%). Most adults are diagnosed when they are over 45

years of age. Late onset weight gain and the time to failure of glucoregulatory mechanisms is a gradual process (Hillier & Pedula, 2001; Kodama et al., 2014),

Second, the duration of exposure to WPB, In this sample the average exposure time to WPB was 8 years which may not be sufficient time to develop weight gain and insulin resistance. Weight gain and insulin resistance are both variables in the calculation of an allostatic load score (Juster, McEwen, & Lupien, 2010) and therefore the length of employment and exposure to WPB may have been insufficient to result in allostatic load, a condition that occurs after chronic exposure to stress (Jackson, Kirschbaum, & Steptoe, 2017; Sinha & Jastreboff, 2013). Allostatic load, in this study, was found to be positively correlated with length of employment. This is consistent with findings from a prospective study of 4315 AA women on perceived discrimination and residential segregation, in this study they found a stronger association with experiences of racism and visceral adiposity, a marker of metabolic dysfunction and allostatic load (Cozier, et al., 2014).

Other factors that may contribute to the lack of significance are small sample size and homogeneity. The HbA1C were homogeneous with values in the range for prediabetes. This may be due to metabolic flexibility in AA women. It has been reported by Stull, Galgani, Johnson and Cefalu, (2010), that AA have a lower resting metabolic rate, difficulty switching from carbohydrate to fat oxidation, and lower insulin sensitivity, these factors translate to higher glucose levels and therefore higher HbA1C (Stull, Galgani, Johnson, & Cefalu, 2010). Another study looked at glucoregulation differences in AA and European Americans and found AA have a higher BMI and higher HbA1c values. They also report those with values that confer prediabetes (5.7%-6.4%) do not show impaired insulin sensitivity and therefore may not progress to type 2

diabetes (Ebenibo, Edeoga, Wan, & Dagogo-Jack, 2014). This may account for the homogeneity seen in the HbA1C in this population.

Further statistical analysis included a chi square to determine if there was an association between prediabetes, diabetes and Work Place bias both institutional and interpersonal. The hemoglobin A1C, the dependent variable was categorized into the HBA1C of  $\geq 5.7$  for prediabetes and diabetes (ADA, 2011) and a WPB score of  $> 12$  for perceptions of WPB. There was a positive association between interpersonal Work Place Bias and diabetes. In a hierarchical regression to explore the relationship between interpersonal, WPB, WHR and HbA1C, the addition of WHR resulted in statistical significance. This suggests that WHR and interpersonal WPB combined contribute to an increase in glycated hemoglobin.

Previous studies have found correlates of hemoglobin A1C and visceral adiposity and found the latter to be a precursor for insulin resistance more so than BMI (Du, Sun, Huo, Yu, 2014). Insulin resistance in visceral adiposity leads to metabolic dysfunction such as activation of the RAAS system, acute kidney injury and cardiovascular disease (Sarathy et al, 2016). Discrimination studies have found an increased prevalence of visceral adiposity when faced with discrimination or increased job strain (Bernados, & Bastos 2017; Brunner et al 2006; Ferguson et al 2015; Williams 2016). Previous studies support the hypothesis that Work Place bias contributes to the rise in visceral adiposity (Cozier, Wise, Palmer, & Rosenberg, 2009).

### **WPB and Measures of Obesity**

Obesity was operationalized as body mass index and defined as BMI  $>30\text{kg/m}^2$  and visceral adiposity was operationalized as waist to hip ratio and defined as WHR  $>0.85\text{cm}$ . There was a positive correlation between institutional WPB and BMI and with interpersonal WPB and WHR. The findings of this study support the hypothesis that WPB contributes to measures of

obesity. These findings are consistent with other studies on discrimination and weight among African Americans. In the Sister Talk study, they did not find an association between weight and discrimination in African American women but did find an increased rate of emotional eating (Johnson 2012). Other studies have examined eating behaviors in African American women in relation to perceived discrimination (Hayman LW Jr<sup>1</sup>, McIntyre RB, Abbey A., 2015) however, no identified studies to date have examined weight and Work Place Bias. In the metro Atlanta Heart Study, the researchers examined work place discrimination and job strain in African American men and found statistical significance with hypertension but not BMI (Din- Dzietham et al., 2004). In this study, significance was found with BMI and not blood pressure, however the average systolic blood pressure met the JNC7 criteria for hypertension (M = 133, SD = 19.6) in African American female nurses (Chobanian et al., 2003).

Weight based discrimination and age related weight gain was controlled for in the analysis and determined not to be a factor in this population of AA female nurses. The statistical analysis for this population suggest weight gain is related to institutional and interpersonal WPB.

### **Shiftwork as A moderator of WPB, Obesity, and Hemoglobin A1C**

A hierarchical multiple regression showed that shiftwork explained 7.7% of the variance between WPB and BMI. There was a significant interaction between shiftwork and WPB. This suggest shiftwork may add to the stress AA women are experiencing from WPB. Also, in this study there was significant association between shiftwork and waist to hip ratio but not shiftwork and hemoglobin A1C. These results suggest that WPB in conjunction with shiftwork may contribute to obesity in AA nurses.

There is empirical evidence suggesting shiftwork contributes to obesity (Bacquer, Risseghem, Clats, Kittel, & Braeckman, 2009; Pan, Schernhammer, Sun, & Hu, 2011; Peplonska,



Bukowska, & Sobala, 2015). In a prospective longitudinal study over 6 years 309 male shiftworkers were followed and researchers found BMI and waist circumference was greater in the shiftworkers when compared to the day workers. They also found a cumulative incidence of nmetabolic syndrome in the shiftworkers of 31.2% versus 21.6% in the day workers. Metabolic syndrome is characterized by elevated triglycerides, glucose, blood pressure and BMI (Bacquer, Risseghem, Clats, Kittel, & Braeckman, 2009). In the Nurses Health Study I and II they found a moderate increase in BMI with nurses who worked night shift. They reported a dose response relationship with increasing years of night shift resulting in an increase in BMI. There was also an increased incidence of diabetes that was attributed in part to rising body weight (Pan, Schernhammer, Sun, & Hu, 2011). Another large cross sectional study, of 7249 Polish nurses and midwives, aged 40-60 years of age, found that cumulative years of night shift was associated with a higher BMI, WC, and Hip Circumference (HC) (Peplonska, Bukowska, & Sobala, 2015).

There is also evidence that women exposed to discrimination have a higher prevalence of obesity (Cozier, et al., 2014; Farag, et al., 2008; Geronimus A. , 2001). In the Black Womens Health Study (BWHS) they were able to find a positive association between perceived everyday racism and obesity (Cozier, et al., 2014). In another analysis within the BWHS, Cozier et al were able to find an association between weight and discrimination across all levels of education and geographic regions , thereby controlling for covariates such as SES and geographics (Cozier, Wise, Palmer, & Rosenberg, 2009).

### **Work Place Bias and Allostatic Load**

There was not a significant association between WPB and allostatic load. The correlation analysis did show there is a statistical significant relationship with interpersonal and institutional WPB with ERI and job strain. This is consistent with previous studies using the ERI and JCQ

scales examining stress and discrimination (Choi, et al., 2012; Jonge, Bosma, Peter, & Siegrist, 2000; Kivimaki, et al., 2006; Mark & Smith, 2011)

Previous studies have used a larger sample size and were able to find a relationship between allostatic load and discrimination (Duru, Harawa, Kermah, & Norris, 2012; Geronimus, Hicken, Keene, & Bound, 2006; Logan & Barksdale, 2008). Allostatic load is described as a cumulative physiological dysfunction and has been found to be greater in persons of higher socioeconomic status who are subjected to institutional racism. The median allostatic load score in this population was 4 out of a possible 9 points, indicating the participants did not suffer from allostatic load. Since allostatic load is a lifelong cumulative measure and the average length of employment was 8 years, there may not have been sufficient time to develop physiological dysfunction (Oken, Chamine, & Wakeland, 2015).

We used a regression model to determine if allostatic load score increased with years of employment and we found a positive correlation and the relationship was statistically significant. This finding suggests there is a dose response relationship.

## **Implications**

The primary aim of this study examined the relationship between WPB and diabetes in AA American women. The sub-aim evaluated the mediating effects of chronic stress and moderating effects of shift work. The purpose was to evaluate the relationships to assess occupational racism as a potential stressor in the work place affecting worker wellbeing and thereby Total Worker Health®.

The prevention of work place harassment and discrimination are two of the issues addressed in Total Worker Health® (CDC, 2017), however further research is needed in this area. Based on the findings from this pilot study, there are significant relationships between both

institutional and interpersonal WPB with BMI and WHR. The combination of shift work and WPB result in an increase in the variance thereby moderating the effect, increasing the risk for obesity.

Further evaluation of the stressors causing obesity and glycemic dysregulation in this population can possibly lead to programs which reduce or eliminate racial bias in the work place. In addition, identification of stressors can lead to the design of stress reduction programs accessible to workers on all shifts.

The implications of the study findings suggest there are some health effects because of exposure to WPB and shiftwork. There is some evidence that adequate coping skills help to reduce weight gain in AA women (Strickland, Giger, M., & Davis, 2007). The need to promote coping workplace programs and resources to eliminate and combat racism are needed and are important components in decreasing the disparate prevalence of obesity in AA women.

