RACIAL DISCRIMINATION, RACIAL IDENTITY ATTITUDES, AND OBESITY AMONG AFRICAN AMERICAN COLLEGIATE WOMEN

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Abstract

African American women have poorer pregnancy outcomes than other groups in the U.S., and this disparity is not fully understood. Preconceptional health status, including obesity, influences pregnancy outcomes, and chronic stress may increase obesity via Hypothalamic-Pituitary-Adrenal (HPA) axis dysfunction. Racial discrimination (RD) as a chronic stressor may contribute to obesity; however racial identity attitudes may reduce negative health effects of race-related stress.

This cross-sectional study investigated relationships among three manifestations of interpersonal RD (overt, microaggressions and vicarious), explicit and implicit racial identity attitudes, and objective measures of obesity in 136 collegiate African American women aged 18 to 25 years. Participants were recruited using multiple methods. Correlations and multiple regression were used to answer research questions. Microaggressions explained variance in obesity and central adiposity, with obesity measures increasing as microaggressions rose. Overt RD also explained variance in obesity measures, but inverse relationships were observed. Private regard was significantly inversely correlated with both obesity and central adiposity, and ethnic identity was significantly inversely correlated with waist circumference. Interactions between public regard, centrality, implicit racial identity and all three RD measures explained variance in obesity and central adiposity.

A secondary aim was to assess the acceptability of assessing Hypothalamic-Pituitary-Adrenal (HPA) axis functioning through the use of cortisol derived from hair
samples. Few hair cortisol studies to date have included African American participants, and most have focused on older populations. Participants who accepted and declined hair sampling described their reasons via an open-ended written survey question. Seventy-one women (52%) took part in hair sampling.
Chapter 1. Overview

Introduction

For decades, African American women have experienced poorer perinatal outcomes than other ethnic and racial groups in the United States (Singh & van Dyck, 2010). Maternal mortality (King, 2012), premature birth, low birthweight, and infant mortality (McCool, Guidera, & Janis, 2013) have persisted at a higher prevalence for African Americans despite overall improvements in these health indicators over time (Alexander, Wingate, Bader, & Kogan, 2008; Singh & van Dyck, 2010). Personal, demographic and lifestyle factors have been studied in an attempt to account for these differences but fail to fully explain the disparity in maternal-infant outcomes (Braveman et al., 2015; D. R. Byrd, Katcher, Peppard, Durkin, & Remington, 2007; MacDorman, 2011).

One potential contributor to poor perinatal outcomes among African American women is stress, both prior to and during pregnancy (S. J. Brown, Yelland, Sutherland, Baghurst, & Robinson, 2011; Lau, 2013; Sanchez et al., 2013). Racism is a stressor that has been previously overlooked, but is potentially critical to the health of African American mothers and their infants. Racism-related stress, which occurs as a result of negative race-based interactions between people or between individuals or groups and their environment, has repeated, chronic and acute manifestations and occurs in multiple ways throughout an individual's lifespan (Harrell, 2000).

Racism-related stress is commonly experienced among women of color (Harrell,
2000; Hogue & Bremner, 2005), particularly African Americans, who are exposed to higher levels due to the deeply rooted and enduring history and culture of the United States (K. F. Anderson, 2013; Bennett, Buchanan, Jones, & Spertus, 2015). Previous studies suggest a relationship between experiences with racial discrimination and poor perinatal outcomes (Dominguez, Dunkel-Schetter, Glynn, Hobel, & Sandman, 2008; Giurgescu et al., 2012). However, the mechanisms for this relationship have not been established, particularly physiologic pathways between exposure to racial discrimination and perinatal outcomes.

African American women report that racial discrimination is a frequent stressor in their lives (Pieterse, Carter, & Ray, 2013) that is directed towards themselves personally, their family, and members of their extended social networks (Nuru-Jeter et al., 2009). Even when the woman does not personally know the targeted individual, accounts of racial discrimination toward another member of her ethnic or racial group are potential stressors for her (Harrell, 2000). Concern about the potential for differential treatment based on race is a daily reality for many African Americans (Pieterse et al., 2013), and stress related to racial discrimination may be physical, psychological, economic/material, or social in nature (Harrell, 2000). Current evidence suggests that racial discrimination has become subtler over time, as social norms change and overtly communicated prejudice has become less acceptable (Brondolo, ver Halen, Libby, & Pencille, 2011; Speight, 2007; Sue, Capodilupo, et al., 2007). These more subtle manifestations of racial discrimination have been termed racial microaggressions (Sue, Capodilupo, et al., 2007), and are perceived as stressful interactions.
A woman's health status before she becomes pregnant is critical to the health of her future offspring, and chronic stress may adversely impact women even in young adulthood before they become mothers. Evidence supports that chronic stress related to racial discrimination may contribute to health problems, such as obesity, that increase women’s odds of a poor perinatal outcome (Bose, Olivan, & LaFerrere, 2009). While the literature is not consistent (Vines et al., 2007), several studies have found a relationship between racial discrimination and obesity that is independent of economic status (Cozier, Wise, Palmer, & Rosenberg, 2009; Cozier et al., 2014; Gee, Ro, Gavin, & Takeuchi, 2008; Lewis, Kravitz, Janssen, & Powell, 2011).

The pathway between experiences of discrimination and poorer health outcomes likely occurs, in part, at the level of one of the body’s major stress response systems, the hypothalamic-pituitary-adrenal (HPA) axis, a primary neurohormonal interface between environmental stressors and the body (Carlson & Chamberlain, 2005). Chronic stress may affect the development of obesity through changes in HPA axis functioning. The HPA axis directs and coordinates multiple physiological systems in response to stress through regulation of the hormone cortisol (Carlson & Chamberlain, 2005; Lupien et al., 2006; McEwen, 2011). Increasing evidence from human and animal studies suggests that stress experienced in early life can have long-term dysregulatory effects on HPA axis functioning (Hostinar & Gunnar, 2013), predisposing to obesity (Shively, Register, & Clarkson, 2009). Excess cortisol promotes fat deposition in the central part of the body around the viscera, termed central adiposity.

Few studies to date have examined potential biological pathways between racial discrimination and health outcomes, though many studies suggest negative effects on
physical (R. Clark, 2006; Gee et al., 2008; Kwate, Valdimarsdottir, Guevarra, & Bovbjerg, 2003) and mental health (Chou, Asnaani, & Hofmann, 2012; Howarter & Bennett, 2013). However, not every individual subjected to racial discrimination experiences negative health outcomes. Preliminary evidence suggests that holding positive attitudes about one's own race may be protective to health in the face of discrimination (Chae, Nuru-Jeter, & Adler, 2012). Implicit (subconscious) and explicit (consciously-held) racial identity attitudes may serve as a buffer, or reserve capacity (Gallo & Matthews, 2003), that reduces the stress effects of racial discrimination on health.

Thus, the purposes of this study are to investigate: 1) whether racial discrimination is associated with obesity and central adiposity in young African American women of childbearing age; and 2) whether racial identity influences the relationship between racial discrimination and obesity or central adiposity. Specifically, this study will investigate whether racial identity serves as a reserve capacity that moderates the effect of racial discrimination on these outcomes. A secondary aim is to assess the feasibility and acceptability of assessing HPA dysfunction through the use of a novel technique in the measurement of stress hormones: cortisol derived from hair samples.

**Background**

Health during pregnancy and for the infant in the first year of life is strongly influenced by the health of women prior to conception (Denny, Floyd, Green, & Hayes, 2012). Stressors that college-aged women experience prior to motherhood, whether in childhood or as emerging adults, could influence their HPA axis functioning (Karlen,
Ludvigsson, Frostell, Theodorsson, & Faresjo, 2011; S. E. Taylor, 2010), predisposing them to obesity and central adiposity (Reynolds, 2010). These in turn increase the risk for fetal, infant, and maternal morbidity and mortality (Davies et al., 2010).

Young, or emerging, adulthood has long been established as a psychologically stressful time as individuals explore or take on new roles (Estrada-Martinez, Caldwell, Bauermeister, & Zimmerman, 2012). Young African American women in a collegiate environment face additional racism-related stress through overt and subtle forms of racial discrimination that may be directed towards themselves or others (Harwood, Huntt, Mendenhall, & Lewis, 2012; Hope, Hoggard, & Thomas, 2015), making identity formation more challenging (Arnett & Brody, 2008).

**Racial Discrimination**

Racial discrimination is individually perceived and involves a series of judgments: first, that another person’s behavior includes unequal, unfair or negative treatment, and second, that the reason for the treatment is based on the recipient’s ethnic affiliation or phenotypical appearance. Perceptions of racial discrimination are influenced by an individual's prior experiences, belief systems, consciously and unconsciously held stereotypes, and pre-existing impressions of the person whose actions are being perceived (Kuzmanovic, Jefferson, Bente, & Vogeley, 2013). Because individuals' belief systems include racial identity attitudes, these likely affect the extent to which a perception of racial discrimination will be formed.
Manifestations of Racial Discrimination

Racial discrimination (RD) may manifest in multiple ways, and this study will focus on three: overt RD, subtle RD known as microaggressions, and RD directed towards others, or vicarious RD.

**Overt RD.** Overt RD is often confrontational, involving behaviors such as the use of racial slurs or hassling, or the denial of service based on race. Overt RD describes purposeful, intentionally unfair treatment based on race.

**Microaggressions.** *Racial microaggressions* are brief interactions that either intentionally or unintentionally communicate negative racial messages to targeted individuals or groups (Pierce, 1970; Solórzano, Ceja, & Yosso, 2000; Sue, Capodilupo, et al., 2007). They are subtle and often ambiguous, potentially causing stress in part because the recipient is left wondering about the intent of the perpetrator (Harrell, 2000; Sue, Capodilupo, et al., 2007). Microaggressions are classified as microassaults (deliberate slights, insults or social avoidance), microinsults (intentional or unintentional communications that demean an individual's racial identity), and microinvalidations (communications that invalidate the importance of race). Microinvalidations may include statements from Whites such as “I don’t see color” (Sue et al., 2007). Microaggressions often transpire within social climates in which overt RD and prejudice are not socially acceptable (Sue, Bucceri, Lin, Nadal, & Torino, 2007).

Frequent but low-intensity experiences of subtle racial discrimination, that may not be identified as highly stressful at the time they occur, may still increase the daily distress of a person who experiences them (Huynh, Devos, & Dunbar, 2012). While racial microaggressions have been documented and studied in the field of education and
counseling, there are few studies that have examined them in the context of health outcomes (Donovan, Galban, Grace, Bennett, & Felicié, 2013).

**Vicarious racial discrimination.** In addition to overt RD and microaggressions, a college-aged African American woman may experience stress related to vicarious racial discrimination, racial discrimination that is directed towards another person she knows personally or is aware of through media or other means (Harrell, 2000). Children and young adults experience concern for their loved ones and family members as a result of racial discrimination directed towards those important others (Dominguez et al., 2008). Young women may experience vicarious racism directed toward parents, romantic partners, peers, friends, and children (Nuru-Jeter et al., 2009), as well as persons they do not personally know but whose experiences with racial discrimination are widely publicized (Harrell, 2000; Richman & Jonassaint, 2008).

**Racial Identity as a Moderator of Relationships between Discrimination and Health Outcomes**

Higher reported levels of racial discrimination do not always correlate with worsened health outcomes (LaVeist, Sellers, & Neighbors, 2001). Holding certain racial identity attitudes may foster optimism, self-esteem, and a sense of mastery or personal control (Gallo & Matthews, 2003) and may reduce negative emotions, cognitions and physiological stress responses after an encounter with discrimination (Brondolo, Brady Ver Halen, Pencille, Beatty, & Contrada, 2009). Experiencing RD influences the development of racial identity, often making identification with the group stronger for racial minority youth (Quintana, Chew, & Schell, 2012). Conversely, racial identity may be instrumental in preparing young people to cope with RD (Hope et al., 2015).
Achieving a strong and affirmative racial identity by the end of adolescence may be health protective to young adults who confront the stress associated with RD, in part by building reserve capacity in the form of psychological adjustment and academic achievement (Rogers, Scott, & Way, 2014).

One recent study found that higher racial-group affiliation and pride reduced suicidal ideation in African American women experiencing discrimination (Perry, Stevens-Watkins, & Oser, 2013). Chae et al. (2008) found that holding a stronger group identity was negatively correlated with smoking among those reporting more discrimination. Feeling a strong affinity for and recognizing the strengths of one’s own racial group, valuing being a member of the racial group, appreciating cultural values attributed to the group, appreciating phenotypical characteristics associated with one’s group, and feeling proud to be Black are all racial identity attitudes experienced by African Americans (D. L. Lee & Ahn, 2013; Rivas-Drake et al., 2014).

Experiencing racial discrimination without the buffering effects of helpful racial identity attitudes, on the other hand, may contribute to experiencing even more negative emotions and cognitions. Some racial identity attitudes, such as agreement with negative stereotypes about one's own group, may reduce intrapersonal resources such as self-esteem (Brondolo et al., 2011; Worrell, Mendoza-Denton, Telesford, Simmons, & Martin, 2011) and self-efficacy (Harrell, 2000), resulting in increased stress.

Racial discrimination is motivated by attitudes (Harrell, 2000), and racial identity is composed of attitudes (Worrell et al., 2011). While attitudes were once thought of as fully conscious, recent evidence strongly suggests that some attitudes are automatic and operate subconsciously (Nosek & Hansen, 2008). Both forms of attitudes may moderate
relationships between RD and health outcomes. *Explicit attitudes* are consciously held and deliberative, and are accessible to participants who are responding to surveys. They are, however, subject to social desirability bias. *Implicit attitudes*, however, are not fully accessible to the conscious mind, and different neural pathways are likely involved than those used to access explicit attitudes. Implicit attitudes are split-second evaluative judgments, often utilized when time for deliberation is short, yet capable of influencing behavior (Manns-James, 2015). While individuals may not be fully aware of these implicit attitudes, evidence to date suggests they particularly influence behavior between members of different social or racial groups (Greenwald, Poehlman, Uhlmann, & Banaji, 2009).

Both explicit and implicit racial identity attitudes may moderate the relationship between RD and health. Chae et al. (2012) used a measure of implicit racial attitudes, the Race Implicit Association Test (IAT-r), and found significant effects of implicit racial attitudes on the relationship between discrimination and hypertension in middle-aged AA men. Another arm of the same study found that implicit anti-Black attitude moderated the relationships between racial discrimination and two biomarkers, telomere length and C-reactive protein (Chae et al., 2014).

Because racial identity attitudes, whether implicit or explicit, are not included in most studies of racial discrimination and health outcomes, their potential moderating effects are largely unknown. This study may therefore contribute to understanding how implicit and explicit racial identity attitudes influence relationships between RD and health among African American collegiate women.
Racism as a Stressor and the Hypothalamic-Pituitary-Adrenal Axis

The HPA axis allows individuals to physiologically adapt to changing environmental conditions, including stressors such as threats (McEwen, 2006). In humans, stressors affecting the HPA axis can be chronic as well as acute, and may be psychosocial in nature (Pruessner et al., 2008; Seeman, Epel, Gruenewald, Karlamangla, & McEwen, 2010). When stimuli are appraised as threatening, hormonal feedback loops result in the secretion of cortisol. When cortisol rises, the normal response in the absence of further stress is that negative feedback is soon exerted, suppressing further cortisol secretion (Dallman et al., 2006). The same body systems that allow individuals to cope effectively with stress challenges episodically may, with repeated activation over time, cause damage due to excessive amounts of circulating stress hormones (McEwen, 2000).

Racial discrimination and cortisol. Despite the established relationship between chronic stress and HPA axis dysfunction, few studies have specifically examined racial discrimination and cortisol, a biomarker for HPA axis functioning. Fuller-Rowell, Doan, and Eccles (2012) examined diurnal cortisol rhythms in older, community-dwelling adult African Americans and White Americans. African Americans had a less healthy cortisol profile than White participants, with lower waking cortisol levels, flatter diurnal slopes, and higher bedtime levels. However, there was no independent association found between self-reported discrimination and cortisol slopes among either racial group. Similarly, in the Coronary Artery Risk Development in Young Adults (CARDIA) study, self-report of discrimination was not independently associated with cortisol levels (Cohen et al., 2006).
These studies suggest an overall trend in less healthy cortisol patterns for African Americans compared with other racial groups, and no clear relationship with self-reported experiences with racial discrimination. However, relationships between racial discrimination and health outcomes may be moderated by racial identity attitudes, which have not yet been examined in studies of racial discrimination and HPA axis functioning.

**Stress and obesity.** Obesity is an international health concern (World Health Organization, 2006) that disproportionately affects AA women (Flegal, Carroll, Ogden, & Curtin, 2010). There are many factors that have been identified through epidemiological studies as affecting obesity risk, including smoking (negatively associated with obesity) (Fesinmeyer et al., 2013) and socioeconomic status (Assari, Nikahd, Malekahmadi, Lankarani, & Zamanian, 2016). Particularly among women, having low levels of income and education increase the likelihood of being obese (Grabner, 2012). Developed countries with greater income inequality tend to demonstrate higher obesity rates, especially among women (Pickett, Kelly, Brunner, Lobstein, & Wilkinson, 2005).

Prolonged or frequent stress may increase obesity due to chronically elevated levels of cortisol (McEwen, 2000). Excess cortisol predisposes individuals to visceral fat storage and affects appetite, leading to obesity and central adiposity (Grossniklaus, Gary, Higgins, & Dunbar, 2010; Reynolds, 2010). A small number of prospective studies have found that higher levels of racial discrimination lead to increased visceral fat deposition in African American and White women (Lewis et al., 2011) and to waist circumference enlargement in men and women (Hunte, 2011). Most of these findings have been limited to women in midlife or older.
In summary, there is reason to suspect that RD may act as a chronic stressor that influences the development of obesity through HPA axis dysfunction. Racial identity attitudes, both explicit and implicit, may affect the extent to which RD influences health, potentially protecting against RD-related stress.

**Theoretical Framework**

The Reserve Capacity Model (RCM) is a framework (Figure 1-1) developed to link lower social status with poorer health across social contexts around the developed world (Gallo & Matthews, 2003). The model was developed using existing data demonstrating that lower social position increases exposure to stressful experiences, which in turn increase the likelihood of experiencing negative emotions and cognitions, and worsen mental and physical health outcomes (Gallo, Espinosa de Los Monteros, & Shivpuri, 2009). The RCM is a complex model that posits bidirectional relationships within several of its proposed pathways that have been previously tested and supported (Bennett et al., 2015; Brondolo et al., 2008; Gallo, Bogart, Vranceanu, & Matthews, 2005; Gallo et al., 2012; Howarter & Bennett, 2013; Matthews, Räikkönen, Gallo, & Kuller, 2008). Although originally proposed as a model to guide research on the mechanisms of how social position affects mental and physical health status, the RCM has been expanded to address health disparities seen in racial and ethnic minority populations (Gallo, Penedo, Espinosa de los Monteros, & Arguelles, 2009). The RCM suggests that stressful experiences both directly and indirectly affect physical health outcomes. However, these pathways may be mediated or moderated by the amount and type of resources available to address a given stressor, or an individual’s
Figure 1-1. Gallo and Matthews’ Reserve Capacity Model.

reserve capacity (Gallo, Espinosa de Los Monteros, et al., 2009). Within the model, reserve capacity is conceptualized as an individual’s resource bank for addressing stressful experiences. Reserve capacity within the RCM includes tangible resources, interpersonal resources such as social support and social integration, and intrapersonal resources such as a sense of optimism, personal control beliefs, and self-esteem (Gallo & Matthews, 2003). Having access to sufficient reserve capacity can improve expectancies for positive outcomes, facilitate the development of more accurate perceptions in ambiguous interpersonal situations, and reduce physiological stress responses (Gallo, Espinosa de Los Monteros, et al., 2009).

Individuals with higher reserve capacity may cope more effectively with stressors when they occur, and so may experience more positive emotions and cognitions in the course of daily life. Positive emotions and cognitions can build an individual’s capacity to develop social support networks (Gallo, Espinosa de Los Monteros, et al., 2009). Thus, reserve capacity may attenuate the health effects of many stressors and even protect the individual from experiencing others. For example, evidence suggests that low SES individuals who nevertheless have high personal control or mastery beliefs have similar self-reported health outcomes to high SES individuals (Lachman & Weaver, 1998). Conversely, inadequate reserve capacity can result in a vicious circle in which inadequate resources to cope with stress may make individuals more vulnerable to future stressors (Gallo, Espinosa de Los Monteros, et al., 2009). Negative emotions and cognitions resulting from un-buffered stressors may additionally drive unhealthy behavioral attempts to cope, further damaging physical health (Gallo & Matthews, 2003).
Within the expanded RCM model, being of minority race results in higher likelihood of exposures to more frequent stressors. In the absence of sufficient coping resources, physiological stress responses such as over-activation of the HPA axis occur. Repeated physiological stress responses are posited to result in HPA axis dysfunction, obesity and central adiposity. These responses, along with unhealthy behavioral attempts to cope, form the physiological pathways between increased stress exposure and worsened physical health status over time (Gallo & Matthews, 2003).

In the expanded RCM, racial discrimination is conceptualized as a specific and unique stressor experienced by people with minority ethnic or racial status. Stress exposures are specific in type and prevalence to different racial and ethnic groups depending on the positioning of that group within a society. Stressors are also additive and potentially multiplicative in terms of their effects on health, and include general stressors such as threatening life events (Brugha, Bebbington, Tennant, & Hurry, 1985) as well as ethnicity-specific threats. Reserve capacities within the expanded RCM include culture-specific resources that influence resiliency in specific ways depending on ethnic group membership. For example, familismo, a cultural attitude emphasizing mutual family support, is conceptualized as a reserve capacity for a Hispanic individual (Gallo, Penedo, et al., 2009). Familismo appears to be health-protective in the face of chronic caregiver stress among Hispanics (Losada et al, 2006, as cited in Gallo, Penedo et al., 2009). Within the proposed study, racial identity is conceptualized as a reserve capacity.