Although this was a small pilot study, the positive correlations found with Institutional WPB and BMI and interpersonal WPB and WHR warrant a future longitudinal multiethnic comparative study. A larger study may lead to interventions to promote coping and eliminate WPB.

### **Strengths and Limitations**

The strength of this research is the use of biological specimen collection and analysis and anthropometric measures. The sample size was adequate for an exploratory pilot study and therefore has sufficient power to suggest there is a relationship between diabetes and Work Place bias. The limitations of the research are due to a change from a venous blood draw to point of care testing which resulted in a loss of c- reactive protein. Another limitation was the loss of

salivary cortisol due to the complexity and time consumption required by the participant to collect the sample, this made the results not usable.

## **Conclusion**

There are several important findings in this study, the first is there is a positive correlation with interpersonal Work Place bias and waist to hip ratio and waist to hip ratio is correlated with a rise in hemoglobin A1C. Previous studies have linked waist to hip ratio with a high risk of type 2 diabetes. This is an important finding as the AA female nurses in this study have hemoglobin A1C values in the prediabetic range. Although no data exist for ethnic differences in prediabetes in nurses, there is evidence, from a meta-analysis of 391 studies that examined prediabetes, that African Americans have a higher HbA1C than any other ethnic group (Kirk, et al., 2006). In a study that looked at ethnic differences in HbA1C between Caucasian and African American obese women found that AA women who were prediabetic had more insulin resistance than Caucasian women and progressed to Type 2 diabetes over a median of six years (Osei, & Gaillard, 2017)

The second important finding is the relationship of institutional Work Place bias with BMI, while controlling for everyday discrimination and life stress scores. This indicates that Work Place bias is an important factor in the disparate rate of obesity in AA female nurses and this relationship should be further explored in a larger longitudinal multiethnic study.

The third finding is that shiftwork, may play a role in poor health however it was not determined if it potentiates the effects of Work Place bias or if it results in poor health by itself. The chi square analysis did find significance with shiftwork and waist to hip ratio however the interaction of shift work and WPB could not be determined. There may be some interaction between institutional Work Place bias and BMI as determined using multinomial moderator

regression analysis. The interaction between shiftwork and institutional WPB was found to statistically predict BMI in this sample. This suggests that shiftwork may potentiate the relationship. However, this finding warrants further study with larger sample size and questionnaires on sleep quantity and quality.

The last important finding is that length of employment is positively correlated with allostatic load scores. As length of employment increases allostatic load scores increase suggesting a dose response relationship. However, in the current study there was not a significant relationship between allostatic load and WPB. Allostatic load is a lifelong cumulative physiologic dysfunction when individuals are exposed to chronic stressors. The average length of employment of eight years may not have been long enough to predict allostatic load.

## Appendix A

### Screening Tool

UNIVERSITY OF CALIFORNIA, LOS ANGELES SCREENING CONSENT SCRIPT The relationship between work place racism and obesity in African American Women: A pilot study

Thank you for calling Deborah Curtis. I would like to ask you a few questions to determine whether you may be eligible for the research. Before I begin the screening, I would like to tell you a little bit about the research. The research is designed to investigate aspects of work and health (blood pressure, body mass index, waist to hip ratio, blood and saliva markers of stress, occupational racism and shiftwork). The aim is to determine if there is a relationship between chronic stress secondary to occupational racism and shiftwork with body mass index. This study will be conducted by asking questions related to you, your job and your health. In addition to questions, I would like to measure your height, weight and waist circumference. I will also measure your blood pressure and collect two drops of blood from a fingerstick to test for cholesterol and sugar in your blood. You will get results in 5 minutes. I will ask you to collect your saliva when you first wake up and every 15 minutes for one hour for a total of four saliva samples. The saliva will be used to measure your cortisol. Would you like to continue with the screening for the study? The screening will take about 5 minutes. I will ask you about your age, your employment, and what type of work you do. I will also ask you if you are pregnant or nursing and if you take any medications that interfere with hormones in your blood. You do not have to answer any questions you do not wish to answer or are uncomfortable answering, and you may stop at any time. Your participation in the screening is voluntary. Your answers will be confidential. No one will know your answers except for the research team. After the screening your answers will be shredded. Would you like to continue with the screening? Please answer

yes or no to the following questions. After the screening I will inform you of your eligibility to participate in the study.

1. Is your age greater than 25 years?
2. Are you currently employed as a registered nurse?
3. Have you worked for more than a year with your current employer?
4. Do you work more than 24 hours a week?
5. Do you currently live/reside in southern California?
6. Are you pregnant, nursing or breastfeeding?
7. Do you currently take steroid medications?

Thank you for answering the screening questions. You are eligible for the study. May I arrange a meeting with you to obtain your consent to participate in the study?

Or

Thank you for your interest in the study at this time you are not eligible for this study because you do not meet the inclusion criteria. Do you have any questions about the screening or the research? I am going to give you a couple of telephone numbers to call if you have any questions later. Do you have a pen? If you have questions about the research screening, you may call Deborah Curtis she will answer your questions. If you have questions about your rights as a research subject or if you wish to voice any problems or concerns you may have about the study to someone other than the researcher, you may contact my faculty advisor Dr. Wendie Robbins [wrobbins@sonnet.ucla.edu](mailto:wrobbins@sonnet.ucla.edu) or 310- 825-8999 OR you may call the UCLA Office of the Human

Research Protection Program at (310) 825- 7122. Thank you again for your willingness to answer our questions.

Protocol ID:IRB#15-001870 UCLA IRB Approved Approval Date: 8/22/2017 Through:  
8/21/2018 Committee: South General IRB



Informed Consent

University of California, Los Angeles

**CONSENT TO PARTICIPATE IN RESEARCH**

The relationship between work place racism and obesity in African American Women: A pilot study

*Deborah Curtis MSN, RN, Doctoral Student from the School of Nursing at the University of California, Los Angeles (UCLA) is conducting a research study.*

You were selected as a possible participant in this study because you are an African American woman greater than 25 years of age and are employed as a registered nurse. Your participation in this research study is voluntary.

**Why is this study being done?**

The purpose of this study is to investigate the relationships between occupational racism and shiftwork with obesity. We will need to enroll participants with many different body weights (from low to high) in order to investigate these relationships.

**What will happen if I take part in this research study?**

If you volunteer to participate in this study, the researcher will ask you to do the following:

- *You will be asked to answer questions about yourself, your job and your health*
- *Your blood pressure, weight, height, hip and waist measurements will be measured*
- *You will be asked to undergo one finger stick for two drops of blood to check for to check for:*
  - *hemoglobin A1C to estimate your average blood sugar,*
  - *cholesterol levels and triglycerides*
- *You will be asked to collect saliva samples from yourself when you first wake up.*
- *You will be asked to complete the questionnaires at home and return them with the saliva samples.*

**How long will I be in the research study?**

Participation will take a total of about one to two hours but not all in the same day. The questionnaires can be completed at home to ensure privacy. The saliva samples will take place at home on awakening. The blood test, blood pressure and body measurements will take place at a convenient location.

- *The questionnaires will take approximately 30 minutes to complete and can be done at home.*
- *The body measurements will take approximately 10 minutes to complete*
- *The finger stick will take approximately 6 minutes to setup and collect and get the results*

- *The saliva samples will take 1-3 minutes for each sample and approximately one hour to collect all 4 samples. Each of the saliva samples must be collected 15 minutes apart for a total of four samples.*
- *The blood pressure measurements will take approximately 12 minutes for the two measurements. There will be a 5-minute rest period prior to the first reading and a wait time of 5 minutes before the second reading.*

**Are there any potential risks or discomforts that I can expect from this study?**

- *Discomfort may arise from having a finger stick blood sample*
- *You may be uncomfortable collecting and handling your saliva*
- *You may have discomfort during the blood pressure measurement*
- *You may be uncomfortable thinking about or discussing racism at work*

However, you may skip questions that make you feel uncomfortable and you can stop the study at any time.

**Are there any potential benefits if I participate?**

You will not directly benefit from your participation in this research. However, information from this study will help determine if there is a relationship between occupational racism and shift work with body weight. This information will be used to design an intervention to decrease the effects of occupational racism and shiftwork on African American women and thereby decrease the rising rate of obesity. This will lead to improved health in African American women who are employed as registered nurses.

**What other choices do I have if I choose not to participate?**

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. If you decide to participate, you are free to withdraw your consent and discontinue without penalty.

**Will I be paid for participating?**

You will receive a total of \$75.00 in three separate \$25.00 gift cards for your participation in the study.

Two \$25.00 gift cards will be given to you at the first research visit where the following will occur:

- Questionnaires collected or completed
- Finger stick blood sample performed and sample analyzed
- Blood pressure measured
- Height, weight, waist circumference, hip circumference measured
- Supplies and instructions given for collection of saliva samples

One \$25.00 gift card will be given when saliva samples are picked up by the PI or research assistant.

**Will information about me and my participation be kept confidential?**

Any information that is obtained in connection with this study and that can identify you will remain confidential. It will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of assigning numbers to the questionnaires, blood and saliva samples. Blood collected from the fingerstick and saliva samples will not be stored by

the researcher. They will be destroyed once the blood lipids, hemoglobin A1C and saliva cortisol tests are run. Data will be stored in a locked file in the researcher's private office.

**What are my rights if I take part in this study?**

- You can choose whether or not you want to be in this study, and you may withdraw your consent and discontinue participation at any time.
- Whatever decision you make, there will be no penalty to you, and no loss of benefits to which you were otherwise entitled.
- You may refuse to answer any questions that you do not want to answer and still remain in the study.

**Who can I contact if I have questions about this study?**

• **The research team:**

If you have any questions, comments or concerns about the research, you can talk to the one of the researchers. Please contact: Deborah Curtis at 310-613-1892 or [debcurtis@g.ucla.edu](mailto:debcurtis@g.ucla.edu) or my faculty advisor Dr. Wendie Robbins [wrobbins@sonnet.ucla.edu](mailto:wrobbins@sonnet.ucla.edu) 310-825-8999

• **UCLA Office of the Human Research Protection Program (OHRPP):**

If you have questions about your rights while taking part in this study, or you have concerns or suggestions and you want to talk to someone other than the researchers about the study, please call the OHRPP at (310) 825-7122 or write to:

UCLA Office of the Human Research Protection Program  
10889 Wilshire Blvd Suite 800  
Los Angeles, CA 90095-1406

**I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been a copy of this form.**

**SIGNATURE OF STUDY PARTICIPANT**

**SIGNATURE OF STUDY PARTICIPANT**

Print Name \_\_\_\_\_ Date \_\_\_\_\_

Signature \_\_\_\_\_

**SIGNATURE OF PERSON OBTAINING CONSENT**

Print Name \_\_\_\_\_

Signature \_\_\_\_\_

Protocol ID:IRB#15-001870 UCLA IRB Approved Approval Date: 8/22/2017 Through: 8/21/2018 Committee: South General IRB

Appendix C

IRB Approval Notice

**APPROVAL NOTICE**

<b>DATE:</b>	8/23/2017
<b>TO:</b>	DEBORAH CURTIS, Doctorate(C), Masters in Science in Nursing SCHOOL OF NURSING
<b>FROM:</b>	THOMAS COATES, PhD Chair, SGIRB
<b>RE:</b>	IRB#15-001870-CR-00002 2017 Review for IRB#15-001870 The relationship between workplace racism and obesity in African American Women: A pilot study

The UCLA Institutional Review Board (UCLA IRB) has approved the above-referenced study. UCLA's Federalwide Assurance (FWA) with Department of Health and Human Services is FWA00004642.

**Submission and Review Information**

Type of Submission	Continuing Review
Type of Review	Full Board Review
Approval Date	8/22/2017
Expiration Date of the Study	8/21/2018
Funding Source(s)	1) DHHS-CENTERS FOR DISEASE CONTROL (INCL CDC FOUNDATION) <i>Grant PI:</i> DEBORAH CURTIS <i>Grant Title:</i> The Relationship between Workplace Racism and Obesity in African American Women: A Pilot Study

**Regulatory Determinations**

-- **Waiver of Signed Informed Consent** - The UCLA IRB waived the requirement for signed informed consent for screening under 45 CFR 46.117(c)(2).

**Documents Reviewed included, but were not limited to:**

Document Name	Document Version #
<a href="#">15-001870_Debbies_Revised_Recruitment_Flyer_version2(1).pdf.pdf</a>	0.02
<a href="#">15-001870_Revised_consent_form_3_22_2017_clean.pdf.pdf</a>	0.02

<a href="#">15-001870 Revised direct recruitment script 03 22 2017 Clean.pdf.pdf</a>	0.02
<a href="#">15-001870 Revised recruitment email 03 22 2017 Clean.pdf.pdf</a>	0.02
<a href="#">15-001870 Revised screening script 03 22 2017 Clean.pdf.pdf</a>	0.02

**Important Note:** Approval by the Institutional Review Board does not, in and of itself, constitute approval for the implementation of this research. Other UCLA clearances and approvals or other external agency or collaborating institutional approvals may be required before study activities are initiated. Research undertaken in conjunction with outside entities, such as drug or device companies, are typically contractual in nature and require an agreement between the University and the entity.

### General Conditions of Approval

As indicated in the PI Assurances as part of the IRB requirements for approval, the PI has ultimate responsibility for the conduct of the study, the ethical performance of the project, the protection of the rights and welfare of human subjects, and strict adherence to any stipulations imposed by the IRB.

The PI and study team will comply with all UCLA policies and procedures, as well as with all applicable Federal, State, and local laws regarding the protection of human subjects in research, including, but not limited to, the following:

- Ensuring that the personnel performing the project are qualified, appropriately trained, and will adhere to the provisions of the approved protocol,
- Implementing no changes in the approved protocol or consent process or documents without prior IRB approval (except in an emergency, if necessary to safeguard the well-being of human subjects and then notifying the IRB as soon as possible afterwards),
- Obtaining the legally effective informed consent from human subjects of their legally responsible representative, and using only the currently approved consent process and stamped consent documents, as appropriate, with human subjects,
- Reporting serious or unexpected adverse events as well as protocol violations or other incidents related to the protocol to the IRB according to the OHRPP reporting requirements.
- Assuring that adequate resources to protect research participants (i.e., personnel, funding, time, equipment and space) are in place before implementing the research project, and that the research will stop if adequate resources become unavailable.
- Arranging for a co-investigator to assume direct responsibility of the study if the PI will be unavailable to direct this research personally, for example, when on sabbatical leave or vacation or other absences. Either this person is named as co-investigator in this application, or advising IRB via webIRB in advance of such arrangements.

## Appendix D

### Recruitment Flyer



## Volunteers Needed to Participate in Research Study on Health and Work

**UCLA** School of Nursing

The purpose of this study is to look at aspects of health and work in African American Women. We will be looking at blood pressure, bodyweight, waist to hip ratio, biomarkers of stress, occupational racism and shiftwork.

### ***We are looking for:***

- ✓ Professional nurses, nurse practitioners, nurse administrators and educators with degrees ranging from ADN/Diploma to PhD.
- ✓ Self-Identify as African American
- ✓ Age 25 years or older
- ✓ Currently employed in any field of nursing
- ✓ Employed at least part-time (24 hours/week) for the past year

### **Study Procedures include:**

- Questionnaires on health, stress and perceptions of racism
- One research visit to collect BMI, WHR, BP, and one blood sample
- Provide saliva cortisol sample
- Total time commitment 2-3 hours (questionnaires 30 minutes, body measurements, BP and blood draw 30 minutes, saliva collection one hour)
- Questionnaires and saliva collection can be done at home at your convenience
- ***Participants will receive up to \$50.00 in target gift cards.***

If you are interested, contact Deborah Curtis MSN, RN Doctoral Student from UCLA School of Nursing, Los Angeles CA 90095 [debcurtis@g.ucla.edu](mailto:debcurtis@g.ucla.edu) or 310-613-1892

## Appendix E1

### Survey 1: Demographic Questions:

Job Title: \_\_\_\_\_

1. What type of Nursing Degree or nursing credentials qualified you for your first RN license?

- a. Diploma
- b. Associates
- c. Bachelors
- d. Masters
- e. Doctorate
- f. Other \_\_\_\_\_

2. What year did you get your first RN license? \_\_\_\_\_

3. How long have you been continuously employed at your current job?

\_\_\_ years \_\_\_ months

4. Which of the following best describes the employment setting of your principal nursing position?

- a. Inpatient unit
- b. Outpatient unit
- c. Psychiatric inpatient unit
- d. Psychiatric outpatient clinic
- e. Skilled nursing unit
- f. Nursing/extended care unit
- g. Advanced practice nursing
- h. Nursing education
- i. Other \_\_\_\_\_

5. Have you earned any additional degrees after graduating from your initial registered nursing program?

- a. ADN
- b. BSN
- c. MSN
- d. Doctorate

6. What is your current pretax annual income?

- a. \$15,000 or less
- b. \$15,001 to \$25,000
- c. \$25,001 to \$35,000
- d. \$35,001 to \$50,000
- e. \$50,001 to \$75,000
- f. \$75,001 to \$100,000

- g. \$100,001 to \$150,000
- h. \$150,001 to \$200,000
- i. More than 200,000

7. Do you currently work shift work, defined as working outside the normal daylight hours of 7am to 6pm.

- 1. Yes
- 2. No

8. If you answered yes to question 7 please answer the following questions:

a. What shift do you work?

- 1. Day Shift                      8 hours    10 hours    12 hours
- 2. Evening Shift                8 hours    10 hours    12 hours
- 3. Night shift                    8 hours    10 hours    12 hours

b. Rotating Shifts

- 1. Yes
- 2. No

c. If you answered yes to rotating shifts how often do you rotate shifts in a 4 week period?

- 1. 1-2 times
- 2. 3-4 times
- 3. More than 4 times

9. How would you describe the racial composition of your work place in terms of the percentage of African Americans employed in both your primary work area and the organization?

Percentage of African Americans Employed	Work Area	Organization
Less than 10%		
10-20%		
21-30%		
31-40%		
41-50%		
51-60%		
61-70%		
71-80%		
81-90%		
≥ 91%		



## Appendix E2

### Survey 2: General Health and Health Practices

Q1. Age (at last birthday)

1. 18-29
2. 30-39
3. 40-49
4. 50-59
5. 60+

Q2. In the last year, how many days were you away from work because you were sick, injured or disabled?