For the purposes of this study, being African American is assumed to increase the likelihood of experiencing racial discrimination (including overt RD, microaggressions and vicarious RD). These racism-related stressors, which may be chronic and cumulative,
may trigger physiological changes in an individual including HPA dysfunction -- unless sufficient reserve capacity is present. Feeling connected with other African Americans, and feeling proud and happy about being Black are hypothesized to be protective racial identity attitudes that may moderate RD-related negative health outcomes (Figure 1-2).

The RCM is promising as a framework for understanding racial discrimination as a contributor to poor health outcomes. It may improve understanding of why racial discrimination appears to negatively impact health in some individuals but not in others, despite a general trend toward damaging effects. It also facilitates understanding of how and why positive racial identity may moderate racism-related stressors’ effects on health outcomes.

**Conceptual Definitions of Study Variables**

For the purposes of this study, *racial discrimination* (RD) will refer to an individual's perception that a behavior is unfair or unequal on the basis of ethnic affiliation or phenotypical appearance (Yetman, 1991), and is a source of stress (Pascoe & Smart Richman, 2009). Racial discrimination can be *overt*, characterized by blatant and purposeful unfair treatment, but can also be subtle (microaggressions). *Microaggressions* are conceptualized as a form of RD involving subtle, everyday interactions, whether intentional or not, that are perceived to communicate negative racial messages to targeted individuals or groups (Sue, Capodilupo, et al., 2007). *Vicarious racial discrimination* refers to racial discrimination that is directed towards another person known to an individual or of whom he or she is aware. It may include interactions affecting an individual’s partner, children, friends, or other family members, as well as persons not
Figure 1-2. Conceptual Study Model.

Covariates: Threatening Life Events, Smoking, Income

Threat of harm or loss (stressor): Racial discrimination (overt, subtle, and vicarious RD)

Reserve Capacity: Racial Identity (explicit and/or implicit)

Intermediate paths: HPA dysfunction obesity & central adiposity

Perinatal outcomes
personally known but whose experiences with racial discrimination are widely publicized (Harrell, 2000).

*Racial identity* is defined as explicit (consciously accessible) and implicit (unconscious and automatic) affective or evaluative attitudes about being a member of a racial group. Racial identity attitudes may include racial pride, preferences in favor of one’s own racial group, and a positive feeling about group membership, and may serve as a reserve capacity. They may also include feeling strongly connected with one’s own racial group, and include an appreciation of the cultural values believed to be held by the group.

Hypothalamic-Pituitary-Adrenal axis dysfunction, or *HPA dysfunction*, will refer to disruption in the normal functioning of the HPA axis. HPA dysfunction is conceptualized as an intermediate path between racism-related stress and worsened health outcomes over time, including poorer perinatal outcomes. In this study, hair cortisol is considered a biomarker for HPA functioning.

*Obesity* will refer to a body composition that is characterized by an unhealthy and elevated ratio of fat to lean tissue (World Health Organization, 1995). *Central adiposity* refers to excessive fatty tissue centered around the viscera or waist, where it may be the most biologically active and contribute to metabolic dysfunctions (Grossniklaus et al., 2010).

**Philosophical Assumptions**

1. Racial discrimination is experienced by African American women.
2. Racial discrimination is a stressor that African American women begin to experience at an early age.
3. Racial discrimination is experienced both implicitly and explicitly.

4. Implicit attitudes are arrived at through different neural processes than explicit attitudes, and influence human behavior and interpretations. These assumptions are supported by a considerable body of work in the field of cognitive psychology.

**Research Questions**

The primary research questions are: Among college-aged AA women,

1. Are there interrelationships among racial discrimination, racial identity and obesity?

2. Are there interrelationships among racial discrimination, racial identity and central adiposity?

3. Controlling for income, smoking status and threatening life events, is there a direct relationship between racial discrimination and obesity?

4. Controlling for income, smoking status and threatening life events, is there a direct relationship between racial discrimination and central adiposity?

5. Controlling for income, smoking status and threatening life events, does explicit racial identity moderate the relationships between racial discrimination and obesity or central adiposity?

6. Controlling for income, smoking status and threatening life events, does implicit racial identity moderate the relationships between racial discrimination and obesity or central adiposity?

Secondary, exploratory questions include:

7. Is measurement of cortisol from hair an acceptable strategy in young African American women?
8. Controlling for smoking, hair care practices and income, are measures of racial discrimination related to hair cortisol levels in young African American women?
Chapter 2. Review of the Literature

Introduction

For African American (AA) women, racial discrimination (RD) may act as a unique and chronic stressor, adversely affecting their own and their children's health (Barker, 2004) in part by contributing to obesity through changes in the HPA axis (Phillips, Roseboom, Carroll, & de Rooij, 2012). Preconceptional health is critical to pregnancy outcomes, particularly among minority groups in the United States (Strutz, Richardson, & Hussey, 2014), and obesity is a prevalent health risk (Flegal et al., 2010) that contributes to multiple perinatal complications (Siega-Riz & Laraia, 2006). The purposes of this study are to investigate: 1) whether racial discrimination is associated with obesity and central adiposity in young African American women of childbearing age; and 2) whether racial identity influences the relationship between racial discrimination and obesity or central adiposity. Specifically, this study will investigate whether racial identity serves as a reserve capacity that moderates effects of racial discrimination on these outcomes. A secondary aim is to assess the feasibility and acceptability of assessing HPA dysfunction through the use of a novel technique in the measurement of stress hormones: cortisol derived from hair samples.

This review of the literature is presented in four sections. The first section describes what is known about relationships between racial discrimination and physical and mental health outcomes. The second section describes research findings relating racial discrimination to both HPA axis dysfunction and obesity, as intermediate pathways
between chronic stress and physical health outcomes. The third section will describe racial identity attitudes and their potential role as a reserve capacity or resource, to manage and reduce the physiologic effects of racism-related stress. Finally, the fourth section will review the measurement of cortisol in human hair, focusing on gaps in understanding of how acceptable and feasible this technique is for measuring this critical stress hormone in African American women.

**Racial Discrimination and Health Outcomes**

Growing evidence suggests that racial discrimination as an aspect of daily life functions as a chronic stressor, negatively affecting physical and mental health outcomes (Gallo, Penedo, et al., 2009; Williams & Mohammed, 2013). In one of the first studies of racial discrimination, stress, and health outcomes, Williams, Yan, Jackson, and Anderson (1997) investigated socioeconomic status, race, exposure to racial discrimination, and physical and mental self-reported health status among 1139 adult participants, including 586 African Americans. The Everyday Racism Scale (Williams et al., 1997) was used to capture daily hassles relating to racial discrimination. Everyday Racism Scale scores significantly explained the number of days AA respondents were unable to work or perform usual activities due to physical or emotional health problems. In a model including age, education, income, and three measures of general stress, everyday racial discrimination accounted for variance in self-reported well-being ($R^2 = .06, \ p < .01$) and psychological distress $R^2 = .06, \ p < .01$). This study, as well as several later investigations (K. F. Anderson, 2013; Brondolo et al., 2008; Buchanan & Fitzgerald, 2008) supported racial discrimination as a unique stressor that is not always captured by other measures of general stress.
Using a biopsychosocial model conceptualized by R. Clark, Anderson, Clark, and Williams (1999), Kwate et al. (2003) conducted an early study of racial discrimination, using the Schedule of Racist Events (SRE) (Landrine & Klonoff, 1996) to investigate relationships between lifetime episodes of racial discrimination (RD), past-year RD, and self-reported mental, physical and behavioral health indicators in AA women. In this study, higher levels of both lifetime and past-year RD were positively and significantly related to psychological distress (r = 0.40 and 0.31, respectively, p < .01), and lifetime RD was related to perceived poor health (r = .27, p < .05). Among women who smoked cigarettes or drank alcohol, past year RD was positively correlated with the amounts consumed (r = 0.37 and 0.40, respectively, p < .05). In this study, psychological distress was found to be a full mediator between racial discrimination and perceived health. This mediated relationship is consistent with the mechanisms proposed by the Reserve Capacity Model, which posits that stressful experiences lead to poor health outcomes because of the negative emotional responses generated by the experiences (Gallo & Matthews, 2003).

**Microaggressions as Racial Discrimination**

Microaggressions are likely frequently experienced; Donovan et al. (2013) found in their study of mental health symptoms among 187 Black women college students (mean age 25 years) at a Southeastern university that while 63% reported experiencing overt (obvious or clear) RD in the past year, 96% reported experiencing microaggressions. In that study, both overt RD and microaggressions significantly predicted depressive symptoms; however, overt RD was more predictive for depression, and only overt RD predicted anxiety symptoms.
Ong et al. (2013) studied 152 Asian American college students, who kept a daily diary for two weeks logging their emotions, physical health, and experiences with racially relevant situations including microaggressions. Seventy-eight percent of participants recorded weekly experiences consistent with microaggressions, and these were associated with greater negative emotions and more somatic symptoms, after controlling for trait neuroticism. Blume et al. (2012) studied microaggressions, anxiety symptoms and alcohol use among students in a primarily White university \((n=684\) students) and found that the number of experienced microaggressions was associated with both anxiety and binge drinking among ethnic and racial minority (including AA) students. More recently, microaggressions were found to be positively and significantly associated \((r=.28)\) with anxiety symptoms in a study of 126 AA college students (Liao, Weng, & West, 2016).

Racial microaggressions have been studied infrequently in relation to health outcomes, largely because the concept of microaggressions is relatively new and lacks precision in its conceptualization. Two critiques (Minikel-Lacocque, 2013; Wong, Derthick, David, Saw, & Okazaki, 2013) have raised important questions about conceptual overlap between microassaults, one type of microaggression, and overt RD, since microassaults include deliberate acts of negative treatment such as name-calling. Studies to date have not addressed this overlap empirically; only one study to date has included both microassaults and other microaggressions along with traditionally measured overt RD in its design (Donovan et al., 2013).

To date, it is unclear whether overt racial discrimination, racial microaggressions, and vicarious racial discrimination are equally stressful or damaging to health. Limited evidence supports relationships between microaggressions and mental, but not physical,
health outcomes (Wong, Derthick, David, Saw, & Okazaki, 2014). This study will contribute to a greater understanding of how prevalent these more subtle manifestations of RD may be in young AA college women of childbearing age, and the extent to which they may explain variance in obesity or central adiposity.

**Vicarious RD**

Racial discrimination may also be experienced vicariously (R. Clark et al., 1999), and has psychological effects on individuals who become aware of RD experienced by friends, family members, or others sharing their racial designation (Brondolo et al., 2011; Krieger, 1999; Nuru-Jeter et al., 2009; Vines & Baird, 2009). African American women participating in a qualitative study specifically identified vicarious RD as stressful (Nuru-Jeter et al., 2009), particularly their concerns about their children experiencing RD. Herda (2016) studied the effects of parental fears and experiences of RD on adolescent fears of experiencing RD in the future. Black adolescents had an incidence-rate ratio (IRR) of 1.10 (p < .05) of being concerned about experiencing future RD if their parents feared RD. Hispanic adolescents were more likely to fear future RD if their parents had directly experienced it (IRR 1.19, p < .001). Parental concerns about, or experiences with, RD may thus increase stress on their children.

Vines & Baird (2009) studied vicarious racial discrimination among 476 African American women aged 36 to 53 years. They found that mothers who themselves experienced RD were more concerned about their children experiencing RD (p < .0001). The majority (60%) of mothers, regardless of personal experience of RD, reported being concerned about the possibility of their children experiencing RD across a variety of contexts, particularly about the possibility that the police might harass their children.
because of the child's race. Modifying Krieger's Experiences of Discrimination Scale (EOD) (2005), Dominguez (2008) reported that vicarious RD during childhood was the only significant racism-related predictor of low birthweight among AA women with a mean age of 29 years (6% of variance; p < .05) after controlling for socioeconomic status, gestational age and medical risk.

More recently, Priest, Perry, Ferdinand, Paradies, and Kelaher (2014) studied the effects of vicarious RD and RD directed towards the participant on Australian children and adolescents, specifically in regards to depressive symptoms and loneliness. They found that while participant-directed RD was associated with these mental health symptoms in ethnic minority students, ethnic majority students who had friends of minority status, and who also reported holding strong attitudes about fairness, were also more likely to report loneliness (OR 2.25; 95 % CI 1.37–3.69, p <0.01) and depressive symptoms (OR 1.76; 95 % CI 1.40–2.22, p < 0.01). Priest et al. suggest their findings may indicate that majority students who strongly believe in fairness experience negative emotions when they witness discrimination against friends.

Studies specifically examining stress or health outcomes associated with vicarious racial discrimination are very limited, and no specific or validated tool has been developed to measure these experiences. Thus, it is difficult to determine the extent to which vicarious RD contributes to chronic stress and/or health outcomes among AA women. The proposed study will contribute to this small body of evidence, and has the potential to elucidate relationships among different forms of RD and their effects on health.
RD and Mental Health Outcomes

The majority of published studies support relationships between RD and adverse mental health symptoms across ages, races and symptoms (Appendix A). Peters (2006) studied 162 AA adults aged 18 to 80 years, and found that 83% of participants reported experiencing RD, and RD accounted for 15% of variance in emotions related to chronic stress. Brondolo et al. (2008) studied 362 AA and Latino adults, and found that RD was positively associated with daily anger ($\beta = 4.81$), nervousness ($\beta = 4.29$), and sadness ($\beta = 4.77$, all $p < .01$) for AA participants and accounted for 12% of variance in negative affect. Greer et al. (2009) studied 183 AA college students on a predominantly White campus, and found that among women, RD was positively associated ($p < .01$) with obsessive-compulsive disorder symptoms, interpersonal sensitivity, anxiety, and somatization.

RD and Physical Health Outcomes

In general, RD has been associated with negative physical health indicators, though fewer of these studies have been conducted, and the mechanisms by which physical health is adversely affected by RD are not well understood (Williams & Mohammed, 2013). Sims et al. (2012) studied 4939 AA adults aged 35-84 years (n of women = 3123), and found that high levels of lifetime RD and stress related to RD were positively associated with hypertension. For every one standard deviation increase in lifetime discrimination the prevalence of hypertension increased by 4%, so that for individuals in the highest quartile for lifetime RD hypertension prevalence was 8% higher after adjustment for age, gender, and socioeconomic factors.
Anderson (2013) used the Behavioral Risk Factor Surveillance Survey dataset to examine RD, emotional stress from RD, and number of self-reported poor physical or mental health days in the prior month. Once potential confounders were controlled for, experiencing stress due to RD was associated with self-reported poor physical health for all groups (White, Black, Hispanic, and other). In general, Black participants were more likely than other groups to experience emotional stress (OR = 3.14, p < .001) or physical stress from racism (OR = 3.31, p < .001). Participants who thought about race daily or hourly experienced higher emotional and physical stress related to RD (p < .001). However, Black participants on average reported fewer poor mental and physical health days in the past month.

**Paradoxical Relationships between RD and Health**

While most studies show relationships between higher levels of racial discrimination and poorer physical or mental health, there is a paradox evident in a few. In these studies (Appendix A), reported RD is significantly related to better physical health outcomes. For example, Everage et al. (2012) found in their study of Black men and women (n = 1362) that RD was significantly and *negatively* associated with coronary artery calcification, with a decreased OR for calcification (0.94, 95% CI = 0.90 - 0.98, p < .05) for every one unit increase in the Experiences of Discrimination Scale. However, there were positive but weak associations between RD and both mean depressive symptomatology (r = .16) and anger expression (r = .18).

The roles of personal characteristics, social status and measurement considerations have been described as possible explanations for these counter-intuitive findings. Vines et al. (2007) suggest that holding negative racial identity attitudes may
make perceiving RD more difficult for persons who are being treated poorly or unfairly. Individuals with negative racial identity attitudes may personalize the experiences more, attributing poor treatment to a characteristic of their own personal identity (blaming themselves) instead of the other person's racial prejudice, and thus perhaps may experience more stress. These individuals may not perceive and report negative interactions as RD because of this personalization. With regard to socioeconomic status, Krieger and Sidney (1996) found that people with higher status report more RD, and suggest that having more social power allows individuals to identify unfair treatment as RD. This increased social power itself may have health-protective effects.

Methodological differences in how RD is measured may also contribute to these contradictory findings; for example, Vines et al. (2007) used an investigator-developed tool that has not been used in other studies. This measure had Cronbach's alpha scores of .75 except for one subscale, which had an alpha of .68. Test-retest reliability of the subscales after a mean of 3 weeks was reported to vary between an interclass correlation coefficient of .61 and .82. In addition, studies of RD almost always use self-report, which capture only explicitly perceived RD and are subject to social desirability bias. Explicit perceptions are consciously available to individuals, while implicit perceptions operate below the level of full awareness. There is reason to believe that RD may be perceived implicitly as well as explicitly (Krieger et al., 2010; Krieger et al., 2011), and also evidence that individuals are more likely to report RD happening to others in their group than to themselves (Krieger et al., 2010). Finally, it is conceivable that unmeasured but protective health factors play a role in these findings. One such protective factor may be
racial identity attitudes, serving as a reserve capacity and buffering the stress associated with RD.

In summary, while most studies do show positive correlations between RD and worsened physical and mental health outcomes, there are a variety of possible reasons why this relationship is not always consistent in the literature. This study may contribute to a better understanding of how racial identity attitudes interact with RD on outcomes, a relationship that may be critical in understanding why RD is not universally associated with worsened health status.

**HPA Dysfunction and Obesity as Pathways to Poor Perinatal Outcomes**

Evidence supports chronic stress as contributing to both HPA dysfunction and obesity (Phillips et al., 2012; Rosmond, Dallman, & Bjorntorp, 1998). Preconceptional obesity (BMI $\geq 30$ kg/m$^2$) increases the risk for life-threatening complications and death at the time of delivery (Mission, Marshall, & Caughey, 2013; Siega-Riz & Laraia, 2006), and may contribute to the nearly threefold excess risk of maternal mortality experienced by African American women (Campbell et al., 2013). Obesity also contributes to congenital anomalies, macrosomia, stillbirth, and iatrogenic prematurity for infants (Mission et al., 2013).

Pre-pregnancy obesity continues to increase among African American women, widening already existent racial disparities in preconceptional health over the past 10–20 years (Fisher, Kim, Sharma, Rochat, & Morrow, 2013; Fridman et al., 2014). As of 2009, 29% of African American women were obese (BMI of 30kg/m$^2$ or greater) prior to pregnancy (Fisher et al., 2013). Many more are overweight; Black women of childbearing age in the US have a prevalence of 78% for either obesity or overweight
(BMI >25 kg/m$^2$) (Flegal et al., 2010; Siega-Riz & Laraia, 2006). African American women also disproportionately represent the superobese: mothers with a BMI of 50 kg/m$^2$ or greater (Salihu et al., 2009).

Increasing evidence from animal and human studies suggest that HPA dysregulation (Kramer, Hogue, Dunlop, & Menon, 2011) and chronic stress (Christian, Glaser, Porter, & Iams, 2013) affect immune function and inflammatory load, leading to spontaneous preterm birth (Voltolini et al., 2013). This pathway to preterm birth is observed more frequently in African American women (Menon, Dunlop, Kramer, Fortunato, & Hogue, 2011). Thus, obesity and HPA dysregulation may represent two physiologic pathways underlying racial health disparities in perinatal outcomes. It is therefore critical to improve understanding of whether and to what extent different manifestations of racial discrimination contribute to HPA dysfunction and obesity in AA women in the preconceptional period.

Several factors other than psychological stress are known or suspected to influence obesity risk in women, including socioeconomic status and smoking. Individuals who have lower levels of income, educational achievement, and employment status are more likely to be overweight or obese (Grabner, 2012). Nicotine, in contrast, acts as an appetite suppressant, so current smokers commonly weigh less than non-smokers, and women who quit smoking often gain weight (Fesinmeyer et al., 2013). Thus, the proposed study will include smoking status and income as covariates, and education will be controlled for by design.
Racial Discrimination and the HPA Axis

Stressful life events may occur at any time during childhood, adolescence, or adulthood, and may include either episodic or chronic situations, such as the loss of loved ones, prolonged exposure to the threat of violence, or economic hardship (Soto, Baezconde-Garbanati, Schwartz, & Unger, 2015). Chronic stressors in childhood and adolescence likely affect adult patterning of HPA axis functioning and regulation (Karlen et al., 2011; Lucas-Thompson & Hostinar, 2013), and the type of stressor experienced may affect the direction of HPA dysfunction, including hyper- or hypo-arousal at various times of the day (Essex et al., 2011). The combination of chronic early stress with current negative emotion and cognition interacts to produce the greatest HPA dysfunction (Essex et al., 2011), and critical periods in development may be involved in programming of the HPA axis. Young adulthood is thus an important timeframe to measure HPA functioning, because prior stress exposures may already be operating by the time a woman reaches collegiate (and childbearing) age, and HPA dysfunction may underlie multiple perinatal complications (Kramer et al., 2011).

Studies to date specifically examining racial discrimination and cortisol as a biomarker for HPA functioning are sparse, representing a significant gap in understanding of the mechanisms underlying relationships between RD and poorer health. Laboratory-based studies of RD and salivary cortisol, values of which may widely fluctuate, have had mixed findings (e.g. Jamieson et al., 2013; Wagner et al., 2013).

Laboratory Studies of Racial Discrimination and Salivary Cortisol

One laboratory study of college students' cortisol response to an experimental stressor was affected by a major campus event. The study was designed to assess cortisol
responses to an experimentally developed social threat among AA students after they viewed video material designed to heighten their sense of identity as either students or as African Americans (Richman & Jonassaint, 2008).