\_\_\_\_\_ days

#### **B. PHYSICAL ACTIVITY**

Q3. Do you exercise regularly, i.e. 150 minutes of moderate-intensity aerobic activity (e.g. brisk walking) or 75 mins of vigorous-intensity (e.g running, jogging or playing basketball) a week?

1. Yes
2. No

Q4. In a typical week, how many minutes do you engage in moderate-intensity aerobic activity (e.g. brisk walking)

\_\_\_\_\_ mins/week

#### **C. DIETARY PRACTICES**

Q5. How many servings of fruit do you consume on an average day? \_\_\_\_\_

(Please note that 1 serving is equivalent to:

1 medium apple, pear, orange, mango or banana

1 wedge of pineapple, papaya, watermelon or honeydew

10 grapes )

Q6. How many servings of vegetables do you consume on an average day? \_\_\_\_\_

(Please note that 1 serving = three quarters of a cup of cooked vegetables)

Q7. What type of rice do you usually eat?

1. White rice
2. Unpolished rice e.g. Brown / Red / Black / Multigrain rice
3. Mixture of White / brown rice
4. Do not eat rice

Q8. What type of bread do you usually eat?

1. White (ordinary/enriched)
2. Whole meal/ multigrain
3. A mixture of White/whole meal
4. Do not eat bread

Q9. What type of milk or milk based drinks do you usually drink?

1. Whole milk/full fat
2. Low fat
3. Skimmed/non-fat
4. Sweetened condensed milk
5. I don't drink milk or milk based drinks

Q10. When you eat meat or poultry, how much of the fat and skin do you remove?

1. All
2. Some
3. None
4. I don't eat meat or poultry

Q11. What kind of oil do you usually use for cooking at home?

1. Butter, dripping, ghee, lard or any other animal fat
2. Hard margarine, vegetable oil, blended oil, palm oil or coconut oil
3. Soft margarine, corn oil, soya bean oil, sunflower oil or safflower oil
4. Peanut oil, canola oil, olive oil
5. Other
6. I don't cook at home at all

Q12. At the table, when do you usually add salt or sauces to your food?

1. Before tasting food
2. When the food is not tasty enough
3. I don't add salt or sauces to my food at the table

#### **D. CIGARETTE SMOKING**

Q13. Do you smoke?

1. Daily
2. Occasionally
3. Never [ Go to Section E, question 18 ]

Q14. Do you intend to quit smoking?

1. Yes
2. No

Q15. Have you made any attempts to quit smoking in the past 12 months?

1. Yes
2. No [**Go to Section E, question 18**]

Q16. How many attempts have you made in the past 12 months?

1. 1
2. 2
3. 3
4. More than 3

Q17. Which method/cessation aid did you use?

1. Cold turkey
2. Delay
3. Gradual reduction
4. Nicotine Replacement Therapy
5. Medication
6. Others. Pls specify \_\_\_\_\_

## **E. ALCOHOL INTAKE**

Q18. On how many days did you drink alcohol during the past week?

\_\_\_\_\_

Q19. During the past month, did you drink more than 5 drinks in any one drinking session?

1. Yes
2. No

If YES, how many times? \_\_\_\_\_

## **F. HEALTH SCREENING**

Q20. When was the last time you had screening for high blood pressure?

1. Less than 2 years ago
2. More than 2 years ago
3. Never

Q21. When was the last time you had screening for obesity?

1. Less than 1 year ago
2. More than 1 year ago
3. Never

Q22. When was the last time you had screening for diabetes?

1. Less than 3 years ago
2. More than 3 years ago
3. Never

Q23. When was the last time you had screening for high blood cholesterol?

1. Less than 3 years ago
2. More than 3 years ago
3. Never

<b>Strongly Disagree</b>			<b>Strongly agree</b>	
1	2	3	4	5
Q24. The statements below refer to how you feel currently.			Based on the above scale of 1 to 5, where 1 means “strongly disagree” and 5 means “strongly agree”, please write the number that best describes you.	
a. I am able to deal with day to day stressors				
b. I generally feel relaxed and calm				
c. I can effectively manage my emotions (eg. anger, sadness, anxiety)				
d. I am able to cope with life’s challenges				
e. I have the strong support of my family and friends				
<b>Strongly Disagree</b>			<b>Strongly agree</b>	
1	2	3	4	5
Q25. The statements below refer to your perception of your work environment. To what extent do you agree or disagree with each statement?			Based on the above scale of 1 to 5, where 1 means “strongly disagree” and 5 means “strongly agree”, please write the number that best describes your views.	
a. I am proud to say I work at my company				

b. I see the connection between the work I do and the organization's overall strategic objectives.	
c. My workload is a cause of concern to me.	
d. My work gives me a sense of accomplishment.	
e. My contributions at work are recognized.	
f. At work, my opinions and ideas seem to count.	
g. I am given adequate authority to make decisions appropriate to my job scope.	
h. I can easily balance the demands of work and home life.	

Appendix E3

Survey 3: Life Stress Test

As caregivers, we are often stressed and don't know why. Without realizing the effects that life circumstances have on us, we tend to sweep our feelings of frustration, sadness and turmoil under the rug. In the **past 12 to 24 months**, which of the following major life events have taken place in your life?

Place a check by all that apply.

Death of Spouse		Change to a different line of work	
Divorce		Change in number of marital arguments	
Marital Separation or from relationship partner		Mortgage or loan over \$30,000	
Jail Term		Foreclosure of mortgage or loan	
Death of close family member		Change in work responsibilities	
Personal injury or illness		Trouble with in-laws	
Marriage		Outstanding personal achievement	
Fired from work		Spouse begins or stops work	
Marital reconciliation		Starting or finishing school	
Retirement		Change in living conditions	
Change in family member's health		Revision of personal habits	
Pregnancy		Trouble with boss	
Sex difficulties		Change in work hours, conditions	
Addition to family		Change in residence	
Business readjustment		Change in schools	
Change in financial status		Change in recreational habits	
Death of close friend		Change in church activities	
Change in sleeping habits		Change in social activities	
Change in number of family gatherings		Mortgage or loan under \$20,000	
Change in eating habits		Christmas season	
Vacation		Minor violations of the law	

Appendix E4

## Appendix E-4 Effort Reward Imbalance

### Survey 4: Effort Reward Imbalance

The following items refer to your **present occupation**. For each of the following statements, please indicate whether you strongly agree, agree, disagree or strongly disagree.

	Strongly disagree	disagree	agree	Strongly agree
I have constant time pressure due to a heavy work load.	1	2	3	4
I have many interruptions and disturbances while performing my job.	1	2	3	4
I have a lot of responsibility in my job.	1	2	3	4
I am often pressured to work overtime.	1	2	3	4
My job is physically demanding.	1	2	3	4
Over the past few years, my job has become more and more demanding.	1	2	3	4
I receive the respect I deserve from my superior or a respective relevant person.	1	2	3	4
I experience adequate support in difficult situations.	1	2	3	4
I am treated unfairly at work.	1	2	3	4
My job promotion prospects are poor.	1	2	3	4
I have experienced or I expect to experience an undesirable change in my work situation.	1	2	3	4
My employment security is poor.	1	2	3	4
My current occupational position adequately reflects my education and training.	1	2	3	4
Considering all my efforts and achievements, I receive the respect and prestige I deserve at work.	1	2	3	4

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	Strongly disagree	disagree	agree	Strongly agree
Considering all my efforts and achievements, my job promotion prospects are adequate.	1	2	3	4
Considering all my efforts and achievements, my salary / income is adequate.	1	2	3	4

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Appendix E5

Survey 5: Job Content Questionnaire

For each statement below, check the box that comes closest to describing your job situation

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. My job requires that I learn new things.	1	2	3	4
b. My job involves doing a lot of things over and over again	1	2	3	4
c. My job requires me to be creative.	1	2	3	4
d. My job allows me to make a lot of decisions on my own.	1	2	3	4
e. My job requires a high level of skill.	1	2	3	4
f. On my job, I have very little freedom to decide how I do my work	1	2	3	4
g. I get to do a variety of different things on my job	1	2	3	4
h. I have a lot of say about what happens on my job.	1	2	3	4
i. I have an opportunity to develop my own special abilities	1	2	3	4
j. My job requires working very fast.	1	2	3	4
k. My job requires working very hard.	1	2	3	4
l. My job requires lots of physical effort.	1	2	3	4
m. I am not asked to do too much work	1	2	3	4

	Strongly Agree	Agree	Disagree	Strongly Disagree
n. I have enough time to get the job done.	1	2	3	4
o. I am free from conflicting demands that others make on me.	1	2	3	4
p. My supervisor is concerned about the well-being of those under her.	1	2	3	4
q. My supervisor pays attention to what I am saying.	1	2	3	4
r. My supervisor is helpful in getting the job done.	1	2	3	4
s. My supervisor is respectful to those under her.	1	2	3	4
t. My supervisor shows favoritism in assigning work.	1	2	3	4
u. People I work with know how to do their jobs.	1	2	3	4
v. People I work with take a personal interest in me.	1	2	3	4
w. People I work with are friendly	1	2	3	4
x. People I work with are helpful in getting the job done	1	2	3	4
y. My job security is good.	1	2	3	4
z. The local union and local management work well together to solve problems.	1	2	3	4
aa. The local union in my area of nursing considers health and safety are considered important issues.	1	2	3	4
bb. The management in my area of nursing considers health and safety to be important issues.	1	2	3	4

### Survey 6: Work Place Bias Scale

For each of the statements below please circle the response that best characterizes how you feel about the statement.