Approximately halfway through data collection for this cross-sectional study, an event occurred that caused racial tension for a prolonged period of time: an AA student at a nearby historically black college, moonlighting as an exotic dancer, accused White lacrosse team members whom she was hired to entertain of racial derogation and violent rape. The researchers found that cortisol patterning changed after the incident. Before the incident, participant cortisol levels varied as expected, changing from lower levels before the experimental stressor to higher levels afterwards. However, for students who enrolled in the study after the incident, AA women’s levels in particular were elevated both at baseline and after the experimental social threat, regardless of which video they viewed. Authors concluded that a real-life, ongoing threat to an individual’s sense of safety posed by a widely publicized racially-charged event may have led to sustained elevated cortisol, particularly in women (Richman & Jonassaint, 2008). The study lends support to vicarious racial discrimination experiences as a race-related chronic stressor AA women experience. In addition, it demonstrates the challenges in capturing chronic race-related stress, because at any time, threats to internal validity as a result of acute race-related stressors may occur.

A recent human study used functional MRI (fMRI) and salivary cortisol measurements before and after an experimental race-related stressor. Akdeniz et al. (2014) compared ethnic majority and minority students in a European university, and exposed them to a previously validated experimental social stressor protocol during fMRI
imaging. Minority students perceived greater levels of chronic stress at baseline and had higher elevations of salivary cortisol (p = .004) and greater activation of brain regions (p < .01) after the stress protocol. Participants who perceived more discrimination against their own ethnic groups at baseline also demonstrated increased brain activation during the study (p = .02). Chronic stress levels were found to mediate the relationship between perceived discrimination and brain activation (p < .05). Thus, those who perceived more discrimination towards their group were more likely to report chronic stress and to react more under conditions of experimental social stress.

**Community-Based Studies of Racial Discrimination and Salivary Cortisol**

Studying HPA functioning in non-laboratory settings is challenging, because timing of salivary cortisol is critical to reliable data. Cortisol levels normally peak within 30 minutes of awakening, then fall throughout the day. Participants’ precision in the timing of collection and adherence to salivary cortisol collection procedures can have large effects on study findings (Halpern, Whitsel, Wagner, & Harris, 2012).

Despite this significant limitation, several studies using participant self-collection of salivary cortisol during daily life have found associations between RD and less healthy cortisol levels or patterning (Doane & Zeiders, 2014; Suglia et al., 2010; Zeiders, Doane, & Roosa, 2012). Suglia et al. (2010) found in their study of pregnant Black and Hispanic women that higher levels of cumulative stress, including a measure of cumulative lifetime racial discrimination, were associated with flatter cortisol slopes and lower morning cortisol levels (p = .002) in Black but not Hispanic women; these patterns are considered less healthy than steeper slopes and a higher morning peak. In contrast, Martin, Bruce & Fisher (2012) found no association between RD and diurnal cortisol
patterns in 179 ethnically diverse pre-adolescents. However, Martin et al. (2012) measured RD retrospectively over a very short period (3 months), capturing only recent RD experiences. Additionally, these researchers used an unpublished instrument to measure RD, and while reliability was high (alpha = .78), evidence for validity was not reported.

Kaholokula et al. (2012) found that Native Hawaiians demonstrated a significant negative correlation between diurnal cortisol values and higher levels of racial discrimination as measured using an oppression questionnaire (r = -.21, p < .05), and no relationship between cortisol slope and racial discrimination. However, findings should be interpreted cautiously because the study included only one morning and bedtime cortisol measurement for one day, rather than the repeated measures used in other studies.

In a sample of 150 older adults (mean age = 56 years), Fuller-Rowell, Doan & Eccles (2012) found that higher perceived daily discrimination in Whites (n = 100) was associated with an 11% flatter diurnal cortisol pattern, while RD in AA adults (n = 50) was associated with a 33% steeper (healthier) cortisol slope (p = .008). These investigators also found moderating effects of SES on the relationship between RD and cortisol patterning, so that higher SES AA individuals with lower levels of perceived discrimination had 40% flatter (less healthy) diurnal slopes. Fuller-Rowell et al. (2012) suggest their findings lend support to the idea that being able to identify racial discrimination and attribute poor treatment to RD may be health protective in some circumstances, particularly to members of stigmatized minority groups, as suggested by Krieger and Sidney (1996).
Summary of Mixed Findings in Salivary Cortisol Studies

In summary, these mixed findings may be due to challenges in timing of salivary collection in non-laboratory settings, inconsistent measurement of RD based on instruments and timeframes, unspecified moderators, or other undetermined factors. Protective moderators, if present, could reduce overall cortisol exposure in individuals with an intact, normally functioning HPA axis (E. Chen, Miller, Lachman, Gruenewald, & Seeman, 2012; Roubinov, Hagan, & Luecken, 2012). The measurement of salivary cortisol is influenced by timing of meals, vigorous exercise, smoking, and storage of samples (Kudielka, Gierens, Hellhammer, Wust, & Schlotz, 2012), making fidelity to specimen collection protocols difficult to achieve. A measure for cortisol that is less sensitive to these collection and storage considerations, capable of quantifying cortisol levels over time rather than at a specific moment, would be useful in better understanding relationships between RD and HPA functioning. Limitations of salivary collection have led to increased interest in measuring cortisol in hair. The proposed study will potentially be able to add to this early body of work with descriptive data regarding racial discrimination and hair cortisol levels.

Racial Discrimination and Obesity

In addition to the growing evidence linking chronic and early life stress with HPA dysfunction, stress has well-established relationships with appetite, eating behaviors, and obesity (Coccurello, D'Amato, & Moles, 2009; De Vriendt, Moreno, & De Henauw, 2009; Epel, Lapidus, McEwen, & Brownell, 2001). These relationships are likely mediated through HPA axis hormones, specifically cortisol and corticotropin-releasing factor (Bose et al., 2009; Champaneri et al., 2012). The Reserve Capacity Model specifies
that HPA dysfunction predisposes individuals to develop obesity due to these mechanisms. (Appendix B describes the physiology linking HPA dysfunction and obesity.)

Cozier et al. (2009), in a large study (n = 43,103, mean age = 40 years) utilizing the Black Women’s Health Study database from 1997 to 2005, found that exposure to RD was positively associated with weight gain measured via self-report of weight and height, after controlling for a number of personal and behavioral factors. The difference in weight gain among the highest and lowest RD exposure quartiles was a mean .56 kg (p < .0001), and waist circumference increased with perceived everyday, but not lifetime, RD (p < .05). A follow-up prospective study on the same sample updated similar findings (Cozier et al., 2014), with RD correlating with obesity, and the highest levels of RD conferring an incident rate ratio of obesity of 1.69 (95% CI = 1.45, 1.96, p < .01) compared to the lowest levels of RD.

Lewis et al. (2011) studied RD and central adiposity in 402 middle aged White (n = 220) and African American (n = 182) women over 3 years in the context of a larger longitudinal study. Visceral fat deposits were measured in 138 women by dual x-ray absorptiometry (DXA); the remainder of the cohort had waist circumferences measured. Everyday discrimination was measured at year 3 and 7 for the larger study sample and at baseline for those who received DXA. They found that central adiposity was positively and linearly related to scores on a RD measure, the Everyday Discrimination Scale (Williams), B = 11.92 (SE 6.07, p = .05). After controlling for age and race, there was a strengthened relationship between RD and central adiposity, with a 13.03-cm² increase in visceral fat for every one-point increase on the RD scale (p = .04). There was no
relationship found between RD and subcutaneous fat, waist circumference (despite higher measures of visceral fat by DXA), or total body fat.

Studies in other ethnic groups also show positive relationships between RD and obesity; Gee, Gavin & Takeuchi (2008) examined the effects of RD on obesity in Asian Americans (mean age 41 years, n = 1956), and found that after controlling for personal and employment characteristics, RD was positively related to BMI (based on self-reported weight and height, $b = 0.97$, $p \leq .001$). Hunte (2011) found in her analysis of a dataset of a racially diverse but predominantly White group of midlife adults (n = 1452) that both men and women who reported high levels of everyday interpersonal discrimination at two time points had higher increases in self-measured waist circumference over time than those who reported low levels; women with high interpersonal everyday discrimination had a 1.88 cm additional increase compared to those who reported consistently low levels ($p < .05$).

**Contradictory Findings for Racial Discrimination and Obesity**

These studies suggest that by middle age, RD exposure predicts the development of obesity. However, it is not clear at what age this relationship begins to manifest, particularly whether it is already influencing obesity in African American women during the childbearing years. In addition, fat distribution relating to RD varies among studies, and not every study of RD and obesity shows a positive relationship. Two notable examples are the studies by Vines et al. (2007) and Shelton et al. (2009).

Vines et al. (2007) used a telephone interview of 447 middle-aged African American women with uterine fibroids to examine relationships between RD and waist-to-hip ratio, controlling for BMI. They developed a novel instrument for the study, the
Telephone-Administered Perceived Racism Scale. RD was associated with a significantly lower risk for waist-hip ratio >0.8 in this study (OR 0.5, 95% CI 0.3 -0.9) after controlling for BMI, though high daily stress was associated with a higher risk. Several factors may contribute to these contradictory findings: a higher mean BMI than in most other studies (30 kg/m²), a study population with known uterine fibroids, and lack of control for education or income, which are well established in the literature as protective against obesity (Sutherland, Brown, & Yelland, 2013; Vahratian, 2009).

Shelton et al. (2009) randomly sampled male and female low-income housing residents (n = 1307, mean BMI 30.2, mean age 49 years) and examined relationships between RD, gender discrimination and obesity. After controlling for financial status, country of birth, health status, having a regular healthcare provider, gender and age, no associations between discrimination and BMI (2/3 self-reported, 1/3 researcher-measured) reached statistical significance.

In summary, most studies to date have found positive relationships between RD and obesity and/or central adiposity. However, there have been inconsistent findings, and variations in anthropomorphic measurement techniques, frequent reliance on self-report for anthropometric data (introducing a common source of bias), and different strategies for measurement of RD mean that the extent to which RD affects obesity or central adiposity remains uncertain. Whether previously established relationships hold among younger populations is unknown. The proposed study may thus contribute to a better understanding of this phenomenon.
Racial Identity Attitudes as a Reserve Capacity

Within the Reserve Capacity Model, reserve capacities include any resources that allow individuals to offset or reduce the effects of stressors they face (Gallo, Penedo, et al., 2009). Mixed findings in the literature suggest that further exploration is needed to understand why some individuals may, despite high exposure to RD, continue to experience good health. This study conceptualizes racial identity attitudes as a possible reserve capacity that buffers the effect of race-related stress. Prior research suggests that individuals who feel their race is an important and valued part of themselves may maintain better health in the face of stressors (Bediako, Lavender, & Yasin, 2007; Forsyth & Carter, 2012; D. L. Lee & Ahn, 2013; Utsey, Chae, Brown, & Kelly, 2002) and be less likely to adopt harmful health behaviors (e.g. Perry et al., 2013; Stevens-Watkins, Perry, Harp, and Oser, 2012.)

Explicit and Implicit Identity Attitudes

Like all attitudes, racial identity attitudes can be implicit and unconscious as well as explicit and acknowledged (Fazio & Olson, 2003). Previous research has supported that attitudes about race are likely to have diverging explicit and implicit components (Greenwald et al., 2009), making it particularly important to measure both. Racial identity attitudes as moderators for RD on health outcomes have been measured explicitly, but rarely have implicit measures been used. No study to date has measured implicit and explicit racial identity attitudes simultaneously in the context of RD-related stress, making the proposed study unique.
Racial and Ethnic Identity as Social Identities: Similarities and Distinctions

Racial identity is a complex attitudinal phenomenon that includes multiple dimensions (Cokley, 2007; Cross & Vandiver, 2001; Ponterotto, Park-Taylor, & American Psychological Association, 2007; Sellers, Smith, Shelton, Rowley, & Chavous, 1998). Racial identity has often been used to explore social group identification among African Americans, whereas ethnic identity, a construct with distinct theoretical roots (Phinney, 1992), has often been used for this purpose among Whites, Latinos, Asian Americans and American Indians (Rivas-Drake et al., 2014). Often the terms are used interchangeably in the literature, both theoretically and analytically, and both have been investigated as possible contributors to health outcomes.

Social identity theory explains and predicts intergroup behavior. The development of a social identity requires two elements: a cognitive awareness of membership within the group, and an evaluative awareness of the value of the group (Tajfel, 1982). Both ethnic identity and racial identity theories include tenets derived from social identity theory, in that they each include affective and evaluative attitudes about group membership.

While ethnic identity and racial identity share similar underpinnings, they have distinctive characteristics. Cokley (2007) defines ethnic identity as involving a sense of the self as belonging to a group with a shared history, ancestry, traditions, and cultural traits such as language, food, music, dress, values and beliefs. Racial identity, on the other hand, involves the sense of self one develops in relation to being socialized as a member of a racial group, characterized by shared phenotypical features such as skin color, facial features or other hereditary traits. In addition, racial identity may include
beliefs about how best to interact with members of one's own racial group and members of other racial groups (Sellers et al., 1998; Vandiver, Fhagen-Smith, Cokley, Cross, & Worrell, 2001). Cokley suggests that when the research question relates to how individuals navigate a racially oppressive society as a member of a racial group, the appropriate construct to use is racial identity.

While African Americans constitute an ethnic as well as a racial group, this study will focus on racial identity because it is explicitly concerned with how an individual's identity interacts with RD to affect health. However, the values, behaviors and affective components included in the concept of ethnic identity may also serve as a reserve capacity, so this study will include measures for both.

**Importance of the Affective and Evaluative Dimensions of Racial Identity**

Studies to date have found that for young people of color, holding more positive attitudes about their own racial identity is often associated with positive outcomes in many domains: educational achievement (Cokley, McClain, Jones, & Johnson, 2011), self-esteem (Ghavami, Fingerhut, Peplau, Grant, & Wittig, 2011; Mandara, Gaylord-Harden, Richards, & Ragsdale, 2009), affect and psychological adjustment (Mandara et al., 2009; Street, Harris-Britt, & Walker-Barnes, 2009), and reduced risk-taking (DeGruy, Kjellstrand, Briggs, & Brennan, 2012). Relationships between racial identity attitudes and psychosocial and academic outcomes are particularly consistent for African American youth, and tend to have small to moderate effect sizes (Rivas-Drake et al., 2014).

A recent meta-analysis (Rivas-Drake et al., 2014) suggests that it may be the affective and evaluative dimensions of racial identity that are most relevant for young
people. Feeling proud, happy about, and connected to one's racial group may be more important for emotional and physical health among AA youth than are particular identity-related behaviors or ideologies. Therefore, the proposed study will focus on affective and evaluative components of racial identity, here referred to as racial identity attitudes, as the primary variable of interest representing reserve capacity.

**Racial Identity and Health: Direct Relationships**

The majority of studies investigating racial identity and health outcomes include RD and/or racism-related stress. Very few studies examine direct relationships between racial identity and health. Settles et al. (2010) studied depression, self-esteem and racial identity in 379 African American women with a mean age of 33 years, using the Multidimensional Inventory of Black Identity (MIBI) subscales Private Regard, Public Regard, and Centrality to measure identity attitudes. *Private regard* refers to how affirmative an individual feels about being a member of his or her racial group, and *public regard* refers to an individual's beliefs about how his or her group is perceived and valued by members of other groups. *Centrality* refers to an individual's evaluation of the importance of race to his or her sense of self, and how connected the individual feels to the group.

In Settles et al. (2010), private regard was found to be more strongly related to self-esteem scores (r = 0.50) than were public regard or centrality, though all relationships were significant and positive (p < .01). Tests of mediation and moderation suggested that inverse relationships found between regard scores and depression were mediated by self-esteem. Additionally, women with high centrality demonstrated stronger inverse relationships between private regard and depression. Similarly, in a longitudinal
study of African American adolescents using latent variable growth modeling, Mandara et al. (2009) found that as racial pride increased in young adolescents, depressive symptoms decreased; this relationship persisted after controlling for self-esteem.

Racial identity has also been studied in relation to health behaviors and physical symptoms. Armstrong (2013) was interested in predictors of African American women’s participation in physical activity. She used a one-item assessment of the concept of racial centrality, asking women to rate the “strength of your association with your racial group”, and found that stronger centrality predicted more frequent physical activity among her sample (β = .243, p = .013). Bediako, Lavender & Yasin (2007) examined African Americans with sickle cell disease and their use of the healthcare system to manage pain crises. They hypothesized that individuals with a stronger Black identity would experience less psychological stress, reducing pain crisis frequency and the need for episodic care. They found that strong Black identity was inversely associated with both pain severity and health care service use.

While some racial identity attitudes may contribute to better health, there is some evidence that other attitudes may independently predict poor health outcomes. These include negative feelings or beliefs about one’s own race, or denigrating other members of one’s own racial group. In a few small studies, these negatively-valenced racial identity attitudes, sometimes conceptualized as internalized racism, have been independently associated with higher blood glucose (Tull, Cort, Gwebu, & Gwebu, 2007), central adiposity (Butler, Tull, Chambers, & Taylor, 2002; Cort, Gwebu, Tull, Cox, & Modise, 2013; Tull et al., 1999) insulin resistance (Chambers et al., 2004), flatter diurnal salivary cortisol slopes (Tull, Sheu, Butler, & Cornelious, 2005), BMI (W. S. Lee,
2016), and increased risk for cardiovascular disease (Chae, Lincoln, Adler, & Syme, 2010). In studies including both genders, women appear to demonstrate stronger relationships between negative racial identity attitudes and markers of poor metabolic health than men do.

In summary, studies to date suggest that racial identity attitudes may directly contribute to health outcomes, with racial pride and affirmative attitudes showing protective health effects and negative attitudes being detrimental to health outcomes.

**Effects of Racial and Ethnic Identity on Relationships between Discrimination and Health**

Holding affirmative, positively-valenced attitudes about one’s racial or ethnic group may buffer the stress involved in episodes of discrimination, reducing anger directed towards the self after a RD episode occurs (Neblett, Rivas-Drake, & Umaña-Taylor, 2012) and decreasing negative health effects. In four experimental studies designed to test the effects of discrimination and social group identity on self-directed anger compared with anger directed towards others, Hansen and Sassenberg (2006) found that identifying more with a social group significantly reduced self-directed anger after exposure to vignettes involving social discrimination based on group membership. Studies specifically examining moderation have generally found that strong and affirmative identity attitudes reduce negative effects of RD on health outcomes, particularly mental or behavioral health issues, like substance use (Appendix C). However, relatively few have investigated relationships among RD, racial identity, and physical health markers or outcomes.
**Moderation by explicit racial identity attitudes.** Strong and affirmative racial identity attitudes appear to be health protective. Brody et al. (2015) prospectively examined racial discrimination, racial identity and cytokines in African American adolescents. A modified version of the Schedule of Racist Events (Landrine & Klonoff, 1996) was administered at baseline for 160 AA adolescents aged 17 to 19 years along with the Centrality scale of the MIBI, and anthropometric measurements and cytokine levels were collected. Exposure to higher levels of RD at baseline correlated with higher cytokines at age 22 after controlling for potential confounders, but only for participants with low levels of racial centrality. This suggests that a strong sense of belonging and connectedness with other Black people helped minimize negative health effects of RD over time.

Neblett and Roberts (2013) used audio vignettes of three situation types (neutral, blatant RD, and subtle RD) to assess African American college students' autonomic responses to discrimination in relation to their racial identity. Individuals with high private regard showed responses consistent with preparation for challenge and threat (autonomic reactivity) when the perpetrator in the blatant RD condition was Black, but not when perpetrators were White. This suggests that feeling strongly positive about being Black reduced physiological stress in the face of blatant White racism -- but not blatant racism perpetrated by other Black people. Individuals with low private regard, however, demonstrated autonomic reactivity when the blatant RD perpetrator was White.

Individuals with moderate levels of public regard, indicating a belief that members of other groups have largely neutral attitudes about Black people, demonstrated little or no autonomic reactivity to RD vignettes involving perpetrators of either race.
However, those with low or high levels of public regard showed autonomic reactivity for both blatant and subtle RD conditions, leading the researchers to speculate that those who believe others hold a high opinion of African Americans (high public regard) might be more likely to be surprised by RD experiences, finding them more threatening. Contrary to the researchers' expectations, low public regard did not appear to be protective against threat-related autonomic responses to RD vignettes.

Responding to the findings of Neblett and Roberts (2013), Hope et al. (2015) suggest that the autonomic reactivity associated with low public regard attitudes may be related to an increased sense of vulnerability, due to ongoing vigilance based on the expectation of future RD experiences. A moderate level of public regard thus may be most adaptive, avoiding both surprise and disappointment due to RD that is experienced, and also avoiding hypervigilance and a sense of vulnerability about possible future episodes of RD.

Studies conducted in the past several years by Chae and colleagues have improved understanding of the relationships among RD, racial and ethnic identity, and physical health outcomes. In 2009, Chae and Waters studied RD among 447 gay, lesbian, bisexual and other sexual-minority American Indians and Alaskan Natives. They found that higher levels of actualization (defined as feeling committed to ethnic group interests and appreciating being a member of the group) buffered inverse relationships between discrimination and self-rated physical health (Chae & Walters, 2009).

Chae et al. (2010) studied RD and cardiovascular health among 1216 middle-aged African American men. They found that anti-Black bias (agreeing with negative beliefs
about Blacks) was directly associated with having a history of cardiovascular disease. Anti-Black bias additionally moderated relationships between RD and cardiovascular disease. Among participants who reported neutral or positive attitudes about Black people, a curvilinear relationship between RD and cardiovascular disease was found: those who reported a moderate amount of RD exposure had the highest probability of cardiovascular disease, followed by those reporting the highest levels of RD, with the lowest disease prevalence found in those reporting no RD experiences. The highest overall prevalence of cardiovascular disease was found in men who both held anti-Black attitudes and who reported experiencing no RD. This finding is consistent with Major's (2003) work suggesting that attribution of unfair or negative treatment to RD may be health protective, because it conceptualizes the treatment as a function of the perpetrator's prejudice rather than some fault of the self. However, failing to recognize RD and attribute negative treatment to prejudice, perhaps due to holding negative racial attitudes about one's own group, may increase stress and reduce health.

**Moderation by implicit racial identity attitudes.** Implicit racial attitudes may also interact with racial discrimination. In 2012, Chae, Nuru-Jeter and Adler studied RD and hypertension, using the race implicit association test (IAT-r) to measure implicit racial identity attitudes among 91 middle-aged African American men. While neither RD nor racial identity attitudes demonstrated main effects on hypertension, RD was associated with a lower risk of hypertension among men with a pro-Black implicit bias, and with a higher risk among men with an anti-Black implicit bias once a number of potential confounders were statistically controlled for (Chae et al., 2012). Chae et al. (2014) also examined the effects of implicit racial identity attitudes and RD on leukocyte
Telomere length in this same sample. Telomere length is considered to be a biomarker for biological aging, and shorter telomeres are associated in the literature with both chronic stress and aging (Blackburn & Epel, 2012; Epel et al., 2004). There were no main effects found for RD or for implicit racial identity attitudes on telomere length. However, interactions were found between RD and implicit racial identity on telomere length, which remained significant after controlling for sociodemographic factors and common diseases, prescription medications and smoking ($b = -.10, SE = 0.04, p = .02$). Among participants with an anti-Black implicit bias, higher RD was associated with shorter telomeres. However, participants with a pro-Black implicit bias were protected from RD, with slightly longer telomeres among those who reported more RD compared to those who reported low levels of RD.

While studies to date tend to show protective effects of positive racial identity attitudes on physical health indicators, few have been conducted with young African American women. Similarly, it is not yet clear whether implicit racial identity attitudes generally are congruent with explicit attitudes, or whether one or the other is more important as a stress buffer. The proposed study will contribute to a better understanding of these questions, and of how racial identity attitudes may interact with RD on health outcomes. The inclusion of an ethnic identity measure will provide an opportunity to learn more about the extent to which ethnic identity attitudes serve as a reserve capacity in this population.

**Measuring Cortisol in African American Hair: Challenges**

Hair cortisol is an emerging approach to measure the physiological effects of chronic stress. Hair cortisol has an advantage over other measures because it quantifies
circulating cortisol over time instead of at a particular moment, and is less sensitive to collection timing and technique. A systematic review by Staufenbiel et al. (2013) found that chronic stressors such as shift work, chronic pain, unemployment, and major life events have been positively correlated with hair cortisol levels. Recently, Schreier et al. (2016) reported that lifetime stressful events were associated with hair cortisol levels in Black women during pregnancy, $F(1, 25) = 5.61, p = .03$. Although hair cortisol measurement is a promising technique that could be used to understand effects of stressors on the HPA axis, there are several challenges specific to the measurement of cortisol in the hair of African American women.

**Measurement Issues**

Studies to date are inconsistent regarding the effects of various forms of hair processing on the measurement of cortisol levels. While the biochemical composition of keratin in hair is the same across racially diverse populations (Ramos-e-Silva, 2002), hair texture and shape varies based on follicle shape and angle, and also the numbers of disulfide bonds between amino acids in the hair shaft (Ramos-e-Silva, 2002; Tirado-Lee, 2014). Conditioners and moisturizers are frequently used by African American women, because Black hair types tend to be more dry (Franbourg, Hallegot, Baltenneck, Toutain, & Leroy, 2003), and the frequency of shampooing is typically less than is commonly done by European or Asian women (Ramos-e-Silva, 2002). It is a common practice for African American women to chemically process their hair, and the kinds of chemical processing used are different than the ones used on other types of hair (Crawford & Hernandez, 2014). Chemical relaxants can change amino acid concentrations in hair and thus hair structure, with those containing lye producing more hair damage (Mamabolo,
Agyei, & Summers, 2013). Hair bleaching, either by itself or as a prelude to coloring, is also a practice African American women sometimes choose for their hairstyles (Roseborough & McMichael, 2009). Currently, it is not certain whether or not these treatments affect the measurement of cortisol in hair.

Dettenborn et al. (2012b) assessed natural hair color, hair curliness, age, gender, frequency of washing, medication use, and cigarette smoking as potential variables in cortisol measurement. They found that only age and gender were related to cortisol levels for the first 6 cm of hair proximal to the scalp. However, it is not clear whether or not their sample was ethnically diverse. Hamel et al. (2011) found that in rhesus monkey models, exposure to repeated water washings reduced hair cortisol, though shampooing itself did not. Other human studies have failed to show an association between hair washing and hair cortisol levels (Dettenborn, Tietze, Kirschbaum, & Stalder, 2012a; Manenschijn, Koper, Lamberts, & van Rossum, 2011), at least in segments proximal to the scalp. Hair moisturizers appear not to affect hair cortisol concentrations (Manenschijn et al., 2011). Hair bleaching, use of relaxants, and use of dyes may slightly reduce the level of cortisol in hair (Manenschijn et al., 2011; Sauve, Koren, Walsh, Tokmakejian, & Van Uum, 2007) but other studies have failed to find an association (Stalder et al., 2012). Most recently, Hoffman et al. (2014) found that bleaching, permanents and multiple shampoos did not decrease cortisol levels in African American hair; however, of the 121 participants in this study, only 5 were Black, and the researchers did not test chemical straighteners.

While there is a continuum of types of Black hair based on each woman's individual genetics (Jablonski & Chaplin, 2014), in general, Black hair grows slightly
more slowly than Asian or European hair types (Loussouarn, El Rawadi, & Genain, 2005). This poses a question about whether standardized lengths of hair should be used for cortisol measurement among different populations. Currently, most laboratories assume that a centimeter of hair growth represents approximately one month of cortisol deposition for up to a 6-month period (Dettenborn, Tietze, Bruckner, & Kirschbaum, 2010). However, one study suggested a one-year hair growth difference between African (slowest growing) and Asian (fastest growing) hair types would average 5 cm (Loussouarn et al., 2005). Continued efforts to assess cortisol in Black hair samples will contribute to evidence that clarifies these issues.

**Acceptability of Hair Sampling and Cultural Meanings of African American Hair**

The acceptability of hair sampling to African American women is not well understood. This method is relatively new, and thus there have been few attempts to collect hair from this group of women. Two potential reasons are posited for speculating that hair collection may be less acceptable to this group of women compared to other groups. First, Black women commonly experience hair breakage, due to both weaker hair structure and traction-related alopecia (Ramos-e-Silva, 2002), particularly if manipulated or combed through while wet. In one recent study, more than 50% of Black women reported concern about excessive hair loss (Gathers & Mahan, 2014). Women who are already concerned about hair loss may be reluctant to lose the small amount, just over 5 mg, required for hair cortisol collection. Second, hair has significant cultural meanings for African Americans. While the social meaning of hair is understood in relation to beauty in most cultures, African American hair has been the focus of additional social
meanings to an extent not present in most other cultural and historical contexts (Okazawa-Rey, Robinson, & Ward, 1987).

African American hair has been simultaneously symbolized to represent a focus for discrimination, resistance to oppression, and a means of personal expression (Dash, 2006). Many families and groups of friends engage in regular hair rituals, such as washing day, braiding parties or weekly trips to the salon (Neal-Barnett, Statom, & Stadulis, 2011), giving hair symbolic meaning as a focus for communal activity. From childhood, African American girls receive messaging about the importance of hair and the differences between "good hair" and "bad hair" (Neal-Barnett et al., 2011; Robinson, 2006). This categorization is based on both aesthetic and manageability concerns, such as ease of combing and styling facilitated by straighter, less kinky strands (Robinson, 2006).

Given the multiple cultural meanings for hair within the African American community, and considering the history of research ethics in the U.S. context (W. M. Byrd & Clayton, 2001), hair collection for research purposes may be challenging. However, researchers may be successful in involving African American women in research that includes hair collection, particularly with an approach to recruitment that focuses on benefitting African Americans and their health (Lang et al., 2013; Neal-Barnett et al., 2011). This study may add to an understanding of how acceptable hair collection is to young collegiate African American women who are not already familiar with the primary investigator.

**Conclusion**

While the past two decades have involved an acceleration of research into the effects of RD on health, many questions remain. It is critical to the health of AA mothers
and their infants that more research be conducted in this area, as it may have explanatory
power for racial disparities in perinatal health outcomes. Only by understanding these
relationships, and particularly factors that may be protective against otherwise negative
health effects of RD, can effective interventions be designed and implemented.
Chapter 3. Study Design and Methods

The purposes of this study were to investigate: 1) whether racial discrimination is associated with obesity and central adiposity in young African American women; and 2) whether racial identity influences these relationships. A secondary aim was to assess the feasibility and acceptability of assessing HPA dysfunction through hair sampling.

Institutional Review Board Approval and Consent

Approval from Kent State University’s Institutional Review Board (IRB) was obtained for the study (protocol # 15-365, Appendix D).

Design, Setting and Sample

A cross-sectional, descriptive, correlational design was used in this study.

Setting

Participants were recruited from within an ethnically diverse but majority-White public Midwestern university with 27,500 students. The campus has seven regional campuses and one main campus; recruitment took place on the main campus.

Sample

The sampling frame was determined in collaboration with the university's Department of Research, Planning and Institutional Effectiveness, who collated unique email addresses for 1215 undergraduate and graduate women from the main campus. Inclusion criteria were 1) self-identification as an African American, 2) female, 3) aged 18 to 25 years, and 4) active enrollment in university courses. Exclusion criteria were based on factors known to influence cortisol levels and adiposity over a longer (3-month)
timeframe, and included 1) Cushing’s disease, 2) usage of oral, intravenous or injected corticosteroid medications within the prior 3 months (Wells et al., 2014), and 3) current pregnancy (Kirschbaum, Tietze, Skoluda, & Dettenborn, 2009). An additional exclusion criterion for hair cortisol measurement was the use of topical steroid medications, because touching the hair after applying these may confound results (Stalder & Kirschbaum, 2012).

**Sample Size**

Studies to date have found small to moderate effect sizes for relationships between racial discrimination and mental (D. L. Lee & Ahn, 2013) or physical health (K. F. Anderson, 2013). The main study was designed to include 9 predictor variables: 3 measures of racial discrimination (RD), two explicit racial/ethnic identity attitude measures, one implicit attitude measure for racial identity, and 3 covariates (threatening life events, income, and smoking status.)

To detect moderation in multiple regression, sample sizes must be large enough to capture effects calculated by multiplying effect sizes of predictors on outcomes. Based on a review of the literature, main effects on obesity were estimated at \( r^2 = .10 \) for RD measures and \( r^2 = .10 \) for racial/ethnic identity measures (Appendix E). Per Aiken and West (1991), the sample size required to detect interaction with \( \alpha = .05 \) and power = .80, when main effects are \( r^2 = .10 \) and interactions increase effects by \( r^2 = .05 \), is 135. Tabachnick and Fidell (2007) suggest a sample size of at least \( N > 8k +50 \) for multiple regression when effect sizes are medium; suggesting a minimum of 122 participants. The larger number was used because effect sizes for some predictors were anticipated to be small. One additional participant was recruited for potential replacement purposes, due to
one participant identifying herself more as African than African American, for a total sample of 136. Replacement was later determined to be unnecessary.

**Measures**

For all measures, reliability indicators are summarized in Table 3-1.

**Racial Discrimination**

Racial discrimination was defined as a perception held by an individual that a behavior is unfair or unequal on the basis of ethnic affiliation or phenotypical appearance (Yetman, 1991). Behaviors motivating this perception may be either overt or subtle (like microaggressions), and the measurement strategy for this study was intended to capture both.

**Experiences of discrimination (EOD) scale.** The Experiences of Discrimination scale (EOD) was used to measure overt racial discrimination (Krieger, 1990; Krieger & Sidney, 1996; Krieger et al., 2005), Appendix F. The EOD has two parts that are often used independently, e.g. Krieger et al. (2011). Part I consists of two questions addressing an individual's typical response to discrimination, and was not included in this analysis because coping with discrimination was not a focus of this study. Part II (9 items) represents 9 RD experiences encountered in daily life, including both the number of situations where RD occurs and the frequency. The situations include school, workplace, hiring, housing, medical care, stores or restaurants, financial institutions, public settings, and judicial settings. Each situation where the respondent reports RD occurring is given a score of 1, for a total situation score ranging from 0-9. Frequency of RD is measured by the number of times the situational discrimination has happened. Responses are assigned weighted frequency scores where "never" = 0, “once” = 1, “two or three times” = 2.5, and
Table 3-1.

*Reliability Indicators for Selected Measures Used in Analysis*

<table>
<thead>
<tr>
<th>Conceptual Variable</th>
<th>Scale/Subscales</th>
<th>Number of Items</th>
<th>Standardized Alpha</th>
<th>Mean Inter-item Correlations</th>
<th>Item Means: Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overt RD</td>
<td>EOD: Frequency</td>
<td>9</td>
<td>.71</td>
<td>.21</td>
<td>1.05</td>
</tr>
<tr>
<td>Microaggressions</td>
<td>REMS: total scale score</td>
<td>45</td>
<td>.90</td>
<td>.16</td>
<td>.38</td>
</tr>
<tr>
<td>Private Regard</td>
<td>MIBI Private Regard</td>
<td>6</td>
<td>.84</td>
<td>.46</td>
<td>6.35</td>
</tr>
<tr>
<td>Public Regard</td>
<td>MIBI Public Regard</td>
<td>6</td>
<td>.80</td>
<td>.40</td>
<td>2.99</td>
</tr>
<tr>
<td>Racial Centrality</td>
<td>MIBI Centrality</td>
<td>8</td>
<td>.77</td>
<td>.29</td>
<td>4.92</td>
</tr>
<tr>
<td>Ethnic Identity</td>
<td>MEIM-R Total</td>
<td>6</td>
<td>.87</td>
<td>.53</td>
<td>3.84</td>
</tr>
<tr>
<td>Threatening Events</td>
<td>Modified LTE-Q, aged 18 to 25 years</td>
<td>15&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.70</td>
<td>.14</td>
<td>.28</td>
</tr>
</tbody>
</table>

<sup>a</sup>total number of items = 16; items endorsed by any participant = 15.
“four or more times” = 5 (range = 0 to 45). Krieger et al. (2005) have validated scoring using either summation of reported situations (situation scoring) or frequencies (frequency scoring). Higher scores reflect greater exposure to racial discrimination, which in this study was anticipated to be a contributor to chronic stress; frequency scoring was used in this study's analyses.

The validity and reliability of the EOD was supported through confirmatory factor analysis, test-retest analysis, and Cronbach’s alpha (Krieger et al., 2005), in a study that included 158 Black, 249 Latino and 208 White adults aged 25-64 years, and a follow-up validation sample of 98 Black and 110 Latino participants. Internal consistency scores for the instrument varied by population. Cronbach's alphas for RD situations experienced by Blacks, Latinos and Whites were 0.81, 0.81, and 0.77 respectively, and frequency score alphas for the three groups were 0.86, 0.79 and 0.74. Test-retest reliability was r = 0.69. Construct validity was assessed using confirmatory factor analysis, comparing the EOD with Williams’ Major Discrimination Scale and the Everyday Discrimination Scale (Williams et al., 1997). The EOD demonstrated an excellent model fit (CFR = 0.966, RMSEA = 0.069), with a single underlying construct, experiences of discrimination (Krieger et al., 2005).

In this study, Cronbach's alpha for situation scoring was .60, and frequency scoring was .71. Cronbach's alpha is determined by item intercorrelations, which are sensitive to imbalances in the numbers of responses per item. Few participants reported ever experiencing discrimination in three situations, resulting in a skewed distribution of responses; the true relationship between items may thus have been underestimated (Gadermann, Guhn, & Zumbo, 2012).
Racial and ethnic microaggressions scale (REMS)-checklist. Microaggressions are conceptualized as a form of RD involving subtle, brief, everyday interactions that communicate negative racial messages. Microaggressions may or may not be intentional, but draw attention to the importance of race in everyday life (Sue, Capodilupo, et al., 2007). Racial microaggressions were measured using the Racial and Ethnic Microaggressions Scale (REMS-Checklist), with author permission (Appendix G). This 45-item scale includes 6 subscales based on types of microaggressions experienced, which are hypothesized to differ in frequency based on one's racial group. Subscales include a) Assumptions of Inferiority (8 items), b) Second-Class Citizen and Assumptions of Criminality (7 items), c) Microinvalidations (9 items), d) Exoticization and Assumptions of Similarity (9 items), e) Environmental Microaggressions (7 items), and f) School and Work Microaggressions (5 items). Response format is dichotomous (yes or no) based on whether a specified experience has happened in the last 6 months (Nadal, 2011). Mean total scores are obtained by summing 'yes' responses after specified items are reverse coded, then the total is divided by 45. Higher mean scores indicate greater exposure to microaggressions.

The REMS scale was reported to have a KR-20 of 0.92 for the original 131-item version in a sample of 443 educationally, ethnically, racially, and geographically diverse participants, including African Americans. Exploratory and then confirmatory factor analyses were used to reduce the items to 45. KR-20 for the six subscales of the REMS-Checklist ranged from 0.71 to 0.86. Convergent validity of the 45-item REMS-Checklist was established with all 6 REMS subscales positively correlated ($r = 0.489$, $p < .001$) with the RaLES-B, a short form of the Racism and Life Experiences- Self-Administration.
Version (RaLES-S) developed by Harrell (1997). A new sample completed the REMS-Checklist and a confirmatory factor analysis was conducted; two of three fit indices, the RMSEA (0.5) and SRMR (0.71), suggested a good or excellent fit. The KR-20 for the 6 subscales in this second sample ranged from .76 to .92.

In this study, reliability of microaggressions measurement used KR-20. The total scale score was used in analysis, and not the subscales. **Table 3-1** provides detailed information on reliability results.

**Modified experiences of discrimination (EOD).** *Vicarious racism experiences* refer to perceived racial discrimination that is directed towards another person known to an individual, such as a partner, children, friends, other family members, or even strangers whose experiences are well publicized. To date, no scale to measure vicarious racism experiences has been developed. However, Dominguez et al. (2008) modified the EOD scale to measure perceived vicarious racism (**Appendix H**). Using the measurement strategy outlined by Dominguez, participants were asked to report on close contacts who had experienced RD in 9 situations. For each contact, the participant was asked to specify the individual's race and relationship with her, and to specify the situation(s) in which that person experienced RD. Responses for each situation were coded dichotomously (yes = 1, no = 0), and situations for all a participant's close contacts were summed together. That sum was then divided by the number of close others, in order to create a mean vicarious RD score for each participant (total sum of situations reported/number of close others). It is assumed that discrimination situations that happen to others, but are reported by the participant, have been significant enough to potentially cause racism-related stress. In the modification to the EOD by Dominguez, reliability estimates were not reported.
Racial Identity Attitudes

Racial identity attitudes were measured both explicitly and implicitly. Because the literature is inconsistent in the conceptualization and measurement of racial identity and ethnic identity, this study included a measure for both.

Multidimensional Inventory of Black identity (MIBI). To measure explicit attitudes about racial identity, the Multidimensional Inventory of Black Identity (MIBI) (Sellers, Rowley, Chavous, Shelton, & Smith, 1997) was used (Appendix I). The MIBI is based on the theoretical Multidimensional Model of Racial Identity (MMRI) (Sellers et al., 1998). Three scales in the MIBI instrument measure centrality (evaluative strength of feeling connected to the group), regard (affective attitudes about African Americans), and ideology (beliefs about how African Americans should enact their values). The Centrality and Regard scales were used in this study. Centrality and regard are considered relatively stable attitudes that may change with time and life experience, but do not change from one situation to the next in the course of daily life (Sellers et al., 1998).

Centrality is measured in a single scale with 8 items. The Regard scale is composed of 2 subscales: Private Regard (6 items) is designed to measure affective attitudes about being African American, and Public Regard (6 items) measures the extent to which individuals think others view African Americans positively or negatively (Sellers et al., 1997). Responses are on a 7-point Likert-like format, ranging from 1= strongly disagree to 7 = strongly agree. Some items are reverse-scored. Each subscale's responses are summed, and a mean subscale score is then calculated. High centrality scores indicate a strong sense of connection to the group, and high private regard scores indicate feeling very positive and affirming about being Black. High public regard
indicates that a participant believes people of other ethnicities highly value Black people and their contributions to society.

The Centrality scale and Private Regard subscale of the MIBI have shown variable internal consistency ($\alpha = .66-.85$ for centrality, and $\alpha = .6-.78$ for private regard) in both the original validation study and in most psychometric studies to date (Appendix J). Public regard reliability has varied in prior studies from $\alpha = .49$ to .91. In this study, alphas for centrality, private regard and public regard were .77, .84 and .80 respectively.

**Multigroup ethnic identity measure-revised.** The Multigroup Ethnic Identity Measure-Revised (Phinney & Ong, 2007), was used to measure explicit ethnic identity (Appendix K). The MEIM-R is derived theoretically from social identity and Ericksonian identity theories (Casey-Cannon, Coleman, Knudtson, & Velazquez, 2011; Phinney, 1992; Yap et al., 2014). While the original MEIM was validated among adolescents (Phinney, 1992), based on Phinney's assertion that adolescence was a particularly important time in the development of ethnic identity, her later work acknowledged that ethnic identity may continue to be explored throughout adulthood (Phinney & Ong, 2007), and the revised scale was validated with a college population. The 6-item Likert-like revised scale consists of 2 subscales: the 3-item Exploration subscale (the extent to which a person seeks information and experiences that are ethnically relevant), and the 3-item Commitment subscale (the strength of attachment and personal investment in belonging to an ethnic group). Responses are on a 5-point scale ranging from 1 = strongly disagree to 5 = strongly agree, and responses are summed, and then averaged, to calculate a mean total scale (all 6 items) and subscale scores. Higher scores on the Exploration subscale indicate higher engagement in behaviors designed to
increase understanding of one's ethnic group and its traditions. Higher scores on the Commitment subscale represent greater attachment to the group and greater understanding of the personal meaning of ethnic identity. Higher scores on the total measure indicate more stable and strong ethnic identity.