	Strongly Disagree	Disagree	Agree	Strongly Agree
<b>Institutional Racism</b>				
<i><b>Do you agree or disagree that at the place where you work....</b></i>				
1. African American women get the least desirable assignments.	1	2	3	4
2. There is discrimination against African American women in hiring.	1	2	3	4
3. African American women have to work harder to get a promotion than other workers do.	1	2	3	4
4. African American women get jobs that have fewer fringe benefits than other jobs have.	1	2	3	4
5. There is discrimination against African American women in salaries.	1	2	3	4
6. Differences between African American women and Anglo culture sometimes cause trouble.	1	2	3	4
7. You overhear jokes or slurs about African American women	1	2	3	4

---

	Strongly Disagree	Disagree	Agree	Strongly Agree
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**Interpersonal Racism**

*Do you agree or disagree that at the place where you work....*

1. People you work with have stereotypes about African American women that affect how they judge you.	1	2	3	4
2. You deal with people on your job who are prejudiced against African American women.	1	2	3	4
3. People notice your ethnic background before they notice anything else about you.	1	2	3	4
4. People you work with assume that African American women are not as competent as others.	1	2	3	4
5. You work with people who assume all African American women are the same.	1	2	3	4

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Appendix E7

Survey 7: Everyday Discrimination Scale

In your day-to-day life, how often do any of the following things happen to you? Circle the best response.

	Almost Everyday	At least once a week	A few times a month	A few times a year	Less than once a year	Never
1. You are treated with less courtesy than other people are.	5	4	3	2	1	0
2. You are treated with less respect than other people are.	5	4	3	2	1	0
3. You receive poorer service than other people at restaurants or stores.	5	4	3	2	1	0
4. People act as if they think you are not smart.	5	4	3	2	1	0
5. People act as if they are afraid of you.	5	4	3	2	1	0
6. People act as if they think you are dishonest.	5	4	3	2	1	0
7. People act as if they're better than you are.	5	4	3	2	1	0
8. You are called names or insulted.	5	4	3	2	1	0
9. You are threatened or harassed.	5	4	3	2	1	0

## References

- American Diabetes Association. (2011). *Diabetes basics*. Retrieved from <http://www.diabetes.org/diabetes-basics/diabetes-statistics/>
- An, J., Braveman, P., Dekker, M., Egerter, S., & Grossman-Kahn, R. (2011, May). Exploring the social determinants of health: Work, workplaces and health. San Francisco, CA: Robert Wood Johnson Foundation. Retrieved from [http://www.rwjf.org/content/dam/farm/reports/issue\\_briefs/2011/rwjf70459](http://www.rwjf.org/content/dam/farm/reports/issue_briefs/2011/rwjf70459)
- Bacquer, D., Risseghem, E., Clats, E., Kittel, G., & Braeckman, L. (2009). Rotating shift work and the metabolic syndrome: A prospective study. *International Journal of Epidemiology*, 38, 848-854. doi: 10.1093/ije/dyn360
- Bauer, G. (2014). Incorporating intersectionality theory into population health research methodology: Challenges and the potential to advance health equity. *Social Science & Medicine*, 110, 10-17. doi: 10.1016/j.socscimed.2014.03.022
- Bernardo, C. de O., Bastos, J. L., González-Chica, D. A., Peres, M. A., & Paradies, Y. C. (2017). Interpersonal discrimination and markers of adiposity in longitudinal studies: a systematic review: Discrimination and markers of adiposity. *Obesity Reviews*, 18, 1040–1049. <https://doi.org/10.1111/obr.12564>
- Best, M. (2008). The growing challenge of diabetes. *NIH Medline Plus*, 3(1), 12. Retrieved from <http://www.nlm.nih.gov/medlineplus/magazine/issues/winter08/articles/winter08pg12.html>

- Bowleg, L. (2012). The problem with the phrase Women and Minorities: Intersectionality-An important theoretical framework for public health. *American Journal of Public Health, 102*, 1267--1273. doi:10.2105/AJPH.2012.300750
- Brondolo, E., Blair, I., & A, K. (2018). Biopsychosocial mechanisms linking discrimination to health: A focus on social cognition. *In The Oxford Handbook of Stigma, Discrimination, and Health* (pp. 219-240). New York: Oxford University Press.
- Brunner, E., Chandola, T., & Marmot, M. (2007). Prospective effect of job strain on general and central obesity in the Whitehall II study. *American Journal of Epidemiology, 165*, 828-837. doi:10.1093/aje/kwk058
- Campbell, J. C., & Bunting, S. (1991). Voices and paradigms: Perspectives on critical and feminist theory in nursing. *Advances in Nursing Science, 13*, 1-5.
- Carbado, D., Crenshaw, K., Mays, V., & Tomlinson, B. (2013). Intersectionality mapping the movements of a theory. *Du Bois Review, 10*, 303-312. doi:10.1017/S1742058x13000349
- Carlson, E., & Chamberlain, R. (2005). Allostatic load and health disparities: A theoretical orientation. *Research in Nursing & Health, 28*, 306-315. doi:10.1002/nur.20084
- Centers for Disease Control and Prevention. (2011). CDC Health Disparities and Inequalities Report - United States, 2011. *MMWR Morbidity and Mortality Weekly Report, 60*(Suppl.), 1-116.
- Centers for Disease Control and Prevention. (2009). CDC Newsroom: Press Release: New obesity data shows blacks have the highest rates of obesity. Retrieved from [http://www.cdc.gov/media/pressrel/2009/r090716.htm?s\\_cid=mediarel\\_r090716](http://www.cdc.gov/media/pressrel/2009/r090716.htm?s_cid=mediarel_r090716).

Centers for Disease Control and Prevention. (2011). CDC Health Disparities and Inequalities Report - United States, 2011. *MMWR Morbidity and Mortality Weekly Report*, 60(Suppl.), 1-116.

Centers for Disease Control and Prevention, National Center for Chronic Disease Promotion, Division of Diabetes Translation. (2012). *Diabetes report card 2012*. Retrieved from <http://www.cdc.gov/diabetes/pubs/pdf/DiabetesReportCard.pdf>

Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health. (2013, March 6). *Health related quality of life (HRQOL): Well-being concepts*. Retrieved from <http://www.cdc.gov/hrqol/wellbeing.htm>

Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Nutrition, Physical Activity and Obesity. (2014). *Overweight and Obesity: Adult Obesity Facts*. Retrieved from <http://www.cdc.gov/obesity/data/adult.html>

Centers for Disease Control and Prevention. (2014, July 11). *Healthy Weight - it's not a diet, it's a lifestyle!* Retrieved from [http://www.cdc.gov/healthyweight/assessing/bmi/adult\\_bmi/index.html](http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html)

Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., Green, L. A., Izzo, J. L., . . . the National High Blood Pressure Education Program Coordinating Committee. (2003). *Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension*, 42, 1206–1252. doi: 10.1161/01.HYP.0000107251.49515.c2



- Choi, B., Kurowski, A., Bond, M., Clays, E., Bacquer, D., & Punnett, L. (2012). Occupation-differential construct validity of the Job Content Questionnaire (JCQ) psychological job demands scale with physical job demands items: a mixed methods research. *Ergonomics*, 55, 425-439.
- Chong, R., Uhart, M., NcCaul, M., Johnson, E., & Wand, G. (2008). Whites have a more robust hypothalamic-pituitary-adrenal axis response to a psychological stressor than blacks. *Psychoneuroendocrinology*, 33, 246-254. doi:10.1016/j.psyneuen.2007.10.014
- Chung, S., & Wolf, T. S. (2009). Sleep and health consequences of shift work in women. *Journal of Womens's Health*, 18, 965-977. doi:10.1089/jwh.2007.0742
- Chyu, L., & Upchurch, D. (2011). Racial and ethnic patterns of allostatic load among adult women in the United States: Findings from the National Health and Nutrition Examination Survey 1999-2004. *Journal of Women's Health*, 20, 575-583. doi:10.1089/jwh.2010.2170
- Clow, A., Hucklebridge, F., Stalder, T., Evans, P., & Thorn, L. (2010). The cortisol awakening response: More than a measure of HPA axis function. *Neuroscience and Biobehavioral Reviews*, 35(1), 97-103.1-7. doi.org/10.1016/j.neubiorev.2009.12.011.
- Cochran, N. (2017). Annual update of the HHS Poverty Guidelines. Health and Human Services. Retrieved from <https://www.federalregister.gov/documents/2017/01/31/2017-02076/annual-update-of-the-hhs-poverty-guidelines>