Reliability and validity of the current version of the MEIM-R has been established by psychometric testing. Internal consistency ranges from $\alpha = .76$ for the Exploration subscale, $\alpha = .78$ for the Commitment subscale, and $\alpha = .81$ for the total scale in the original validation sample of 241 ethnically diverse university students (Phinney, 2008) to $\alpha = .87$ for Exploration, $\alpha = .88$ for Commitment, and $\alpha = .88$ for the total scale score in a sample of diverse college and graduate students in California (Yoon, 2011). In this study, the total scale score was used in multiple regression analyses; $\alpha = .87$.

Construct validity of the 6-item MEIM-R was confirmed in a multi-ethnic sample of 1,463 pregnant women, 58 of whom were Black (S. D. Brown et al., 2014); two factors representing the two subscales described here were supported, with SRMR = .03, RMSEA (90% CI) = .07 (.06 - .09), and CFI = .98. Measurement invariance across groups was established noting small changes (< .01) in CFI by ethnic group. Yoon (2011) recently compared the Ethnic Identity Scale (Umaña-Taylor et al., 2014) and the MEIM-R in upper division and graduate level counseling students. The Ethnic Identity Scale has three subscales: Exploration (the degree to which individuals have explored what their ethnicity means to them), Affirmation (positive or negative affective attitudes about ethnicity), and Resolution (the extent to which individuals feel they understand how they feel about their ethnicity, or feel resolved about their ethnic identity). Yoon found evidence of convergent validity for the Exploration subscales of both the MEIM-R and
the EIS (r = .79, p ≤ .01), and for the Commitment subscale of the MEIM-R with the Resolution subscale of the EIS (r = .69, p ≤ .01).

**Race IAT.** In this study, an IAT for automatic racial preference (IAT-r) measured implicit racial identity attitudes. The IAT-r used computerized reaction times to measure automatic preferences for Black or White faces, using associations between positive words, negative words, and race. Pairing stimuli included photographs of European American and African American faces (10 in total, 5 of each category), positive words (e.g. "happy," "wonderful," 9 total), and negative words (e.g. "awful," "horrible," 9 total). Images of European American and African American faces used in the study IAT were those used in the original Race IAT (IAT-R) (Nosek et al., 2007), made freely available from Project Implicit. Words used included a positive and negative set created by Nosek et al. and described in Nosek et al. (2005).

The computer tracks the speed at which respondents match a stimulus (word or picture) with its appropriate category (European American, African American, Positive Words, Negative Words). Categories in testing blocks were paired visually on the screen (e.g. "European American" appeared just above "Negative Words") and the pairings changed with different blocks. Matching times (or latencies) are used by the computer to calculate a mean score for each block. In the IAT, a single numeric scale score between -2 and 2 is obtained in a manner similar to a Cohen's D: the difference in mean scores for testing blocks with different category pairings are divided by the standard deviation of pooled, log-transformed categorization times for that individual. Higher numeric values (either positive or negative in sign) indicate stronger implicit preferences for one category compared with another (Greenwald, Nosek, & Banaji, 2003).
In this study, high IAT scores represent an implicit association between African American faces and positive words, and between European American faces and negative words (implicit pro-Black preference). Low IAT scores represent an implicit association between European American faces and positive words, and between African American faces and negative words (implicit pro-White preference). A score near 0 would mean that an individual has no implicit preference for either race, or a neutral implicit attitude.

The Race IAT (IAT-r), as originally configured, is well established and demonstrates strong psychometrics (Greenwald et al., 2009). Most studies included in a meta-analysis of IATs found alphas at or above 0.78 (Lane, Banaji, Nosek, & Greenwald, 2007). Research to date suggests that IATs assessing how one’s own group is valued compared with others demonstrate divergent, construct and criterion validity (Lane et al., 2007). Additionally, the IAT-r has strong predictive validity for interracial behaviors in a meta-analysis. In 32 samples (n = 1,699) from studies including criterion measures relating to Black-White behaviors, IAT- criterion correlation across studies was .236 ± .062, exceeding self-report, which averaged .118 ± .108 across 28 samples, n = 1,568 (Greenwald et al., 2009).

In this study, alpha was .72, slightly lower than other published reports. The average inter-item correlation was .56.

**Other Measured Variables**

**List of threatening experiences.** To control for stressful life events, the 12-item List of Threatening Experiences (LTE) checklist (Brugha & Cragg, 1990) was modified with permission. For each item in the LTE, participants indicate whether the event has
occurred in the last 6 months. For each event marked, scores are coded as 1 and scores are summed. Higher scores mean exposure to more threatening events (Appendix L).

Cohen’s kappa for test-retest reliability ranged from .9 for a 3-month period to .7 for a 6-month period (Brugha & Cragg, 1990). The experiences included in the checklist have been validated as events with a high potential to cause chronic and significant stress (Brugha et al., 1985).

Modifications to the LTE instrument were made to better reflect childhood or adolescent experiences that could affect current stress burden or HPA functioning for a young adult; these modifications are consistent with those used by other researchers using this measure (e.g. Zavos et al., 2012 & van der Pol et al., 2013). Specific modifications included additional items about parental life events that would be expected to cause stress for a participant. To better reflect childhood and adolescent experiences, the modified LTE-Q asked participants about threatening events occurring within time periods roughly corresponding to elementary school and earlier, middle school, high school, and adulthood (Appendix L). The modified LTE-Q included 16 items with 4 time frames (each response assigned one point), for a possible range from 0 to 16 for each age category.

Kuder-Richardson-20s were conducted separately for the original LTE-Q and the modified LTE-Qs. No score met the criteria for moderate reliability except for the modified LTE-Q for ages 18 - 25 years (KR-20 = .70), Table 3-1. Most studies using the LTE-Q do not report alpha coefficients, but instead rely on the test-retest reliability data reported in the literature with the original validation study (e.g. Johnson et al., 2014; Kruijt, Putman & van der Does, 2014). The reliability data for the LTE-Q for this study
and modifications of the LTE-Q are described in Table M1 in Appendix M; numbers of items reflect those endorsed at least once by participants.

Because this study is designed to control for non-RD-related chronic stress, a theoretical decision was made to use the modified adult LTE-Q score representing the cumulative number of negative life events occurring since a participant reached 18 years of age.

**Obesity and central adiposity.** Body mass index was measured using a standardized formula of weight in kg to height in cm, kg/m^2\(^2\) (World Health Organization, 2006). A medical-grade portable scale, the SECA 869, and portable stadiometer, the SECA 213, were used in the study. Although it is likely that African Americans on the aggregate have a slightly lower ratio of fatty tissue to lean tissue at a given BMI than other ethnic groups (Jackson, Ellis, McFarlin, Sailors, & Bray, 2009; Rahman & Berenson, 2010), BMI is a commonly used proxy for obesity and is a well-established risk indicator for health problems.

Central adiposity is excess fat around the midsection and is measured using waist circumference and waist-to-hip ratio. Waist circumference correlates well with biomarkers for metabolic syndrome (Shen et al., 2006), as does waist-hip ratio, and these measures are more predictive than BMI with respect to metabolic health (World Health Organization, 2011). The World Health Organization (2011) has created guidelines for standardized measurement of waist and hip circumference, which were used in this study. A non-stretchable measuring tape (the SECA 201) was used to measure hip and waist circumferences. Keeping the tape held level and parallel to the floor, waist circumference was measured at the midpoint between the top of the iliac crest and lower margin of the
last palpable rib in the mid axillary line. Hip circumference was measured at the largest circumference of the buttocks. Measurements were repeated twice, and if within 1 cm of one another, a mean was calculated and recorded. If not, the two measurements were repeated. Waist circumference was recorded in cm, and waist-hip ratio was calculated by dividing waist circumference in cm by hip circumference in cm. A waist-hip ratio greater than .80 is correlated with higher incidence of metabolic syndrome and diabetes (World Health Organization, 2011).

**Hair cortisol.** Cortisol is deposited in hair as it grows at a rate of approximately 1 cm per month. Thus, a 3 cm length of hair obtained closest to the scalp contains the amount of cortisol deposited within the prior 3 month time period (Dettenborn, Muhtz, et al., 2012). Cortisol in hair is measured by collecting a small amount of hair (approximately 5 milligrams) from the occipital region, with thinning shears or scissors positioned parallel to and touching the scalp (Hoffman et al., 2014). Strands are aligned and placed in foil packet with the scalp end of the sample labeled. Cortisol in hair is stable at room temperature for years (M. Laudenslager, personal communication, January 15, 2015). In the lab, hair samples are washed in isopropanol and dried. After weighing, hair is frozen with liquid nitrogen, and then ground into powder. Powdered hair is placed in methanol and then centrifuged, creating an extract. Dried extract is reconstituted to make a high sensitivity enzyme immunoassay (EIA) plate, and then tested for cortisol (measured in pictograms per milligram) (Hoffman et al., 2014). Reliability and validity of the EIA method for hair cortisol measurement was recently validated using blinded samples from 4 leading laboratories performing the procedure, including the laboratory that processed this study's hair samples, the University of Colorado-Anschutz Medical
Samples from the same individuals processed using EIA procedures and/or the benchmarking LC-MS/MS procedures at the 4 labs correlated with one another highly, with $rs = .88$ to $.97$, $p < .0001$. Samples processed by the lab that performed the analysis for this study correlated with two other laboratory's benchmarking LC-MS/MS results at $r = .97$, $p < .0001$ (Russell et al., 2015).

**Demographic and health history variables.** Demographic data were used to describe the sample (Appendix N), including previous education and location of residence, marital status, parental education and occupation, and income. Covariates for the main study included income, smoking status, and threatening events (LTE-Q score). Income level for this study was determined by asking participants if they were eligible for free or reduced price lunch or breakfast during high school. Eligibility for free or reduced meals in school is determined by a federally determined formula and applied to all states (Nicholson, Slater, Chriqui, & Chaloupka, 2014). The formula includes household size and income, and the cutoff points are 130% of poverty for free meals and 185% of poverty for reduced price meals. Free and reduced price meal eligibility for adolescents was recently determined to be highly correlated with not only individual socioeconomic status (SES) but also with community measures of SES (Nicholson et al., 2014).

Smoking potentially affects cortisol (Stalder et al., 2012) as well as body mass, with current smokers having lower BMIs than former or never smokers (Fesinmeyer et al., 2013). Smoking status was determined by asking participants if they currently smoked cigarettes, or had in the past.

To assess acceptability of hair sampling, open-ended questions were asked about reasons to participate or decline participation. For participants who were eligible and
willing to have their hair sampled, a short questionnaire of hair care practices was administered (Appendix O).

**Procedure**

**Prior Testing**

To evaluate survey completion time, layout, directions, item clarity, and any questions that could be upsetting or sensitive, two graduate students who attend Frontier Nursing University agreed to provide anonymous pre-study feedback via Survey Monkey. These students were recruited through the university's Promoting Recruitment and Retention to Increase Diversity in Nurse-Midwifery and Nurse Practitioner Education (PRIDE) program, whose coordinator sent an email to solicit volunteers. Six students whose identities were known only to the PRIDE coordinator expressed willingness to participate; 2 followed through with piloting the survey. No changes to the survey were indicated based on the feedback.

**Recruitment**

Several recruitment methods were used to access potential participants. First, the PI contacted campus organizations including the Black Graduate Student Association (BGSA), KSU Sister Circle, and the University Women's Center. The PI spoke at a BGSA meeting to introduce the study prior to launch, and met with representatives at the University Women's Center and the KSU Sister Circle to describe the study. Flyers with contact information about the study were provided to these organizations and posted at other public sites on campus, including the library and student center. A Google Voice mobile number was included on the flyers, permitting text replies to be sent from a laptop.
Three weeks after data collection began, the PI’s advisor sent a recruitment email to 200 African American female students randomized from 1215 who fit inclusion criteria (the entire sample frame as identified by the Department of Research, Planning and Institutional Effectiveness). The email described the purpose of the study, an outline of procedures, the time required to participate, and participant compensation. Two additional randomized cohorts were contacted by email, one group of 200 and one group of 100 at 2 to 6-week intervals, to complete recruitment. The first 24 participants were recruited via flyers and word-of-mouth, and the remaining 112 using all 3 strategies. Participants were encouraged to inform other eligible women about the study. To reduce risk of sample bias, participants were asked not to discuss specific content of the study with others.

Screening for inclusion and exclusion criteria was done at the time of first contact, and data collection scheduled within 1 week of screening. Same-day screening and data collection occurred for 14 participants (10%), who were recruited by friends who brought them in at the time of their own data collection appointments.

Most of the 156 individuals who contacted the study for information were eligible to participate (n = 151). Five women (3%) were determined to be ineligible due to medical exclusions (n = 3), lack of current enrollment in college (n = 1), or ethnicity (n = 1), Table 3-2. Of the 151 eligible individuals, 131 made an initial appointment for data collection. Nine scheduled participants ultimately failed to keep their data collection appointments, though a few participants rescheduled at least once, resulting in a final
sample of 136: 122 of the 131 who had contacted the study directly and made a data collection appointment, plus 14 who were screened when they arrived with friends for data collection. Because some participants who were initially informed about the study via email may have first contacted the study by text message or telephone, a response rate from the randomized emails is not calculable. However, 87% of eligible women who contacted the study by email, phone or text scheduled an appointment, and 81% participated.

**Protection of Human Subjects**

The purpose, risks and benefits of participation were reviewed at the time of data collection using a teach-back method described by Bankert (2015) and a written consent to participate (Appendix P) was signed. Potential risks included the possibility of emotional discomfort and cosmetic risks of hair collection. Participants were specifically informed that hair sampling was not required for participation in the main study. Each participant had an opportunity to ask questions privately, and was given a copy of the consent form. Participants were informed that they could withdraw from the study at any time. Information flyers about campus counseling services were available at the data collection sites. Participant identifying information was not linked directly with data. Participants who wished to receive results of their own hair cortisol analysis provided an email and/or physical address on a tear-off sheet including their participant number which was stored separately from surveys. Informed consent forms were not linked to data or identification numbers and were stored separately.
Table 3-2.

*Initial Method of Contact, Scheduling Method and Recruitment Rate*

<table>
<thead>
<tr>
<th>Method of Recruitment Contact</th>
<th>Number Original Contacts</th>
<th>Appointments Scheduled</th>
<th>Method of Appointment Confirmation</th>
<th>Not Scheduled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Telephone</td>
<td>Text</td>
</tr>
<tr>
<td>Text Message</td>
<td>73</td>
<td>67</td>
<td>0</td>
<td>67</td>
</tr>
<tr>
<td>Email</td>
<td>70</td>
<td>54</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Telephone</td>
<td>13</td>
<td>10</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Friend Recruitment</td>
<td>14</td>
<td>14</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>170</td>
<td>145</td>
<td>10</td>
<td>81</td>
</tr>
</tbody>
</table>
Data Collection

Procedures

After obtaining informed consent, data was collected during a single 45 to 75-minute session. Data was collected at the university Student Center and the College of Nursing.

Each participant's data collection began with the IAT, which was administered on dedicated encrypted and password-protected laptop computers, configured using Free IAT software (Meade, 2009). Password-protected, encrypted jump drives were used to back up data. Next, surveys were administered and, for participating respondents, questionnaires relating to hair collection. Anthropomorphic measurements were conducted next for all participants. Finally, hair samples were collected.

Anthropomorphic Measurement

Prior to data collection, the PI was trained in anthropometric measurement by Natalie Caine-Bish, Ph.D, RD, LD, an Associate Professor at the Kent State School of Health Sciences. To measure height, a portable stadiometer was used, with procedures based on the National Health and Nutrition Examination Survey (NHANES) (Centers for Disease Control and Prevention, 2007). Placement and alignment of the SECA 213 stadiometer with the wall was confirmed at the start of each data collection session to ensure accurate height measurement. Participants were asked to remove their shoes, and the PI confirmed correct participant posture and head position: hips and shoulders even, with the tragus of the ear in alignment with the outer canthus of the eye, the back straight, and the posterior touching the stadiometer. The participant was asked to hold the correct position while the PI lowered the slide to align with the vertex of the participant’s skull,
and this measurement was recorded to the nearest 0.5 cm. A repeat measure was obtained and recorded using the same procedure. If results were within 1 cm of the first measurement, the two scores were averaged. If initial measurements were more than 1 cm discrepant, a third measurement was obtained and the two closest scores were averaged. The few women whose hairstyles precluded bringing the slide to the correct position on the head (n = 5) had the difference between the slide and the top of the head measured using a clear plastic ruler, and subtracted from the height obtained with the stadiometer slide. Participants unwilling to remove footwear (n = 2) had their footwear heel height (measured with the ruler) subtracted from their height measurement.

Weights, waist and hip circumferences were measured in accordance with WHO standards described above. Prior to each data collection session, the scale was calibrated using standardized weights, and a calibration log was kept. Privacy was ensured with a portable screen or a closed door, depending on the participant's preference. Waist landmarks were marked and measured directly on the skin, and hip measurements were obtained over light, snug-fitting clothing (jeans or leggings).

**Hair Sampling**

Participants who agreed to provide hair samples were first screened to ensure eligibility. Next, participants completed a short questionnaire relating to hair care practices. Hair sampling procedures averaged approximately 15 minutes. The PI collected all hair samples, after completing training using videos and written instruction from the hair cortisol analysis lab. Participants were asked to select one or two areas in the occipital region from which the hair was to be obtained. Salon scissors, cold sterilized with rubbing alcohol, were used to collect hair. Hair in the sampling region was
detangled using new combs, picks, or the participant's fingers (based on the participant’s choice), and a specimen was cut and placed in foil. Hair samples were mailed to the Behavioral Immunology and Endocrinology Lab at the University of Colorado Anschutz Medical Campus at the conclusion of recruitment. All samples met weight criteria for adequacy.

After the completion of data collection, a $30 gift card for Amazon was provided to participants ($45 for those who participated in hair sampling). Women who provided hair samples and wished to know their own cortisol levels were mailed this information using an IRB-approved standardized letter (Appendix Q), once all hair analysis was completed. Women were specifically informed that cortisol measurement is not diagnostic of stress levels or health status, because factors besides stress may affect cortisol levels, hair cortisol is not yet being used in the clinical setting to diagnose cortisol-related conditions, and no clinically normal range for hair cortisol has been established (Russell et al., 2015).

**Data Management and Protection**

To de-identify data, each participant was assigned a numeric code to link survey responses with anthropometric data and IAT results. Addresses for hair cortisol results were stored separately from all data, and codes were used on all hair specimens.

Data was entered into SPSS version 23, and accuracy was checked using a random sample of 25% of data. Errors found were corrected.
Data Analysis Plan

Data Cleaning

Data cleaning was conducted as outlined by Tabachnick and Fidell (2007). First, univariate descriptive statistics were assessed for accuracy by screening for out-of-range values, univariate outliers, and plausibility of means and standard deviations. An examination of missing data was undertaken to assess whether data was missing completely at random or missing at random; data were determined to be missing completely at random using Little's MCAR (Chi-square = 399.26, p = 1.00). As a result of an omission in the data collection instrument, 28 (20.6%) participants were missing one item on the EOD (experiencing unfair treatment at work), and 4 participants were missing smoking status. All other missing data was less than 1% per item.

Imputation was based on the degree and pattern of missing data. Significant differences in missingness were found solely on age and year in college, with younger participants more likely to be missing the EOD item initially omitted from the questionnaire. Imputation for the EOD items was performed using expectation maximization in SPSS, version 23.0.0. The EOD frequency scale score mean prior to imputation was 9.17, and after replacement, the mean was 9.40.

A second expectation maximization procedure was used to replace one missing item score each for three total cases on the REMS Checklist. Little's MCAR ($\chi^2 = 178.63$, df = 174, p = .37) was consistent with data being MCAR prior to this second procedure. REMS-checklist mean was unchanged after imputation of the few missing scores on individual items, at .38.
While not all scale variables were normally distributed, the amount of data replaced in all represented less than 1% of the entire data set. One survey was missing income data, and the mode of free/reduced lunch eligibility was imputed. Pairwise deletion addressed all other missing data, which totaled less than 1%.

**Data Analysis**

Descriptive statistics, including means, standard deviations, and frequencies depending on level of data, were calculated for demographic and major study variables. Preliminary analyses was undertaken to assess psychometrics of all standardized scales. Prior to conducting the analyses, data was assessed for univariate and multivariate normality, linearity and homoscedasticity as described in Chapter 4. Next, data was screened for outliers. Finally, variables were evaluated for multicollinearity and singularity.

A Pearson correlation was used to answer the first two research questions regarding interrelationships among racial discrimination, racial identity, obesity and central adiposity. Next, separate regression models were tested to answer the remaining quantitative research questions, 3 through 6 (Figure 3-1).

To meet assumptions for multiple regression, independent variables (IVs) should be fixed and measured without error (Mertler & Vannatta, 2005). The reliability of proposed moderators must be high in order to avoid inflating the standard error of interaction terms, which would reduce power to detect moderation and increase likelihood of a type II error (Frazier, Tix, & Barron, 2004). In addition, the relationship between IVs (and their combinations) and the dependent variable (DV) should be linear.
Figure 3-1. Study Analytic Model.
For the residuals, errors in the observations of the DV should be independent of one another. Errors should be uncorrelated with IVs, and homoscedasticity of the variance of the residuals should be constant. Errors should also be normally distributed (Mertler & Vannatta, 2005). Except where noted, data in this study met assumptions for multiple regression.

For questions three and four, covariates were entered first, followed by RD variables. To assess possible moderation (questions five and six), three block models were tested according to the following steps:

1. Enter covariates, regress each dependent variable on these.

2. Next, per recommendations of Tabachnick and Fidell (2007), RD and explicit racial or ethnic identity variables were centered to reduce multicollinearity between predictor variables and interaction terms, and entered into the model.

3. Interaction terms (RD measures x racial or ethnic identity measures) were then created and entered. A significant and incremental change in $R^2$ and beta weight, with the addition of interaction terms to the model, indicates moderation (Jaccard & Turrisi, 2003). To interpret the nature and significance of the interaction, racial or ethnic identity scores at 1 standard deviation above and below the mean were used in conducting simple slope analysis as recommended by Aiken and West (1991), to measure the change in the relationship between RD and outcomes in the presence of the moderator.

Explicit (MIBI or MEIM) and implicit (IAT-r) measures of racial identity were not anticipated to be highly multicollinear based on prior analyses (e.g. Greenwald et al.,
2009), but rather to measure two distinct facets of racial identity attitudes. Because that was the case in the study, each was included in separate interaction models.

Research question seven (Is measurement of cortisol from hair an acceptable and feasible strategy in young African American women?) was answered quantitatively, using descriptive statistics. A content analysis then was conducted to categorize comments provided by participants. Cortisol results were used as an outcome variable to answer the following research question:

Research question eight: Controlling for smoking, hair care practices and income, are measures of racial discrimination related to hair cortisol levels in young African American women? A partial correlation analysis was planned, assuming assumptions for this procedure were met.
Chapter 4. Results

This chapter presents the results of a descriptive correlational, cross-sectional study. Using Gallo and Matthew's (2003) Reserve Capacity Model, descriptive and inferential statistics were utilized to answer research questions. The purposes of this study were to investigate: 1) whether racial discrimination is associated with obesity and central adiposity in young African American women of childbearing age; and 2) whether positive racial identity influences the relationship between racial discrimination and obesity or central adiposity. A secondary aim was to assess the feasibility and acceptability of assessing HPA dysfunction in this population through the use of a novel technique in the measurement of stress hormones: cortisol derived from hair samples.

Findings are presented in 6 main sections: 1) study sample characteristics 2) descriptive statistics for the major study variables 3) main study research questions 4) hair sampling decision-making, 5) hair cortisol research questions, and 6) post hoc analyses.

Sample Description

The mean age of the 136 African American college women was 19.9 years (SD= 1.56); all were single and most were undergraduates, with years in university evenly represented (Table 4-1). Most participants graduated from high school (n = 120, 88.9%) and went to high school in Ohio (n = 107, 78.7%). Seventy-five participants (55.6%) reported being eligible for a meal subsidy in high school.
Table 4-1.

*Participant Demographic Data*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>$n$</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year in university</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First year</td>
<td>38</td>
<td>27.9</td>
</tr>
<tr>
<td>Second year</td>
<td>29</td>
<td>21.3</td>
</tr>
<tr>
<td>Third year</td>
<td>34</td>
<td>25.0</td>
</tr>
<tr>
<td>Fourth/Fifth year</td>
<td>34</td>
<td>25.0</td>
</tr>
<tr>
<td>Graduate student</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>High School Completion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduation</td>
<td>120</td>
<td>88.9</td>
</tr>
<tr>
<td>GED</td>
<td>15</td>
<td>11.1</td>
</tr>
<tr>
<td><strong>Eligibility for free or reduced breakfast/lunch</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free</td>
<td>48</td>
<td>35.6</td>
</tr>
<tr>
<td>Free and reduced</td>
<td>6</td>
<td>4.4</td>
</tr>
<tr>
<td>Reduced</td>
<td>21</td>
<td>15.6</td>
</tr>
<tr>
<td>Neither free nor reduced</td>
<td>60</td>
<td>44.4</td>
</tr>
<tr>
<td><strong>State where high school was located</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ohio</td>
<td>107</td>
<td>78.7</td>
</tr>
<tr>
<td>Greater Midwest region</td>
<td>14</td>
<td>10.3</td>
</tr>
<tr>
<td>Outside the Midwest</td>
<td>13</td>
<td>9.6</td>
</tr>
<tr>
<td>Outside the U.S.</td>
<td>2</td>
<td>1.5</td>
</tr>
</tbody>
</table>
While all participants verbally identified as African American during eligibility screening, 20 (14.8%) women reported themselves on the survey as being another ethnicity, e.g. "Jamaican", "Nigerian American", or "Ghanaian". Most participants (73.5%) had at least one parent or guardian who had earned an associate's or higher degree (Table 4-2). Most participants reported education and employment for two parents. Among mothers, 37.5% (n = 51) completed a bachelor's degree or higher; fathers had fewer bachelors' or higher degrees (n = 42).

Most participants (91.1%) reported that their mothers worked outside the home when they were growing up. Of the 118 participants reporting on the employment status of a father, 89.8% worked outside the home. Job titles of parents/guardians ranged from menial or temporary jobs (e.g. "manual labor") to highly skilled professional jobs (e.g. "engineer", "university professor").

Descriptive Statistics for Major Study Variables

A summary table of descriptive statistics for study variables and the conceptual variables they represent is in Table 4-3.

Racial Discrimination Variables

Three measures were used to assess racial discrimination (RD).

Overt RD: The experiences of discrimination (EOD) scale. Of the 9 situations described on the EOD scale, most (n = 128, 94.9%) participants reported experiencing racial discrimination in at least one, with 7 (5.1%) participants reporting none. Many participants reported experiencing discrimination in public or on the street (78.7%), getting service in a store or restaurant (72.1%), and at school (65.1%), Table 4-4.
Table 4-2.

*Parental Characteristics*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother/primary parent or guardian education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; Eighth grade</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&lt; High school</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>High school graduate</td>
<td>46</td>
<td>33.8</td>
</tr>
<tr>
<td>Associate's degree</td>
<td>35</td>
<td>25.9</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>25</td>
<td>18.4</td>
</tr>
<tr>
<td>Graduate degree</td>
<td>26</td>
<td>19.1</td>
</tr>
<tr>
<td>Father/other parent or guardian education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; Eighth grade</td>
<td>2</td>
<td>1.6</td>
</tr>
<tr>
<td>&lt; High school</td>
<td>5</td>
<td>3.0</td>
</tr>
<tr>
<td>High school graduate</td>
<td>61</td>
<td>44.9</td>
</tr>
<tr>
<td>Associate's degree</td>
<td>16</td>
<td>11.8</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>28</td>
<td>20.6</td>
</tr>
<tr>
<td>Graduate degree</td>
<td>14</td>
<td>10.3</td>
</tr>
<tr>
<td>Mother/primary parent or guardian employed</td>
<td>123</td>
<td>91.1</td>
</tr>
<tr>
<td>Father/other parent or guardian employed</td>
<td>106</td>
<td>87.6</td>
</tr>
</tbody>
</table>
Table 4-3.

**Major Study Variables: Constructs, Measurement and Descriptive Data**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measure</th>
<th>Mean (SD)</th>
<th>95% CI of Mean</th>
<th>Theoretical Range</th>
<th>Actual Range</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overt Racial Discrimination</td>
<td>Experiences of Discrimination Scale (EOD), frequency scoring</td>
<td>9.40 (7.06)</td>
<td>8.20, 10.60</td>
<td>0 - 45</td>
<td>0 - 35</td>
<td>.71</td>
<td>.09</td>
</tr>
<tr>
<td>Microaggressions</td>
<td>REMS-Checklist (REMS), scale score</td>
<td>.38 (.20)</td>
<td>.35, .42</td>
<td>0 - 1</td>
<td>0 - .84</td>
<td>.43</td>
<td>-.62</td>
</tr>
<tr>
<td>Vicarious RD</td>
<td>Modified EOD</td>
<td>1.96 (1.82)</td>
<td>1.66, 2.28</td>
<td>0 - 9</td>
<td>0 - 7.8</td>
<td>.99</td>
<td>.38</td>
</tr>
<tr>
<td>Explicit Racial Identity</td>
<td>Multidimensional Inventory of Black Identity (MIBI)</td>
<td>3.85 (.83)</td>
<td>3.71, 3.99</td>
<td>1 - 5</td>
<td>1.17 - 5</td>
<td>-.79</td>
<td>.45</td>
</tr>
<tr>
<td>Private Regard</td>
<td>Private Regard subscale</td>
<td>6.35 (.82)</td>
<td>6.21, 6.49</td>
<td>1 - 7</td>
<td>3 - 7</td>
<td>-2.01</td>
<td>4.64</td>
</tr>
<tr>
<td>Public Regard</td>
<td>Public Regard subscale</td>
<td>2.99 (1.03)</td>
<td>2.82, 3.18</td>
<td>1 - 7</td>
<td>1 - 7</td>
<td>.14</td>
<td>.68</td>
</tr>
<tr>
<td>Racial Centrality</td>
<td>Centrality subscale</td>
<td>4.92 (1.09)</td>
<td>4.73, 5.10</td>
<td>1 - 7</td>
<td>1.63 - 7</td>
<td>-.35</td>
<td>-.15</td>
</tr>
<tr>
<td>Implicit Racial Identity</td>
<td>Race Implicit Association Test (IAT-R)</td>
<td>.01 (.32)</td>
<td>-.05, .06</td>
<td>-2 - 2</td>
<td>-.90, .93</td>
<td>.15</td>
<td>.06</td>
</tr>
<tr>
<td>Ethnic Identity</td>
<td>Multigroup Ethnic Identity Measure Revised (MEIM-R)</td>
<td>4.21 (2.82)</td>
<td>3.73 - 4.69</td>
<td>0 - 16</td>
<td>0 - 13</td>
<td>.69</td>
<td>.23</td>
</tr>
<tr>
<td>Stressful Life Events</td>
<td>List of Threatening Life Events, modified (LTE-Q), age 18 to 25</td>
<td>27.2 (6.84)</td>
<td>26.0, 28.4</td>
<td>N/A</td>
<td>16.6 - 49.6</td>
<td>1.10</td>
<td>1.11</td>
</tr>
<tr>
<td>Obesity</td>
<td>Body mass index in kg/m(^2) (BMI)</td>
<td>82.3 (15.0)</td>
<td>79.7, 84.8</td>
<td>N/A</td>
<td>61.5 - 142.75</td>
<td>1.37</td>
<td>2.22</td>
</tr>
<tr>
<td>Central Adiposity</td>
<td>N/A</td>
<td>79.7 (8.06)</td>
<td>78, 80</td>
<td>N/A</td>
<td>67 - 1.03</td>
<td>.86</td>
<td>1.42</td>
</tr>
<tr>
<td>Waist Circumference</td>
<td>cm</td>
<td>10.44 (6.24)</td>
<td>8.96, 11.92</td>
<td>N/A</td>
<td>1.84 - 23.08</td>
<td>.81</td>
<td>-.45</td>
</tr>
<tr>
<td>Waist-Hip Ratio</td>
<td>cm/cm</td>
<td>10.44 (6.24)</td>
<td>8.96, 11.92</td>
<td>N/A</td>
<td>1.84 - 23.08</td>
<td>.81</td>
<td>-.45</td>
</tr>
<tr>
<td>HPA dysfunction</td>
<td>Hair cortisol in pg/mg(^a)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

\(\text{a}\) recoded from original data
Table 4-4.

*Reported Lifetime Incidence of Overt Racial Discrimination in Nine Situations*

<table>
<thead>
<tr>
<th>Situation</th>
<th>Experiences of Discrimination Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never (%)</td>
</tr>
<tr>
<td>At School (n = 135)</td>
<td>47 (34.8)</td>
</tr>
<tr>
<td>Getting Hired or Getting a Job</td>
<td>95 (69.9)</td>
</tr>
<tr>
<td>At Work (n = 108)</td>
<td>60 (55.6)</td>
</tr>
<tr>
<td>Getting Housing</td>
<td>132 (97.1)</td>
</tr>
<tr>
<td>Getting Medical Care</td>
<td>127 (93.4)</td>
</tr>
<tr>
<td>Getting Credit, Bank Loans or a</td>
<td>133 (97.8)</td>
</tr>
<tr>
<td>Mortgage</td>
<td></td>
</tr>
<tr>
<td>Getting Service in a Store or</td>
<td>38 (27.9)</td>
</tr>
<tr>
<td>Restaurant</td>
<td></td>
</tr>
<tr>
<td>On the Street or in a Public</td>
<td>29 (21.3)</td>
</tr>
<tr>
<td>Setting</td>
<td></td>
</tr>
<tr>
<td>From the Police or in the Courts</td>
<td>92 (67.6)</td>
</tr>
</tbody>
</table>
The mean number of situations reported in the EOD was 3.38 (SD = 1.79). The mean frequency score was 9.40 (SD = 7.06, 95% CI of mean = 8.20, 10.60), reflecting a moderately high amount of RD. Only frequency scoring was used in analysis.

**Microaggressions: The REMS-checklist.** The mean scale score for microaggressions was .38, 95% CI = .35, .42 (SD = .20), reflecting an average number of microaggressions reported of 17.15 of a possible 45 (median 16), occurring in the past 6 months. This suggests a moderately high exposure to microaggressions.

**Vicarious experiences of discrimination: Modified EOD.** The modified EOD score represents the total number of situations reported as happening to close others, divided by the number of close others a participant reported about. The mean modified EOD score was 1.96 (SD = 1.82), with a median of 1.5. Friends were most commonly reported to experience discrimination (23.9%), followed by mothers and siblings (16.7% each). Thirty participants (22.2%), reported no vicarious RD, 90 participants (66.1%) reported 1-3 significant others experiencing RD, and 15 participants (11.7%) reported RD happening to 4 - 8 significant others. Most close others reported as experiencing discrimination were African American (90.7%).

**Descriptive Statistics for Racial and Ethnic Identity Variables**

The mean scores for the 3 subscales of the MIBI racial identity scale were: private regard, 6.35 (SD = .82), representing a high degree of affirmation and pride in being Black; public regard, 2.99 (SD = 1.03), indicating a belief that other groups generally do not value Black people or their contributions; and racial centrality, 4.92 (SD = 1.09), indicating a moderate extent to which being Black is important to self-identity (Table 4-3).
Implicit racial identity: The IAT-R. The Implicit Association Test for implicit preference for African Americans compared to European Americans, or Race IAT (IAT-R) (Greenwald et al., 2009) was used to measure implicit racial identity (Table 4-3). Mean IAT score was .01 (SD = .32), indicating a neutral implicit attitude with no implicit preference for either European Americans or African Americans.

Because a D-score can be conceptualized as an effect size (Nosek, Greenwald, & Banaji, 2002), cut points for strongly preferring (.65), moderately preferring (.35), and slightly preferring (.15) African Americans or European Americans are based on psychometric convention (Tabachnick & Fidell, 2007) and previous interpretation of the scores (Nosek et al., 2002). In this study, 34% of participants implicitly preferred African Americans, 35% implicitly preferred European Americans, and 32% demonstrated no implicit preference.

Ethnic identity: The multiethnic identity measure - revised. Ethnic identity was measured using the MEIM-R. The total mean scale score for the MEIM-R was 3.85 (SD = .83), reflecting a moderately high level of ethnic identity.

Study Covariates: Smoking Status, Stressful Events, and Income

Smoking status. Of the 131 participants with data on smoking, the majority (n = 121, 92.4%) never smoked cigarettes, and 127 (96.9%) were current non-smokers. Only 4 participants (3.1%) currently smoked.

Stressful life events. In this study, 125 participants (91.9%) reported at least one stressful event occurring since age 18 years based on the modified LTE-Q (Table 4-5). The most commonly reported stressful events reported were experiencing a serious problem with a close friend, neighbor, or relative (n = 58 participants, 50%); breakup of
Table 4-5.

**Threatening Life Events Reported by Age of Participant (Modified LTE-Q)**

<table>
<thead>
<tr>
<th>Stressful Event</th>
<th>Percentage of Participants Reporting (n=136)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 - 10</td>
</tr>
<tr>
<td><strong>You yourself</strong> suffered a serious illness, injury, or an assault.</td>
<td>22.8</td>
</tr>
<tr>
<td>A serious illness, injury, or assault happened to a close relative.</td>
<td>16.2</td>
</tr>
<tr>
<td>Your parent, child, or spouse died.</td>
<td>7.4</td>
</tr>
<tr>
<td>A close family friend or another relative died.</td>
<td>30.9</td>
</tr>
<tr>
<td><strong>You</strong> had a separation due to marital difficulties.</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>aYour parent(s)</strong> had a separation due to marital difficulties.</td>
<td>23.5</td>
</tr>
<tr>
<td>You broke off a steady relationship.</td>
<td>0</td>
</tr>
<tr>
<td>You had a serious problem with a close friend, neighbor, or relative.</td>
<td>4.4</td>
</tr>
<tr>
<td><strong>You</strong> became unemployed or were seeking work unsuccessfully for more than one month.</td>
<td>0</td>
</tr>
<tr>
<td><strong>You</strong> were fired from a job.</td>
<td>0</td>
</tr>
<tr>
<td>Your parent was fired from a job.</td>
<td>2.9</td>
</tr>
<tr>
<td><strong>You yourself</strong> had a major financial crisis.</td>
<td>0</td>
</tr>
<tr>
<td><strong>Your parent(s) or family</strong> had a major financial crisis.</td>
<td>10.3</td>
</tr>
<tr>
<td><strong>You yourself</strong> had problems with the police and a court appearance.</td>
<td>0</td>
</tr>
<tr>
<td><strong>Someone close to you</strong> had problems with police and a court appearance.</td>
<td>8.8</td>
</tr>
<tr>
<td>Something you valued was lost or stolen.</td>
<td>8.1</td>
</tr>
</tbody>
</table>

*a questions added to the original LTE-Q
steady relationship (n = 64, 47.1%); or someone close to the participant had problems with the police (n = 65, 47.8%). Nearly 18% (n = 24) reported personally experiencing a serious illness, injury or assault.

Detailed description of mean threatening life events experienced, standard deviations, and normality statistics are in Table 4-6.

Income

For this study, eligibility for free or reduced price breakfast or lunch during high school was used to determine participant income level. Almost 56% of participants were eligible for a full or partial meal subsidy (Table 4-1).

Study Outcomes: Obesity Measures and Hair Cortisol

**Body mass index.** The mean BMI for this sample was 27.2 kg/m² (SD = 6.84), interpreted as overweight, though many women (n = 58, 42.6%) were in the normal BMI category. A few women (n = 8, 5.9%) were categorized in the Class III obese category (BMI > 40 kg/m²).

**Central adiposity.** Mean waist circumference was 82.3 (SD =15.0), with 28% (n=38) having a waist circumference at or greater than 88 cm, indicating increased risk for high blood pressure, diabetes, cardiovascular disease and all-cause mortality (World Health Organization, 2011). Slightly more than half (n = 71, 52%) had a waist circumference of less than 80 cm, considered low risk for these conditions. Mean waist-hip ratio was .79 (SD = .06), and most participants (n = 115, 84.6%) were at low risk for metabolic disease, with a waist-hip ratio of less than .85 (World Health Organization, 2011). Descriptive statistics for obesity measures are in Table 4-7.
Table 4-6.

**Descriptive Statistics for the Mean Number of Stressful Life Events as Measured by the Modified LTE-Q, by Age**

<table>
<thead>
<tr>
<th>Age / Time Period</th>
<th>Mean (SD)</th>
<th>Range</th>
<th>95% CI mean</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified LTE-q (16 items)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past 6 months</td>
<td>3.99 (2.69)</td>
<td>0-12</td>
<td>3.53 - 4.44</td>
<td>.62</td>
<td>-.05</td>
</tr>
<tr>
<td>Birth to age 10 years</td>
<td>1.36 (1.43)</td>
<td>0-8</td>
<td>1.11 - 1.60</td>
<td>1.23</td>
<td>2.27</td>
</tr>
<tr>
<td>Age 11 to 13 years</td>
<td>1.29 (1.51)</td>
<td>0-8</td>
<td>1.04 - 1.55</td>
<td>1.63</td>
<td>3.20</td>
</tr>
<tr>
<td>Age 14 to 17 years</td>
<td>2.96 (2.39)</td>
<td>0-11</td>
<td>2.56 - 3.37</td>
<td>.89</td>
<td>.43</td>
</tr>
<tr>
<td>Age 18 to 25 years</td>
<td>4.21 (2.82)</td>
<td>0-13</td>
<td>3.73 - 4.69</td>
<td>.69</td>
<td>.23</td>
</tr>
</tbody>
</table>
Table 4-7.

*Descriptive Statistics for Obesity and Central Adiposity with Body Mass Index Categories*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean (SD)</th>
<th>Range</th>
<th>95% CI of Mean</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>27.2 (6.84)</td>
<td>16.6 - 49.6</td>
<td>26.0 - 28.4</td>
<td>1.10</td>
<td>1.11</td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>73.4 (19.0)</td>
<td>45.3 - 142.5</td>
<td>70.2 - 76.6</td>
<td>1.28</td>
<td>1.78</td>
<td></td>
</tr>
<tr>
<td>Waist Circumference (cm)</td>
<td>82.3 (15.0)</td>
<td>61.5 - 142.75</td>
<td>79.7 - 84.8</td>
<td>1.37</td>
<td>2.22</td>
<td></td>
</tr>
<tr>
<td>Waist-Hip Ratio</td>
<td>.79 (.06)</td>
<td>.67 - 1.03</td>
<td>.78 - .80</td>
<td>.86</td>
<td>1.42</td>
<td></td>
</tr>
</tbody>
</table>

BMI Category

| Underweight (BMI <18.5 kg/m²) | 4 (2.9) |
| Normal Weight (BMI 18.5-24.9 kg/m²) | 58 (42.6) |
| Overweight (BMI 25- 29.9 kg/m²) | 40 (29.4) |
| Obese (BMI >30 kg/m²)         | 34 (30.0) |
Hair Cortisol

Mean hair cortisol was 147.93 pg/mg. Two values were extreme outliers > 4 SD. The median hair cortisol level for this study was 8.67 (95% CI 7.04 to 10.2). After removal of these outliers, mean hair cortisol was reduced to 14.38, but boxplots and histograms identified 5 other extreme outliers for a total of 7. These seven outliers were recoded to one unit above the highest non-outlier data point (22.08 pg/mg), to 23.08 pg/mg, per procedures outlined in Tabachnick and Fidell (2007) to address non-continuous distributions, and normality statistics were re-evaluated. This procedure brought skewness to .81 and kurtosis to -.45, so this recoded variable was used in subsequent analyses. Detailed statistics for hair cortisol results are in Table 4-8; recoded results are in Table 4-3.