- Cox, T. L., Krukowski, R., Love, S. J., Eddings, K., DiCarlo, M., Chang, J. Y., . . . West, D. S. (2013). Stress management–Augmented behavioral weight loss intervention for African American women: A pilot, randomized controlled trial. *Health Education & Behavior, 40*(1), 78–87. doi:10.1177/1090198112439411
- Cozier, Y., Wise, L., Palmer, J., & Rosenberg, L. (2009). Perceived racism in relation to weight change in the Black Women's Health Study. *Annals of Epidemiology, 19*, 379-387. doi:10.1016/j.annepidem.2009.01.008
- Cozier, Y., Yu, J., Coogan, Bethea, T., Rosenberg, L., & Palmer, J. (2014). Racism, segregation, and risk of obesity in the Black Women's Health Study. *American Journal of Epidemiology, 179*, 875-883. doi:10.1093/aje/kwu004
- Crenshaw, K. (1991). Mapping the margins: Intersectionality, identity politics, and violence against women of color. *Stanford Law Review, 43*, 1241-1299.
- Deuster, P., Kim-Dorner, S., Remaley, A., & Poth, M. (2011). Allostatic load and health status of African Americans and Whites. *American Journal of Health Behaviors, 35*, 641-653.
- Din-Dzietham, R., Nembhard, W., Collins, R., & Davis, S. (2004). Perceived stress following race-based discrimination at work is associated with hypertension in African-Americans. The Metro Atlanta Heart Disease Study, 1999-2001. *Social Science and Medicine, 58*, 449-461. doi:10.1016/s0277-9536(03)00211-9
- Du, T., Sun, X., Huo, R., & Yu, X. (2014). Visceral adiposity index, hypertriglyceridemic waist and risk of diabetes: The China Health and Nutrition Survey 2009. *International Journal of Obesity, 38*, 840–847. <https://doi.org/10.1038/ijo.2013.181>

- Dugan, S. A., Lewis, T. T., Everson-Rose, S. A., Jacobs, E. A., Harlow, S. D., & Janssen, I. (2017). Chronic discrimination and bodily pain in a multiethnic cohort of midlife women in the Study of Women's Health Across the Nation: *PAIN*, *158*, 1656–1665.  
doi:10.1097/j.pain.0000000000000957
- Duru, O., Harawa, N., Karmah, D., & Norris, K. (2012). Allostatic load burden and racial disparities in mortality. *Journal of the National Medical Association*, *104*(1-2), 89-95.
- Ebenibo, S., Edeoga, C., Wan, j., & Dagogo-Jack, S. (2014). Glucoregulatory function among African Americans and European Americans with normal or pre-diabetic hemoglobin A1c levels. *Metabolism Clinical and Experimental*, *63*, 767-772.  
doi:10.1016/j.metaabol.2014.03.002
- Ebrecht, A., Mohamed-Ali, V., Feldman, P., Kirschbaum, C., & Steptoe, A. (2003). Cortisol response to mild psychological stress are inversely associated with proinflammatory cytokines. *Brain, Behavior and Immunity*, *17*, 373-383.
- Farag, N., Moore, W., Lovallo, W., Mills, P., Khandrika, S., & Eichner, J. (2008). Hypothalamic-Pituitary-Adrenal axis function: Relative contributions of perceived stress and obesity in women. *Journal of Women's Health*, *17*, 1647-1655.  
doi:10.1089/jwh.2008.0866
- Farag, Y., & Gaballa, M. (2011). Diabesity: An overview of a rising epidemic. *Nephrology, Dialysis, Transplantation*, *26*, 28-35. doi: 10.1093/ndt/gfq576

- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149-1160.
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.
- Ferguson, T. W., Andercheck, B., Tom, J. C., Martinez, B. C., & Stroope, S. (2015). Occupational conditions, self-care, and obesity among clergy in the United States. *Social Science Research, 49*, 249–263. doi:10.1016/j.ssresearch.2014.08.014
- Ferguson, T. W., Andercheck, B., Tom, J. C., Martinez, B. C., & Stroope, S. (2015). Occupational conditions, self-care, and obesity among clergy in the United States. *Social Science Research, 49*, 249–263. doi:10.1016/j.ssresearch.2014.08.014
- Flegal, K. M., Kruszon-Moran, D., Carroll, M. D., Fryar, C. D., & Ogden, C. L. (2016). Trends in obesity among adults in the United States, 2005 to 2014. *JAMA, 315*, 2284. doi:10.1001/jama.2016.6458
- Fontana, J. (2004). A methodology for critical science in nursing. *Advances in Nursing Science, 27*, 93-101.
- Geronimus, A. (2001). Understanding and eliminating racial inequalities in women's health in the United States: The role of the weathering conceptual framework. *Journal of the American Medical Women's Association, 4*, 133-136, 149-50.

- Geronimus, A., Hicken, M., Keene, D., & Bound, J. (2006). "Weathering" and age patterns of allostatic load scores among Blacks and Whites in the United States. *American Journal of Public Health, 96*, 826-833. doi:10.2105/AJPH.2004.060749
- Granger, D., Kivlighan, K., Fortunato, C., Harmon, A., Hibel, L., Schwartz, E., & Whembolua, G.-L. (2007). Integration of salivary biomarkers into developmental behaviorally-oriented research: Problems and solutions for collecting specimens. *Physiology and Behavior, 583-590*. doi:10.1016/j.physbeh.2007.05.004
- Gray, M., Litz, B., Hsu, J., & Lombardo, T. (2004). Psychometric Properties of the Life Events Checklist. *Sage Publications, 11(4)*. doi:10.1177/10731904269954
- Gucciardi, E., Chan, V., Manuel, L., & Sidani, S. (2013). A systematic literature review of diabetes self-management education features to improve diabetes education in women of Black African/Caribbean and Hispanic/Latin American ethnicity. *Patient Education and Counseling, 92*, 235-245. doi:10.1016/j.pec.2013.03.007
- Hayman, L. W., McIntyre, R. B., & Abbey, A. (2015). The bad taste of social ostracism: The effects of exclusion on the eating behaviors of African-American women. *Psychology & Health, 30*, 518–533. doi: 10.1080/08870446.2014.983923
- Heraclides, A., Witte, D., Chandola, T., & Brunner, E. (2009). Psychosocial stress at work doubles the risk of type 2 diabetes in middle-aged women. *Diabetes Care, 32*, 2230-2235. doi:10.2337/dc09-0132

- U.S. Department of Health and Human Services, National Institutes of Health, The National Institute of Diabetes and Digestive and Kidney Diseases. (2014, September 17). The A1C test and diabetes. Retrieved from <http://diabetes.niddk.nih.gov/dm/pubs/A1CTest/>
- Hillier, T. A., & Pedula, K. L. (2001). Characteristics of an adult population with newly diagnosed Type 2 Diabetes: The relation of obesity and age of onset. *Diabetes Care*, *24*, 1522–1527. doi:10.2337/diacare.24.9.1522
- Hogue, C. J. R. , & Bremner, J. (2005). Stress model for research into preterm delivery among black women. *American Journal of Obstetrics and Gynecology*, *192*, S47-55. doi:10.1016/j.ajog.2005.01.073
- Holmes, T., & Rahe, R. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research*, *11*, 213-218.
- Health Resources and Services Administration. (2013). *The U.S. nursing workforce: Trends in supply and education*. Retrieved from <http://bhpr.hrsa.gov/healthworkforce/index.html>
- Hughes, D., & Dodge, M. (1997). African American women in the workplace: Relationships between job conditions, racial bias at work, and perceived job quality. *American Journal of Community Psychology*, *25*, 581-599.
- Hunte, H. (2011). Association between perceived interpersonal everyday discrimination and waist circumference over a 9-year period in the midlife development in the United States cohort study. *American Journal of Epidemiology*, *173*, 1232-1239. doi:10.1093/aje/kwq463
- IBM SPSS Statistics for Windows. (2015). Version 25.

- Jackson, S. E., Kirschbaum, C., & Steptoe, A. (2017). Hair cortisol and adiposity in a population-based sample of 2,527 men and women aged 54 to 87 years: Hair Cortisol and Adiposity in a Population Sample. *Obesity, 25*, 539–544. doi:10.1002/oby.21733
- James, P., Rigby, R., & Leach, R. (2004). The obesity epidemic, metabolic syndrome and future prevention strategies. *European Journal of Cardiovascular Prevention and Rehabilitation, 11*, 3-8. doi:10.1097/01.hjr.0000114707.27531.48
- Jensen, M. D., Ryan, D. H., Apovian, C. M., Ard, J. D., Comuzzie, A. G., Donato, K. A., . . . Yanovski, S. Z. (2014). 2013 AHA/ACC/TOS Guideline for the management of overweight and obesity in adults. *Journal of the American College of Cardiology, 63*, 2985–3023. doi:10.1016/j.jacc.2013.11.004
- Johnson, P., Risica, P., Gans, K., Kirtania, U., & Kumanyika, S. (2012). Association of perceived racial discrimination with eating behaviors and obesity among participants of the Sister Talk Study. *Journal of the National Black Nurses Association, 23*(1), 34-40. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3773811/>
- Jones, C., & Shorter-Gooden, K. (2003). *Shifting the double lives of Black women in America*. New York: HarperCollins.
- Jonge, J. d., Bosma, H., Peter, R., & Siegrist, J. (2000). Job strain, effort-reward imbalance and employee well-being: A large-scale cross-sectional study. *Social Science & Medicine, 50*, 1317-1327. Retrieved from <https://sciencedirect.com/science/article/pii/S0277953699003883>

- Juster, R.-P., McEwen, B., & Lupien, S. (2010). Allostatic load biomarkers of chronic stress and impact on health and cognition. *Neuroscience and Biobehavioral Reviews*, *35*, 2-16.  
doi:10.1016/j.neubiorev.2009.10.002
- Karasek, R. (1979). *Karasek's model of job strain*. Retrieved from [http://www.med.uottawa.ca/courses/epi6181/Course\\_Outline/Karasek\\_fn.pdf](http://www.med.uottawa.ca/courses/epi6181/Course_Outline/Karasek_fn.pdf)
- Karasek, R. (1990). *Healthy work: Stress, productivity, and the reconstruction of working life*. New York: Basic Books.
- Karasek, R., Brisson, C., Kawakami, N., Houtman, I., Bongers, P., & Amick, B. (1998). The job content questionnaire (JCQ): An instrument for internationally comparative assessments of psychosocial job characteristics. *Journal of Occupational Health Psychology*, *3*, 322-355.
- Kirk, J., D'Agostino, R., Bell, R., Passmore, L., Bonds, D., Karter, A., & Narayan, K. (2006). Disparities in HbA1c levels between African-American and Non-Hispanic White adults with diabetes. *Diabetes Care*, *29*, 2130-2136. doi:10.2337/dc05-1973
- Kivimäki, M., Batty, D., & Hublin, C. (2011). Shift work as a risk factor for future Type 2 Diabetes: Evidence, mechanisms, implications, and future research directions. *Plos Medicine*, *8*(12), 1-3. doi:10.1371/journal.pmed.1001138
- Kivimäki, M., Head, J., Ferrie, J., Shipley, M., Brunner, E., Vahtera, J., & Marmot, M. (2006). Work stress, weight gain and weight loss: Evidence for bidirectional effects of job strain on body mass index in the Whitehall II study. *International Journal of Obesity*, *30*, 982-987. doi:10.1038/sj.ijo.0803229



- Kodama, S., Horikawa, C., Fujihara, K., Yoshizawa, S., Yachi, Y., Tanaka, S., . . . Sone, H. (2014). Quantitative relationship between body weight gain in adulthood and incident type 2 diabetes: A meta-analysis: Body weight gain and type 2 diabetes. *Obesity Reviews*, *15*, 202–214. doi:10.1111/obr.12129
- Kresser, C. (2015). *Diabesity*. Retrieved from <http://chriskresser.com/diabesity>.
- Krieger, N. (2001). Theories for social epidemiology in the 21st century: An ecosocial perspective. *International Journal of Epidemiology*, *30*, 668-677.
- Krieger, N. (2011). Ecosocial theory of disease distribution embodying societal and ecologic context. In N. Krieger, *Epidemiology and the people's health: Theory and context* (pp. 202-235). New York: Oxford University Press.
- Krieger, N. (2012). Methods for the scientific study of discrimination and health: An ecosocial approach. *American Journal of Public Health*, *102*, 936-945.  
doi:10.2105/AJPH.2011.300544
- Krieger, N., Smith, K., Naishadham, D., Hartman, C., & Barbeau, E. (2005). Experiences of discrimination: Validity and reliability of a self-report measure for population health research on racism and health. *Social Science and Medicine*, *61*, 1576-1596.  
doi:10.1016/j.socscimed.2005.03.006
- Krieger, N. (2011). Ecosocial Theory of Disease Distribution: Embodying societal & ecological context. In N. Krieger, *Epidemiology and the people's health theory and context* (pp. 202-235). New York: Oxford University Press.

Kumanyika, S., Whit-Glover, M., & Haire-Joshu, D. (2014). What works for obesity prevention and treatment in Black Americans? Research directions. *Obesity Reviews*, *15*(S4), 204-212. doi:10.1111/obr.12213

Langsted, A., Freiberg, J., & Nordestgaard, B. (2008). Fasting and nonfasting lipid levels: Influence of normal food intake on lipids, lipoproteins, apolipoproteins, and cardiovascular risk prediction. *Circulation*, *118*, 2047-2056. doi:10.1161/CIRCULATIONAHA.108.804146

Lewis, T., Kravitz, H., Janssen, I., & Powell, L. (2011). Self-reported experiences of discrimination and visceral fat in middle-aged African-American and Caucasian women. *American Journal of Epidemiology*, *173*(11), 1223-1231. doi:10.1093/aje/kwq466

Logan, J., & Barksdale, D. (2008). Allostasis and allostatic load: Expanding the discourse on stress and cardiovascular disease. *Journal of Clinical Nursing*, *17*(7B), 201-208. doi:10.1111/j.1365-2702.2008.02347.x.

Looser, R., Metzenthin, P., Helpricht, S., Kudielka, B., Loerbroks, A., Thayer, J., & Fischer, J. (2010). Cortisol is significantly correlated with cardiovascular response during high levels of stress in critical care personnel. *Psychosomatic Medicine*, *72*, 281-289. doi:10.1097/PSY.0b013e318d35065

Lynch, E. B., & Kane, J. (2014). Body size perception among African American women. *Journal of Nutrition Education and Behavior*, *46*, 412-417. doi:10.1016/j.jneb.2014.03.002

Mark, G., & Smith, A. (2011). Occupational stress, job characteristics, coping and the mental health of nurses. *British Journal of Health Psychology*, 505-521.

- Mays, V., Cochran, S., & Barnes, N. (2007). Race, race-based discrimination, and health outcomes among African American. *Annual Review of Psychology*, *58*, 201-225. doi:10.1146/annurev.psych.57.102904.190212
- Mays, V., Coleman, L., & Jackson, J. (1996). Perceived race-based discrimination, employment status, and job stress in a national sample of black women: Implications for health outcomes. *Journal of Occupational Health Psychology*, *1*, 319-329.
- McEwen, B. (1998). Protective and damaging effects of stress mediators. *The New England Journal of Medicine*, *338*, 171-179.
- McEwen, B., & Seeman, T. (2009, August). *Allostatic load notebook*. MacArthur Research Network on SES & Health, The John D. and Katherine T. MacArthur Foundation, University of California, San Francisco. Retrieved from <http://www.macses.ucsf.edu/research/allostatic/allostatic.php>
- McEwen, B., & Stellar, E. (1993). Stress and the individual mechanisms leading to disease. *Archives of Internal Medicine*, *153*, 2093-2101.
- Mezuk, B., Kershaw, K., Hudson, D., Lim, K., & Ratliff, S. (2011). Job strain, workplace discrimination, and hypertension among older workers: The Health and Retirement Study. *Race and Social Problems*, *3*(1), 38-50. doi:10.1007/s12552-011-9041-7
- My Healthy Waist. (2018). *Waist Circumference Measurement Guidelines*: Retrieved from <http://www.myhealthywaist.org/evaluating-cmr/clinical-tools/waist-circumference-measurement-guidelines/index.html>

- Myint, P., Kwok, C., Luben, R., & Wareham, N. (2014, June 24). Body fat percentage, body mass index and waist-to-hip ratio as predictors of mortality and cardiovascular disease. *Heart Online British Medical Journal*, 1-7. doi:10.1136/heartnl-2014-305816
- Nathan, D., Kuenen, J., Borg, R., Zheng, H., Schoenfeld, D., & Heine, R. (2008). Translating the A1C assay into estimated average glucose values. *Diabetes Care*, 31(8), 1-6.
- Centers for Disease Control and Prevention, National Institute of Occupational Safety and Health. (2013, August 29). *Stress at work*. Retrieved from: <http://www.cdc.gov/niosh/topics/stress/>
- Omron. (2015). *10 series Blood pressure monitor model BP786N instruction manual*. Retrieved from <https://omronhealthcare.com/products/10-series-wireless-upper-arm-blood-pressure-monitor-bp786n/>
- Osei, K., & Gaillard, T. (2017). Ethnic differences in glucose effectiveness and disposition index in overweight/obese African American and White women with prediabetes: A study of compensatory mechanisms. *Diabetes Research and Clinical Practice*, 130, 278-285. doi:10.1016/j.diabetes.2017.02.020
- Neylon, A., Canniffe, C., Anand, S., Kreamsoulas, C., Blake, G. J., Sugrue, D., & McGorrian, C. (2013). A Global perspective on psychosocial risk factors for cardiovascular disease. *Progress in Cardiovascular Diseases*, 55, 574–581. doi:10.1016/j.pcad.2013.03.009
- Nyberg, S., Heikkilä, K., Franson, E., Alfredsson, L., DeBacquer, D., Bjorner, J., . . . Kivimäki, M. (2011). Job strain in relation to body mass index: Pooled analysis of 160000 adults

from 13 cohort studies. *Journal of Internal Medicine*, 272, 65-73. doi:10.1111/j.1365-2796.2011.02482.x

Oken, B. S., Chamine, I., & Wakeland, W. (2015). A systems approach to stress, stressors and resilience in humans. *Behavioural Brain Research*, 282, 144–154.  
doi:10.1016/j.bbr.2014.12.047

Omron. (2015). *10 Series wireless upper arm blood pressure monitor: Model: BP786N*. Retrieved from <https://omronhealthcare.com/products/10-series-wireless-upper-arm-blood-pressure-monitor-bp786n/>

Orenes-Pinero, E., Pineda, J., Roldan, V., Hernandez-Romero, D., Marco, P., Tello-Montoliu, A., . . . Marin, F. (2015). Effects of body mass index on the lipid profile and biomarkers of inflammation and a fibrinolytic and prothrombotic state. *Journal of Atherosclerosis and Thrombosis*, 22.