The 7 outlying hair cortisol values were found in participants with a variety of hair care practices and chemical treatments. Three of these participants had never used any permanents, bleach or coloring, 3 had used permanents only, and one participant had used all of these; their most recent chemical treatments ranged from 1-3 to 6-12 months prior to data collection. Hair washing frequency, flat iron use frequency, and use of organic hair products also varied among the outlier samples.

Main Study Research Questions

While all participants identified themselves being as African American during screening for inclusion in the study using a yes-or-no question, 20 women identified themselves as being of a different ethnicity than African American or Black (e.g. Ethiopian, Nigerian, Jamaican) on a fill-in-the-blank question on the MEIM-R. These women may have felt that while "African American" described their race, it did not
Table 4-8.

*Descriptive Statistics for Hair Cortisol (n = 71), Original Data and Recoded Data*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean (SD)</th>
<th>Median</th>
<th>Range</th>
<th>95% CI of mean</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortisol in pg/mg, Original</td>
<td>147.93 (895.6)</td>
<td>8.67</td>
<td>1.84 - 7248.0</td>
<td>-64.1, 359.9</td>
<td>7.51</td>
<td>58.8</td>
</tr>
<tr>
<td>Cortisol in pg/mg, Recoded</td>
<td>10.44 (6.24)</td>
<td>8.96, 11.92</td>
<td>1.84 - 23.08</td>
<td>8.96, 11.92</td>
<td>.81</td>
<td>-.45</td>
</tr>
</tbody>
</table>
describe their ethnicity. Prior to analysis of research questions, these participants were compared with those who described their ethnicity on the MEIM-R as African American or Black (n = 116). T-tests were performed to determine whether means on key variables were significantly different between these two groups (Appendix M, Table M2). Significant differences were found only on REMS-checklist scores; participants who identified themselves as another ethnicity besides Black/AA had a higher mean (.47) for total microaggressions (t = 2.42, p < .05) than those who identified as Black/AA (mean = .36); higher means for the Microinvalidations and Exoticization/Assumptions of Similarity subscales accounted for the higher total scale score. Because no other variables—including racial or ethnic identity measures—showed significant mean differences by ethnicity, all cases were used together for analysis.

Prior to conducting all multiple regression analyses, assumptions relating to both univariate and multivariate outliers were assessed. Multivariate normality and multicollinearity were assessed using residual scatterplots as described in Tabachnick and Fidell (2007).

Potential multivariate outlier cases were then identified using leverage statistics, studentized residuals, Cook's distance, and the Mahalanobis distance (Appendix R). Where appropriate due to violations of assumptions, cases were excluded from analysis. Tabachnick and Fidell (2007) recommend using a conservative probability estimate for a case being a multivariate outlier on the basis of Mahalanobis distance, suggesting using the p < .001 for chi square and calculating the leverage cutoff for a dataset on that basis. Using their recommended procedures, multivariate outlier cases were assessed based on Mahalanobis distance and leverage values exceeding 0.159. Stevens (1984)
recommends checking studentized residuals for values >3, and evaluating these cases further based on the presence of a Cook's distance >1 to determine whether they are influential points. Outliers within the Cook's distance distribution were also identified using stem-and-leaf plots of the Cook's distribution along with q-q plots.

Multicollinearity among IVs was assessed using tolerance and variance inflation factor (VIF), and no multicollinearity was observed except where otherwise noted in the text below. The Durbin-Watson statistic was used to assess independence of residuals.

Appendix R describes detailed decisions for each model.

Question One: Are There Interrelationships among Racial Discrimination, Racial Identity and Obesity?

As expected, the 3 measures of RD were positively and significantly correlated with one another. Overt RD was correlated with microaggressions \( (r = .67, p < .0001) \) and vicarious RD \( (r = .44, p < .0001) \), and microaggressions with vicarious RD \( (r = .43, p < .0001) \). Racial identity measures were significantly correlated with one another; private regard was correlated with public regard \( (r = .29, p = .001) \) and with centrality \( (r = .39, p < .0001) \). Private regard and centrality were uncorrelated with RD measures, however public regard was negatively and significantly correlated with overt RD \( (r = -.26, p = .003) \), microaggressions \( (r = -.31, p < .0001) \), and vicarious RD \( (r = -.27, p = .001) \). Ethnic identity was positively correlated with both private regard \( (r = .43, p < .0001) \) and centrality \( (r = .45, p < .0001) \), but not with RD measures. Implicit racial identity was, as expected, not correlated with any explicit racial or ethnic identity measure, nor was it correlated with RD measures.
Of the racial discrimination measures, only microaggressions (REMS) significantly correlated with body mass index ($r = .17$, $p = .05$), Table 4-9. Among explicit racial identity measures, private regard was significantly and negatively associated with BMI ($r = -.26$, $p < .001$). Public regard and centrality were not significantly correlated with BMI, nor were total ethnic identity or implicit racial identity.

**Question Two: Are There Interrelationships among Racial Discrimination, Racial Identity and Central Adiposity?**

Neither overt RD, microaggressions nor vicarious RD were significantly correlated with waist circumference or waist-hip ratio (Table 4-9). Private regard was significantly and negatively associated with waist circumference ($r = -.30$, $p < .0001$), and waist-hip ratio ($r = -.27$, $p < .001$). Ethnic identity as measured by the MEIM-R total score was significantly and negatively associated with waist circumference ($r = -.18$, $p = .03$). Implicit racial identity was not significantly correlated with central adiposity.

**Question Three: Controlling for income, smoking status and threatening life events, is there a direct relationship between racial discrimination and obesity?**

To analyze this question, a hierarchical multiple regression analysis was conducted. Because participants were largely never-smokers (92.4%), smoking was excluded as a covariate. A dummy variable, subsidized versus unsubsidized lunch, was created using eligibility for any reduced price meal versus no eligibility. One case was missing this item, so the mode of the original distribution was substituted and the case was then dummy-coded.
Table 4-9.

*Pearson Correlation for Racial Discrimination, Racial/Ethnic Identity, Obesity and Hair Cortisol*

<table>
<thead>
<tr>
<th>Concept / Measure</th>
<th>Overt RD (EOD)</th>
<th>Modified EOD</th>
<th>MIBI</th>
<th>MEIM-R Total</th>
<th>IAT-r</th>
<th>BMI</th>
<th>Waist Circumference</th>
<th>Waist-Hip Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microaggressions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REMS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.67**</td>
</tr>
<tr>
<td>Vicarious RD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modified EOD</td>
<td></td>
<td></td>
<td>.44**</td>
<td>.43**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explicit Racial Identity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIBI Private Regard</td>
<td>-.10</td>
<td>-.09</td>
<td></td>
<td>-.14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIBI Public Regard</td>
<td>-.26**</td>
<td>-.31**</td>
<td></td>
<td>-.27**</td>
<td>.29**</td>
<td></td>
<td></td>
<td>.26**</td>
</tr>
<tr>
<td>MIBI Racial Centrality</td>
<td>.12</td>
<td>.16</td>
<td></td>
<td>-.04</td>
<td>.39**</td>
<td>-.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explicit Ethnic Identity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MEIM –R Total</td>
<td>.06</td>
<td>.14</td>
<td>.05</td>
<td>.43**</td>
<td>.07</td>
<td>.45**</td>
<td></td>
<td></td>
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<tr>
<td>Implicit Racial Identity</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IAT-r</td>
<td>-.01</td>
<td>.12</td>
<td>.07</td>
<td>.11</td>
<td>-.07</td>
<td>.05</td>
<td>.04</td>
<td></td>
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<td>Obesity</td>
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<td></td>
</tr>
<tr>
<td>BMI</td>
<td>-.04</td>
<td>.17*</td>
<td>-.06</td>
<td>-.26**</td>
<td>-.09</td>
<td>-.04</td>
<td>-.15</td>
<td>.08</td>
</tr>
<tr>
<td>Central Adiposity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist Circumference</td>
<td>-.04</td>
<td>.15</td>
<td>-.05</td>
<td>-.30**</td>
<td>-.11</td>
<td>-.09</td>
<td>-.18*</td>
<td>.09</td>
</tr>
<tr>
<td>Waist-Hip Ratio</td>
<td>.00</td>
<td>.14</td>
<td>-.02</td>
<td>-.27**</td>
<td>-.11</td>
<td>-.10</td>
<td>-.13</td>
<td>.06</td>
</tr>
<tr>
<td>HPA Dysfunction</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hair Cortisol in pg/mg</td>
<td>-.14</td>
<td>-.09</td>
<td>-.02</td>
<td>.15</td>
<td>.10</td>
<td>.12</td>
<td>.14</td>
<td>.28*</td>
</tr>
</tbody>
</table>

* p < .05, ** p < .01
For this model, all assumptions for multiple regression were met. Covariates (subsidized lunch, plus the modified LTE-Q score for age 18 -25 years) were entered into the analysis in the first block. Next, the three RD measures were entered. The full model was significant (F [5, 130] = 3.26, p = .01) with an adjusted R^2 of .077 (Table 4-10). Significant Betas were found for threatening events (β = .18, p = .04) overt RD (β = -.31, p = .01), and microaggressions (β = .42, p < .0001). BMI decreased with overt RD, and increased with threatening events and microaggressions.

**Question Four: Controlling for income, smoking status and threatening life events, is there a direct relationship between racial discrimination and central adiposity?**

For waist circumference, 7 potential multivariate outliers were identified. Including the 7 influential cases did result in a significant model with adjusted r-squared of .051, p = .02, F (5, 130) = 2.44, p = .04. Significant Betas were found for EOD (β = -.28, p = .03) and REMS (β = .36, p < .001). With the 7 cases excluded, the model was not significant (F [5, 123] = 1.95, p = .09) though the Betas for overt RD (β = -.25, p = .04) and microaggressions (β = .37, p < .001) were both significant. Waist circumference decreased with overt RD and increased with microaggressions (Table 4-10).

For waist-hip ratio, the model did not significantly explain variance; F (5, 130) = 1.46, p = .21 (Table 4-10). Beta was significant for microaggressions with (β = .28, p = .02). Three cases were identified as possible outliers, and excluding these cases did not change the model significance.
Table 4-10.

Regression of Obesity Measures on Racial Discrimination Variables

<table>
<thead>
<tr>
<th></th>
<th>BMI (N=136)</th>
<th>Waist Circumference (N=136)</th>
<th>Waist-Hip Ratio (N=136)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE B</td>
<td>β</td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>.43</td>
<td>1.20</td>
<td>.03</td>
</tr>
<tr>
<td>Threatening events (LTE-Q)</td>
<td>.24</td>
<td>.21</td>
<td>.10</td>
</tr>
</tbody>
</table>

|                                | Step 1 Adjusted $r^2$ |  |  |  |  |  |  |  |  |
|--------------------------------|-----------------------|  |  |  |  |  |  |  |  |
| Income (Subsidized Lunch)      | .05                   | 1.18 | .00 | 1.17 | 2.63 | .01 | .00 | .01 | .03 |
| Threatening events (LTE-Q)     | .44                   | .22  | .18* | .91  | .49  | .17 | .00 | .00 | .14 |
| Overt RD (EOD)                 | -.30                  | .12  | -.31*| -.60 | .26  | -.28*| -.00| .00 | -.18|
| Microaggressions (REMS)        | 14.63                 | 4.01 | .42**| 27.69| 8.91 | .36**| .08 | .04 | .28*|
| Vicarious RD (Modified EOD)    | -.56                  | .36  | -.15 | -.94 | .80  | -.12 | -.00| .00 | -.10|

|                                | Step 2 Adjusted $r^2$ |  |  |  |  |  |  |  |  |
|--------------------------------|-----------------------|  |  |  |  |  |  |  |  |
|                                | .077**                |  |  |  |  |  |  |  |  |
|                                | .051*                 |  |  |  |  |  |  |  |  |
|                                | .017                  |  |  |  |  |  |  |  |  |

*p < .05, **p < .01
Question Five. Controlling for income, smoking status and threatening life events, does explicit racial or ethnic identity moderate the relationships between racial discrimination and obesity or central adiposity?

To analyze these questions, three separate models were constructed for each dependent variable (BMI, waist circumference, and waist-hip ratio). Prior to analysis for moderated models, IVs and potential moderators were centered using procedures outlined by Aiken and West (1991). In each model, subsidized lunch and threatening life events were entered in the first block; in step 2 the three centered RD measures and a centered potential moderator were included. Finally, in step 3, the interaction terms were added. Model variables were limited to 9 for each model to ensure adequate power; this meant testing each potential moderator variable individually for its potential effects on relationships between RD and obesity measures.

A summary of all main effects and moderation effects precedes the description of individual models (Table 4-11).

Explicit racial identity: Private Regard.

**BMI.** To examine moderation between Private regard and RD variables on BMI, a three-block model was created as described above (Table 4-12). BMI was explained by the full model, with adjusted $R^2 = .120$; $F (9, 126) = 3.04, p = .002$. Main effects were found for overt RD ($\beta = -.31, p = .01$), microaggressions ($\beta = .41, p < .0001$), and private regard ($\beta = -.26, p = .003$). BMI decreased with overt RD and private regard, and increased with microaggressions and threatening events; no interaction terms were significant so no moderation was demonstrated. Re-running the analysis with 5 influential
Table 4-11.

**Key Findings from Research Questions 3, 4, 5 and 6**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Main Effects (Yes, No, Other)</th>
<th>BMI</th>
<th>Waist Circumference</th>
<th>Waist-Hip Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overt RD</td>
<td>yes †</td>
<td>yes †</td>
<td>model-dependent †</td>
<td></td>
</tr>
<tr>
<td>Microaggressions</td>
<td>yes ‡</td>
<td>yes ‡</td>
<td>yes ‡</td>
<td></td>
</tr>
<tr>
<td>Vicarious RD</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Private Regard</td>
<td>yes †</td>
<td>yes †</td>
<td>yes †</td>
<td></td>
</tr>
<tr>
<td>Public Regard</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Racial Centrality</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>Ethnic Identity</td>
<td>yes †</td>
<td>yes †</td>
<td>step-dependent †</td>
<td></td>
</tr>
<tr>
<td>Implicit Racial Identity</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overt RD x Private Regard</td>
<td>no</td>
<td>no</td>
<td>no</td>
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</tr>
<tr>
<td>Overt RD x Public Regard</td>
<td>YES</td>
<td>no</td>
<td>no</td>
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<tr>
<td>Overt RD x Centrality</td>
<td>no</td>
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<td>no</td>
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<tr>
<td>Overt RD x Ethnic Identity</td>
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<td>no</td>
<td>no</td>
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<tr>
<td>Overt RD x Implicit Racial Identity</td>
<td>YES</td>
<td>no</td>
<td>YES</td>
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<tr>
<td>Microaggressions x Private Regard</td>
<td>no</td>
<td>no</td>
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<tr>
<td>Microaggressions x Public Regard</td>
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<td>Microaggressions x Centrality</td>
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<td>Microaggressions x Ethnic Identity</td>
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<tr>
<td>Microaggressions x Implicit Racial Identity</td>
<td>YES</td>
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<td>YES</td>
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<tr>
<td>Vicarious RD x Private Regard</td>
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<tr>
<td>Vicarious RD x Public Regard</td>
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<td>no</td>
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</tr>
<tr>
<td>Vicarious RD x Centrality</td>
<td>no</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Vicarious RD x Ethnic Identity</td>
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<td>no</td>
<td>no</td>
<td></td>
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<tr>
<td>Vicarious RD x Implicit Racial Identity</td>
<td>no</td>
<td>no</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>
Table 4-12.

*Effects of Private Regard on the Regression of Obesity Measures on Racial Discrimination*

<table>
<thead>
<tr>
<th></th>
<th>BMI (N=136)</th>
<th>Waist Circumference (N=136)</th>
<th>Waist-Hip Ratio (N=136)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE B</td>
<td>β</td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>.43</td>
<td>1.20</td>
<td>.03</td>
</tr>
<tr>
<td>Threatening events (LTE-Q)</td>
<td>.24</td>
<td>.21</td>
<td>.10</td>
</tr>
<tr>
<td><strong>Step 1 Adjusted $r^2</strong></td>
<td>-.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>-.46</td>
<td>1.16</td>
<td>-.03</td>
</tr>
<tr>
<td>Threatening events (LTE-Q)</td>
<td>.39</td>
<td>.21</td>
<td>.16</td>
</tr>
<tr>
<td>Overt RD (EOD)</td>
<td>-.30</td>
<td>.12</td>
<td>-.31**</td>
</tr>
<tr>
<td>Microaggressions (REMS)</td>
<td>14.30</td>
<td>3.89</td>
<td>.41**</td>
</tr>
<tr>
<td>Vicarious RD (modified EOD)</td>
<td>-.64</td>
<td>.35</td>
<td>-.17</td>
</tr>
<tr>
<td>Private Regard</td>
<td>-2.09</td>
<td>.68</td>
<td>-.25**</td>
</tr>
<tr>
<td><strong>Step 2 Adjusted $r^2</strong></td>
<td>.133**</td>
<td></td>
<td></td>
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<tr>
<td>Income</td>
<td>-.56</td>
<td>1.18</td>
<td>-.04</td>
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<tr>
<td>Threatening events</td>
<td>.37</td>
<td>.22</td>
<td>.15</td>
</tr>
<tr>
<td>Overt RD</td>
<td>-.30</td>
<td>.12</td>
<td>-.31*</td>
</tr>
<tr>
<td>Microaggressions</td>
<td>14.28</td>
<td>3.92</td>
<td>.41**</td>
</tr>
<tr>
<td>Vicarious RD</td>
<td>-.64</td>
<td>.35</td>
<td>-.17</td>
</tr>
<tr>
<td>Private Regard</td>
<td>-2.13</td>
<td>.71</td>
<td>-.26**</td>
</tr>
<tr>
<td>Overt RD x Private Regard</td>
<td>.06</td>
<td>.13</td>
<td>.08</td>
</tr>
<tr>
<td>Microaggressions x Private Regard</td>
<td>-5.38</td>
<td>5.26</td>
<td>-.15</td>
</tr>
<tr>
<td>Vicarious RD x Private Regard</td>
<td>.18</td>
<td>.49</td>
<td>.05</td>
</tr>
<tr>
<td><strong>Step 3 Adjusted $r^2</strong></td>
<td>.120**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05, **p ≤ .01*
cases omitted resulted in no changes in model significance, however threatening events became significant ($\beta = .18$, $p = .04$).

**Waist circumference.** Waist circumference was explained by the full model with adjusted $R^2 = .120$; $F (9, 126) = 3.046$, $p < .001$. Main effects were found for overt RD ($\beta = -.29$, $p = .02$), microaggressions ($\beta = .35$, $p < .001$), and private regard ($\beta = -.29$, $p < .001$). Removal of one potentially influential case did not change model significance. No interaction terms were significant, so no moderation was demonstrated. Table 4-12 shows results with all cases included.

**Waist-hip ratio.** Waist-hip ratio was explained by the full model with all cases included, adjusted $R^2 = .080$; $F (9, 126) = 2.31$, $p = .02$. Main effects were found for microaggressions ($\beta = .27$, $p = .02$), and private regard ($\beta = -.23$, $p = .01$). Overt RD did not explain variance in waist-hip ratio, and no interaction terms were significant so moderation was not demonstrated. With 8 potentially influential cases removed, no block in the model significantly predicted waist-hip ratio ($F [9, 123] = 1.50$, $p = .16$). Beta for microaggressions was unchanged, and Beta for private regard was reduced ($\beta = -.18$, $p = .05$). Table 4-12 shows results with all cases included.

**Explicit racial identity: Public regard.**

**BMI.** Analysis for public regard proceeded as described above. With all cases included, BMI was predicted by the model, adjusted $R^2 = .073$; $F (9, 126) = 2.19$, $p = .03$ (Table 4-13). Significant Betas were found for threatening events ($\beta = .18$, $p = .05$), overt RD ($\beta = -.29$, $p = .02$), and microaggressions ($\beta = .41$, $p < .001$). No interaction terms were significant. Removal of 6 potentially influential cases rendered the model no longer significant ($F [9, 120] = 1.76$, $p = .08$), however Betas remained significant as in the full
Table 4-13.