U.S. Department of Health and Human Services, Office of Minority Health. (2012, August 8). Obesity in African Americans. Retrieved from <https://minorityhealth.hhs.gov/omh/browse.aspx?lvl=4&lvlid=25>

U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, The National Institute for Occupational Safety and Health (NIOSH), (2014, February 3). *Organization of work: Measurement tools for research and practice..* Retrieved from <http://www.cdc.gov/niosh/topics/workorg/detail088.html>

- Pan, A., Schernhammer, E., Sun, Q., & Hu, F. (2011). Rotating shift work and risk of type 2 diabetes: Two prospective cohort studies in women. *PLOS Medicine*, 8(12), 1-8.  
doi:10.1371/journal.pmed.1001141
- Parikh, P., Mochari, H., & Mosca, L. (2009). Clinical utility of a fingerstick technology to identify individuals with abnormal blood lipids and high sensitivity C-reactive protein levels. *American Journal of Health Promotion*, 23, 279-282.
- Pasquali, R. (2012). The hypothalamic-pituitary-adrenal axis and sex hormones in chronic stress and obesity: Pathophysiological and clinical aspects. *Annals of The New York Academy of Sciences*, 1, 20-35. doi:10.1111/j.1749-6632.2012.06569.x
- Peek, K., Cutchin, M., Salinas, J., Sheffield, K., Eschbach, K., Stowe, R., & Goodwin, J. (2010). Allostatic load among Non-Hispanic Whites, Non-Hispanic Blacks, and people of Mexican origin: Effects of ethnicity, nativity, and acculturation. *American Journal of Public Health*, 100, 940-946. doi:10.2105/AJPH.2007.129312
- Peplonska, B., Bukowska, A., & Sobala, W. (2015). Association of rotating night shift work with BMI and abdominal obesity among nurses and midwives. *PLOS One*, 1-13.  
doi:10.1371/journal.pone.0133761
- Pickering, T. G., Hall, J. E., Appel, L. J., Falkner, B. E., Graves, J., Hill, M. N., . . . Roccella, E. J. (2005). Recommendations for blood pressure measurement in humans and experimental animals: Part 1: Blood pressure measurement in humans: A statement for professionals from the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. *Hypertension*, 45, 142–161. doi:10.1161/01.HYP.0000150859.47929.8e

- Popkin, R., & Stoll, A. (1993). Political philosophy. In R. Popkin, & A. Stoll, *Philosophy made simple* (2nd ed., pp. 82-93). New York: Doubleday.
- Rastogi, S., Johnson, T., & Drewery, M. (2011). *The Black population: 2010*. U.S. Department of Commerce Economics and Statistics Administration.
- Richman, L., & Jonassaint, C. (2008). The effects of race-related stress on cortisol reactivity in the laboratory: Implications of the Duke Lacrosse scandal. *Annals of Behavioral Medicine, 35*, 105-110. doi:10.1007/s12160-007-9013-8
- Roger, R., & Colligan, M. (1997). *Plain language about shiftwork*. Cincinnati, OH: National Institute for Occupational Safety and Health.
- Rogers, J., & Kelly, U. (2011). Feminist intersectionality: Bringing social justice to health disparities research. *Nursing Ethics, 18*, 397-407. doi:10.1177/0969733011398094
- Roszkowski, J., & Jaffe, F. (2012). Analyzing shift work sleep disorder. *Dialogue and Diagnosis, 1-10*. Retrieved from <http://www.osteopathic.org/inside-aoa/news-and-publications/Documents/dd-3-12-roszkowski-jaffe-march-2012.pdf>
- Sarathy, H., Henriquez, G., Abramowitz, M. K., Kramer, H., Rosas, S. E., Johns, T., . . . Melamed, M. L. (2016). Abdominal obesity, race and chronic kidney disease in young adults: Results from NHANES 1999-2010. *PLOS ONE, 11*(5), e0153588. doi:10.1371/journal.pone.0153588
- Schwartz, K., Monsur, J., Hammad, A., Bartoces, M., & Neale, A. (2009). Comparison of point of care and laboratory HBA1c analysis: A metronet study. *Journal of Family Medicine, 461-463*.

- Seca. (2018). *Seca 703 s*. Retrieved from <https://us.secashop.com/products/measuring-stations-and-column-scales/seca-703-s/7037821009>
- Selye, H. (1950). Stress and the general adaptation syndrome. *British Medical Journal*, ?vol?, 1383-1392.
- Siegrist, J., Li, J., & Montano, D. (2014). *Psychometric properties of the effort-reward imbalance questionnaire*. Department of Medical Sociology, Dusseldorf University. Dusseldorf, Germany. Retrieved from [http://www.uniklinik-duesseldorf.de/fileadmin/Datenpool/einrichtungen/institut\\_fuer\\_medizinische\\_soziologie\\_id54/ERI/PsychometricProperties.pdf](http://www.uniklinik-duesseldorf.de/fileadmin/Datenpool/einrichtungen/institut_fuer_medizinische_soziologie_id54/ERI/PsychometricProperties.pdf)
- Siegrist, J., Starke, D., Chandola, T., Godin, I., Marmot, M., Niedhammer, I., & Peter, R. (2004). The measurement of effort–reward imbalance at work: European comparisons. *Social Science & Medicine*, 58, 1483–1499. doi:10.1016/S0277-9536(03)00351-4
- Sinha, R., & Jastreboff, A. M. (2013). Stress as a common risk factor for obesity and addiction. *Biological Psychiatry*, 73, 827–835. doi:10.1016/j.biopsych.2013.01.032
- Sloan Work and Family Research Network. (2009, September). *A Sloan Work and Family Research Network fact sheet*. Retrieved from <https://workfamily.sas.upenn.edu/content/sloan-network-fact-sheet-shiftwork-2008>
- Steptoe, A., Hackett, R., Lazzarino, A., Bostock, S., Marca, R., Carvalho, L., & Hamer, M. (2014). Disruption of multisystem responses to stress in type 2 diabetes: Investigating the dynamics of allostatic load. *Proceedings of the National Academy of Sciences*, 111, 15693-15698.



- Trust for America's Health. (2012, September). F as in Fat: How obesity threatens America's future 2012. Retrieved from <http://healthyamericans.org/report/100/>
- Tull, E., Sheu, Y. T., Butler, C., & Cornelius, K. (2005). Relationships between perceived stress, coping behavior and cortisol secretion in women with high and low levels of internalized racism. *Journal of the National Medical Association, 97*, 206-212.
- United States Equal Employment Opportunity Commission. (2013). Race/color discrimination. Retrieved from [http://www.eeoc.gov/laws/types/race\\_color.cfm](http://www.eeoc.gov/laws/types/race_color.cfm)
- Verna, R., Kaur, B., Misha, R., & Himanshu, D. (2015). Recent trends of diabetes and its non-clinical management among urban pts. *Research Journal of Recent Sciences, 4*, 261-264.
- Vinacor, F. (2011, May 20). Diabetes Publications. Retrieved February 12, 2013, from Center for Disease Control: <http://www.cdc.gov/diabetes/pubs/women/index.htm>
- Vogel, F. (2017). *Seca*. Retrieved from Seca file:///C:/Users/Deborah/Downloads/seca\_201\_manual\_17-10-02-253d11.pdf
- Wagner, J. A., Tennen, H., Feinn, R., & Osborn, C. Y. (2015). Self-reported discrimination, diabetes distress, and continuous blood glucose in women with Type 2 Diabetes. *Journal of Immigrant and Minority Health, 17*, 566–573. doi:10.1007/s10903-013-9948-8
- White, A., & Chanoff, D. (2011). Epilogue. In A. White, & D. Chanoff, *Seeing patients: Unconscious bias in health care* (pp. 281-297). Cambridge, MA: Harvard University Press.

- Williams, D. (1999). Race, socioeconomic status, and health. The added effects of racism and discrimination. *Annals of the New York Academy of Sciences*, 896, 173-188. doi: 10.1111/j.1749-6632.1999.tb08114.x
- Williams, D. R. (2012). Miles to go before we sleep: Racial inequities in health. *Journal of Health and Social Behavior*, 53, 279–295. doi: 10.1177/0022146512455804
- Williams, D. R., Priest, N., & Anderson, N. B. (2016). Understanding associations among race, socioeconomic status, and health: Patterns and prospects. *Health Psychology*, 35, 407–411. doi: 10.1037/hea0000242
- World Health Organization. (2011). *Waist circumference and waist-hip ratio: Report of a WHO expert consultation*. Retrieved from [http://apps.who.int/iris/bitstream/handle/10665/44583/9789241501491\\_eng.pdf?sequence=1](http://apps.who.int/iris/bitstream/handle/10665/44583/9789241501491_eng.pdf?sequence=1)
- World Health Organization. (2013, March). *Obesity and overweight*. Retrieved from <http://www.who.int/mediacentre/factsheets/fs311/en/>
- Wyatt, S., Williams, D., Calvin, R., Henderson, F., Walker, E., & Winters, K. (2003). Racism and cardiovascular disease in African Americans. *The American Journal of the Medical Sciences*, 325, 315-331.
- Yang, W., Dall, T., Halder, P., Gallo, P., Kowal, S., & Hogan, P. (2013). Economic cost of diabetes in the U.S. in 2012. American Diabetes Association.

Vinacor, F. (2011, May 20). *Diabetes Publications*. Retrieved February 12, 2013, from Center for Disease Control: <http://www.cdc.gov/diabetes/pubs/women/index.htm>