*Effects of Public Regard on the Regression of Obesity Measures on Racial Discrimination*

<table>
<thead>
<tr>
<th></th>
<th>BMI (N=136)</th>
<th>Waist Circumference (N=128)*</th>
<th>Waist-Hip Ratio (N=136)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE B</td>
<td>β</td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>.43</td>
<td>1.20</td>
<td>.03</td>
</tr>
<tr>
<td>Threatening events (LTE-Q)</td>
<td>.24</td>
<td>.21</td>
<td>.10</td>
</tr>
<tr>
<td><strong>Step 1 Adjusted r^2</strong></td>
<td>-.003</td>
<td></td>
<td>001</td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>-.01</td>
<td>1.19</td>
<td>.00</td>
</tr>
<tr>
<td>Threatening events (LTE-Q)</td>
<td>.45</td>
<td>.22</td>
<td>.18*</td>
</tr>
<tr>
<td>Overt RD (EOD)</td>
<td>-.30</td>
<td>.12</td>
<td>-.31*</td>
</tr>
<tr>
<td>Microaggressions (REMS)</td>
<td>14.06</td>
<td>4.07</td>
<td>.40**</td>
</tr>
<tr>
<td>Vicarious RD (modified EOD)</td>
<td>-.60</td>
<td>.36</td>
<td>-.16</td>
</tr>
<tr>
<td>Public Regard</td>
<td>-.52</td>
<td>.58</td>
<td>-.08</td>
</tr>
<tr>
<td><strong>Step 2 Adjusted r^2</strong></td>
<td>.076*</td>
<td></td>
<td>.042</td>
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<tr>
<td>Income</td>
<td>.04</td>
<td>1.21</td>
<td>.00</td>
</tr>
<tr>
<td>Threatening events</td>
<td>.44</td>
<td>.22</td>
<td>.18*</td>
</tr>
<tr>
<td>Overt RD</td>
<td>-.28</td>
<td>.12</td>
<td>-.29*</td>
</tr>
<tr>
<td>Microaggressions</td>
<td>14.14</td>
<td>4.12</td>
<td>.41**</td>
</tr>
<tr>
<td>Vicarious RD</td>
<td>-.66</td>
<td>.38</td>
<td>-.18</td>
</tr>
<tr>
<td>Public Regard</td>
<td>-.38</td>
<td>.59</td>
<td>-.06</td>
</tr>
<tr>
<td>Overt RD x Public Regard</td>
<td>.11</td>
<td>.12</td>
<td>.13</td>
</tr>
<tr>
<td>Microaggressions x Public Regard</td>
<td>-6.37</td>
<td>4.07</td>
<td>-.22</td>
</tr>
<tr>
<td>Vicarious RD x Public Regard</td>
<td>.02</td>
<td>.37</td>
<td>.01</td>
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<tr>
<td><strong>Step 3 Adjusted r^2</strong></td>
<td>.073*</td>
<td></td>
<td>.085*</td>
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</table>

*p < .05, **p ≤ .01

Influential cases excluded
model. BMI increased with threatening events and microaggressions, and decreased with overt RD; public regard did not moderate the relationship between RD and BMI.

**Waist circumference.** To meet the independence of residuals assumption for MR, 8 cases were excluded. The model explained variance in waist circumference, with adjusted $R^2 = .085$; $F (9, 118) = 2.30, p = .02$. Significant Betas were found for threatening events ($\beta = .20, p = .03$) and microaggressions ($\beta = .31, p = .01$). Two interaction terms were significant: overt RD x public regard ($B = .522, p = .04$) and microaggressions x public regard ($B = -23.641, p = .01$), and adjusted $R^2$ increased from .042 in step 2 to .085 (Table 4-13) in step 3, demonstrating that public regard moderated the effects of microaggressions and overt RD on waist circumference.

The interactions were then examined using the simple slopes procedure outlined by Aiken and West (1991), using an Excel worksheet developed by Jeremy Dawson (n.d.) This procedure determines whether regression lines for specified low, mean or high values of a moderator are significantly different from zero; this aids in interpreting interaction effects by determining which values of the moderator drive the interaction.

**Public Regard interactions with overt RD.** To investigate the nature of the interaction between public regard and overt RD (EOD) on waist circumference, t-tests of regression lines for simple slopes of low, mean and high public regard, based on one standard deviation below and above the mean, were conducted, and a graph was created using the excel worksheet developed by Dawson (Figure 4-1). The simple slope regression for public regard at 1 SD above the mean was not significant (Table 4-14), while the regressions for low and mean values of public regard differed significantly from 0, suggesting the inverse relationships between overt RD and waist circumference
Figure 4-1. Effects of Public Regard on the Relationship between Overt RD and Waist Circumference.

Table 4-14.

*Slope Gradients and Significance Tests for Levels of Public Regard on the Relationship between Overt RD and Waist Circumference*

<table>
<thead>
<tr>
<th>Level of Public Regard</th>
<th>Slope Gradient</th>
<th>T-test</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low, -1 standard deviation (1.96)</td>
<td>-0.898</td>
<td>-2.582</td>
<td>.01</td>
</tr>
<tr>
<td>Mean (2.99)</td>
<td>-0.360</td>
<td>-1.549</td>
<td>.12</td>
</tr>
<tr>
<td>High, +1 standard deviation (4.02)</td>
<td>0.178</td>
<td>0.502</td>
<td>.62</td>
</tr>
</tbody>
</table>
may be accounted for by individuals who hold lower levels of public regard. Further, as 
public regard decreases, so does waist circumference for individuals reporting high overt 
RD, suggesting that the inverse relationship strengthens as public regard decreases.

**Public regard interactions with microaggressions.** The same procedure for 
evaluating simple slopes was conducted for the interaction public regard x 
microaggressions. In models not including moderators, waist circumference increased 
with microaggressions. However, individuals holding high public regard do not appear to 
demonstrate this relationship (Figure 4-2). The simple slope regression for public regard 
at 1 SD above the mean was not significant (Table 4-15), while the regressions for low 
and mean values of public regard differed significantly from 0, suggesting that the 
positive relationship between microaggressions and waist circumference is accounted for 
by individuals who hold lower levels of public regard, and as public regard decreases, 
waist circumference increases for individuals experiencing high microaggressions.

**Waist-Hip Ratio.** Waist-hip ratio was not explained by the full model including 
all cases; F (9,126) = .98, p = .46 (Table 4-13). A significant Beta was found for main 
effects of microaggressions (β = .26, p = .04), but the interaction between public regard 
and microaggressions was not significant, so moderation was not demonstrated. Removal 
of the 4 potentially influential cases did not change model significance.

**Explicit racial identity: Racial Centrality.**

**BMI.** BMI was explained by the full model with adjusted R² = .083; F (9,126) = 
2.36, p = .02 (Table 4-16). Significant Betas were found for threatening events (β = .19,
Figure 4-2. Effect of Low and High Public Regard on Relationship between Microaggressions and Waist Circumference.

Table 4-15.

*Slope Gradients and Significance Tests for Levels of Public Regard on the Relationship between Microaggressions and Waist Circumference*

<table>
<thead>
<tr>
<th>Level of Public Regard</th>
<th>Slope Gradient</th>
<th>T-test</th>
<th>P-value</th>
</tr>
</thead>
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<tr>
<td>Mean (2.99)</td>
<td>20.045</td>
<td>2.578</td>
<td>.01</td>
</tr>
<tr>
<td>High, +1 standard deviation (4.02)</td>
<td>-4.305</td>
<td>-0.358</td>
<td>.72</td>
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Table 4-16.

**Effects of Racial Centrality on the Regression of Obesity Measures on Racial Discrimination**

<table>
<thead>
<tr>
<th></th>
<th>BMI (N=136)</th>
<th>Waist Circumference (n =129)*</th>
<th>Waist-Hip Ratio (n=132)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE B</td>
<td>β</td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>.43</td>
<td>1.20</td>
<td>.03</td>
</tr>
<tr>
<td>Threatening events (LTE-Q)</td>
<td>.24</td>
<td>.21</td>
<td>.10</td>
</tr>
<tr>
<td><strong>Step 1 Adjusted r^2</strong></td>
<td>-.003</td>
<td>-.003</td>
<td>-.003</td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>.00</td>
<td>1.18</td>
<td>.00</td>
</tr>
<tr>
<td>Threatening events (LTE-Q)</td>
<td>.47</td>
<td>.22</td>
<td>.19*</td>
</tr>
<tr>
<td>Overt RD (EOD)</td>
<td>-.29</td>
<td>.12</td>
<td>-.30*</td>
</tr>
<tr>
<td>Microaggressions (REMS)</td>
<td>15.29</td>
<td>4.05</td>
<td>.44**</td>
</tr>
<tr>
<td>Vicarious RD (modified EOD)</td>
<td>-.61</td>
<td>.36</td>
<td>-.16</td>
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<td>Racial Centrality</td>
<td>-.62</td>
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<td>-.10</td>
</tr>
<tr>
<td><strong>Step 2 Adjusted r^2</strong></td>
<td>.080**</td>
<td>.059*</td>
<td>.045</td>
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<tr>
<td>Income</td>
<td>-.31</td>
<td>1.21</td>
<td>-.02</td>
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<tr>
<td>Threatening events</td>
<td>.46</td>
<td>.22</td>
<td>.19*</td>
</tr>
<tr>
<td>Overt RD</td>
<td>-.31</td>
<td>.12</td>
<td>-.32**</td>
</tr>
<tr>
<td>Microaggressions</td>
<td>14.71</td>
<td>4.05</td>
<td>.42**</td>
</tr>
<tr>
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<td>-.54</td>
<td>.37</td>
<td>-.14</td>
</tr>
<tr>
<td>Racial Centrality</td>
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<td>.54</td>
<td>-.09</td>
</tr>
<tr>
<td>Overt RD x Racial Centrality</td>
<td>-.18</td>
<td>.12</td>
<td>-.22</td>
</tr>
<tr>
<td>Microaggressions x Racial Centrality</td>
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<td>4.38</td>
<td>.11</td>
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<tr>
<td>Vicarious RD x Racial Centrality</td>
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<td>.38</td>
<td>.15</td>
</tr>
<tr>
<td><strong>Step 3 Adjusted r^2</strong></td>
<td>.083*</td>
<td>.079*</td>
<td>.077*</td>
</tr>
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</table>

*influential cases excluded
*p < .05, **p < .01
BMI increased with microaggressions and threatening events and decreased with overt RD; no interaction terms were significant, so moderation was not demonstrated. Removal of 3 potentially influential cases did not change model significance.

**Waist Circumference.** Waist circumference was explained by the full model with adjusted $R^2 = .073$; $F(9, 126) = 2.19$, $p = .03$ (Table 4-16). Significant Betas were found for threatening events ($\beta = .19$, $p = .05$), overt RD ($\beta = -.30$, $p = .02$), and microaggressions ($\beta = .37$, $p < .001$). Removal of 7 outlier cases did not change model significance; adjusted $R^2 = .079$, $F(9, 119) = 2.313$, $p = .03$. However, with the cases removed, a significant beta was found for the interaction term vicarious RD x centrality ($B = 1.776$, $p = .02$), and adjusted $R^2$ increased from .059 to .079, indicating moderation. Simple slopes analysis was conducted to determine the effect of low, mean and high values of centrality on the relationship between Vicarious RD and waist circumference (Figure 4-3).

Although there were no main effects of vicarious RD on waist circumference, the simple slope equation for low values of centrality were significant, suggesting that waist circumference decreased with higher vicarious RD for individuals with centrality below the mean (Table 4-17). The simple slope gradient for the mean and high values of centrality did not differ significantly from zero, indicating there was no relationship between vicarious RD and waist circumference for those with mean and high levels of centrality.
Figure 4-3. Effect of Low and High Centrality on Relationship between Vicarious Racial Discrimination and Waist Circumference

Table 4-17.

*Slope Gradients and Significance Tests for Levels of Centrality on the Relationship between Vicarious Racial Discrimination and Waist Circumference*

<table>
<thead>
<tr>
<th>Level of Centrality</th>
<th>Slope Gradient</th>
<th>T-test</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low, -1 standard deviation (3.83)</td>
<td>-2.827</td>
<td>-2.742</td>
<td>.007</td>
</tr>
<tr>
<td>Mean (4.92)</td>
<td>-0.891</td>
<td>-1.312</td>
<td>.19</td>
</tr>
<tr>
<td>High, +1 standard deviation (6.02)</td>
<td>1.045</td>
<td>0.933</td>
<td>.35</td>
</tr>
</tbody>
</table>
**Waist-Hip Ratio.** Waist-hip ratio was not explained by the full model including all cases; $F(9,126) = 1.88, p = .06$. However, a significant Beta was found for microaggressions ($\beta = .28, p = .02$) and for the interaction term overt RD x centrality ($B = -.002, p = .02$). Removal of 4 potentially influential cases resulted in a significant full model and substantial changes in the model, with adjusted $R^2 = .077; F(9, 122) = 2.211, p = .03$. Betas were significant for overt RD ($\beta = -.30, p = .02$), microaggressions ($\beta = .34, p = .01$), and the interaction term vicarious RD x centrality was significant ($B = .008, p = .01$). Adjusted $R^2$ increased from .045 in step 2 to .077 in step 3, indicating moderation. Table 4-16 depicts results with outlier cases removed.

Simple slopes analysis was conducted as described above (Figure 4-4 and Table 4-18). Because covariances of both vicarious and the centrality were .000, t-tests for the simple slope gradients could not be calculated.

**Explicit Ethnic identity: MEIM-R Total.**

**BMI.** BMI was explained by the full model, with adjusted $R^2 = .100; F(9,126) = 2.67, p = .01$ (Table 4-19). Significant Betas were found for threatening events ($\beta = .18, p = .04$), overt RD ($\beta = -.33, p = .01$), microaggressions ($\beta = .47, p < .0001$), and ethnic identity ($\beta = -.22, p = .01$). BMI increased with threatening events and microaggressions, and decreased with overt RD and ethnic identity; the Betas of interaction terms were non-significant, so no moderation was demonstrated. Removal of 2 potentially influential cases did not change model significance.

**Waist circumference.** The full model explained waist circumference with adjusted $R^2 = .081; F(9.126) = 2.32, p = .02$, (Table 4-19). Significant Betas were found for threatening events ($\beta = .19, p = .04$), overt RD ($\beta = -.31, p = .01$), microaggressions
Figure 4-4. Effect of Low and High Centrality on Relationship between Vicarious Racial Discrimination and Waist-Hip Ratio.

Table 4-18.

Slope Gradients and Significance Tests for Levels of Centrality on the Relationship between Vicarious Racial Discrimination and Waist-Hip Ratio

<table>
<thead>
<tr>
<th>Level of Centrality</th>
<th>Slope Gradient</th>
<th>T-test</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low, - 1 standard deviation (3.83)</td>
<td>-0.013</td>
<td>not calculable</td>
<td>not calculable</td>
</tr>
<tr>
<td>Mean (4.92)</td>
<td>-0.004</td>
<td>not calculable</td>
<td>not calculable</td>
</tr>
<tr>
<td>High, + 1 standard deviation (6.02)</td>
<td>0.005</td>
<td>not calculable</td>
<td>not calculable</td>
</tr>
</tbody>
</table>
Effects of Ethnic Identity on the Regression of Obesity Measures on Racial Discrimination

<table>
<thead>
<tr>
<th></th>
<th>BMI (N=136)</th>
<th>Waist Circumference (N =136)</th>
<th>Waist-Hip Ratio (N=136)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$</td>
<td>$SE B$</td>
<td>$\beta$</td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>.43</td>
<td>1.20</td>
<td>.03</td>
</tr>
<tr>
<td>Threatening events (LTE-Q)</td>
<td>.24</td>
<td>.21</td>
<td>.10</td>
</tr>
<tr>
<td>Step 1 Adjusted $r^2$</td>
<td>-.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>-.00</td>
<td>1.16</td>
<td>.00</td>
</tr>
<tr>
<td>Threatening events (LTE-Q)</td>
<td>.50</td>
<td>.22</td>
<td>.21*</td>
</tr>
<tr>
<td>Overt RD (EOD)</td>
<td>-.32</td>
<td>.12</td>
<td>-.33**</td>
</tr>
<tr>
<td>Microaggressions (REMS)</td>
<td>16.14</td>
<td>3.98</td>
<td>.46**</td>
</tr>
<tr>
<td>Vicarious RD (modified EOD)</td>
<td>-.57</td>
<td>.35</td>
<td>-.15</td>
</tr>
<tr>
<td>Ethnic Identity (MEIM-R)</td>
<td>-1.69</td>
<td>.68</td>
<td>-.21*</td>
</tr>
<tr>
<td>Step 2 Adjusted $r^2$</td>
<td>.113**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>-.10</td>
<td>1.18</td>
<td>-.00</td>
</tr>
<tr>
<td>Threatening events</td>
<td>.47</td>
<td>.22</td>
<td>.19*</td>
</tr>
<tr>
<td>Overt RD</td>
<td>-.32</td>
<td>.12</td>
<td>-.33**</td>
</tr>
<tr>
<td>Microaggressions</td>
<td>16.50</td>
<td>4.03</td>
<td>.47**</td>
</tr>
<tr>
<td>Vicarious RD</td>
<td>-.56</td>
<td>.36</td>
<td>-.15</td>
</tr>
<tr>
<td>Ethnic Identity</td>
<td>-1.79</td>
<td>.70</td>
<td>-.22**</td>
</tr>
<tr>
<td>Overt RD x Ethnic Identity</td>
<td>.08</td>
<td>.15</td>
<td>.10</td>
</tr>
<tr>
<td>Microaggressions x Ethnic Identity</td>
<td>-5.82</td>
<td>5.76</td>
<td>-.16</td>
</tr>
<tr>
<td>Vicarious RD x Ethnic Identity</td>
<td>.31</td>
<td>.53</td>
<td>.08</td>
</tr>
<tr>
<td>Step 3 Adjusted $r^2$</td>
<td>.100**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05, **p ≤.01
(β = .41, p < .001), and ethnic identity (β = -.23, p = .01). No interaction terms were identified. Waist circumference increased with threatening events and microaggressions, and decreased with overt RD and ethnic identity; no moderation was demonstrated. Removal of 5 potentially influential cases did not change model significance.

**Waist-hip ratio.** Waist-hip ratio was not explained by the full model; F (9,126) = 1.65, p = .11 (Table 4-19). However, a significant Beta was found for microaggressions (β = .30, p = .01). Removal of two potentially influential cases did not change model significance.

**Question Six.** Controlling for income, smoking status and threatening life events, does implicit racial identity moderate relationships between racial discrimination and obesity or central adiposity?

Three separate models were built for each DV (BMI, waist circumference, and waist-hip ratio).

**Implicit Racial Identity.**

**BMI.** To examine possible interaction effects between implicit racial identity and RD variables on BMI, a three-block model was created as described above. BMI was explained by the full model with adjusted R² = .064; F (9.126) = 2.03, p = .04. Significant Betas were found for threatening events (β = .20, p = .04), overt RD (β = -.34, p = .01), and microaggressions (β = .43, p < .001). When the 4 potentially influential cases were removed, the model remained significant, F (9, 122) = 2.67, p = .01. However a significant Beta was found for the interaction term overt RD x IAT (B = -1.192, p = .02) and also for microaggressions x IAT (B = .27.594, p = .05), and adjusted R² increased to .103, indicating moderation (Table 4-20).
Table 4-20.

**Effects of Implicit Racial Identity on the Regression of Obesity Measures on Racial Discrimination**

<table>
<thead>
<tr>
<th></th>
<th>BMI (n=132)</th>
<th>Waist Circumference (N=136)</th>
<th>Waist-Hip Ratio (n=129)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE B</td>
<td>β</td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>.24</td>
<td>1.18</td>
<td>.02</td>
</tr>
<tr>
<td>Threatening events (LTE-Q)</td>
<td>.34</td>
<td>.21</td>
<td>.14</td>
</tr>
<tr>
<td><strong>Step 1 Adjusted r²</strong></td>
<td></td>
<td>-.007</td>
<td></td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>.04</td>
<td>1.18</td>
<td>.00</td>
</tr>
<tr>
<td>Threatening events (LTE-Q)</td>
<td>.54</td>
<td>.22</td>
<td>.23*</td>
</tr>
<tr>
<td>Overt RD (EOD)</td>
<td>-.26</td>
<td>.12</td>
<td>-.27*</td>
</tr>
<tr>
<td>Microaggressions (REMS)</td>
<td>13.31</td>
<td>4.08</td>
<td>.38**</td>
</tr>
<tr>
<td>Vicarious RD (modified EOD)</td>
<td>-.46</td>
<td>.37</td>
<td>-.12</td>
</tr>
<tr>
<td>Implicit Racial Identity (IAT)</td>
<td>2.07</td>
<td>1.96</td>
<td>.09</td>
</tr>
<tr>
<td><strong>Step 2 Adjusted r²</strong></td>
<td></td>
<td>.076**</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>-.39</td>
<td>1.18</td>
<td>-.03</td>
</tr>
<tr>
<td>Threatening events</td>
<td>.52</td>
<td>.22</td>
<td>.22*</td>
</tr>
<tr>
<td>Overt RD</td>
<td>-.34</td>
<td>.13</td>
<td>-.35**</td>
</tr>
<tr>
<td>Microaggressions</td>
<td>13.74</td>
<td>4.16</td>
<td>.40**</td>
</tr>
<tr>
<td>Vicarious RD</td>
<td>-.22</td>
<td>.38</td>
<td>-.06</td>
</tr>
<tr>
<td>Implicit Racial Identity</td>
<td>1.38</td>
<td>1.95</td>
<td>.06</td>
</tr>
<tr>
<td>Overt RD x Implicit Racial Identity</td>
<td>-.119</td>
<td>.49</td>
<td>-.29*</td>
</tr>
<tr>
<td>Microaggressions x Implicit Racial Identity</td>
<td>27.59</td>
<td>14.00</td>
<td>.22*</td>
</tr>
<tr>
<td>Vicarious RD x Implicit Racial Identity</td>
<td>-.12</td>
<td>1.33</td>
<td>-.01</td>
</tr>
<tr>
<td><strong>Step 3 Adjusted r²</strong></td>
<td></td>
<td>.103**</td>
<td></td>
</tr>
</tbody>
</table>

*a influential cases excluded

*p < .05, **p ≤ .01
Effects of implicit racial identity on relationship between overt RD and BMI.

Simple slopes analysis was undertaken to determine the effect of low, mean and high values of implicit racial identity on the relationship between overt RD and BMI (Figure 4-5). At 1 standard deviation below the mean of the IAT D-score, indicating a pro-White bias, the simple slope regression was not significantly different from zero (Table 4-21). At mean levels of implicit racial identity, indicating no implicit preference for Black or White faces, and at 1 standard deviation above the mean, indicating a pro-Black bias, the simple slope regressions were significant. Thus, the relationship between overt RD and BMI depends on the level of implicit racial identity; BMI falls as overt RD increases among individuals with neutral or pro-Black implicit identity.

Effects of implicit racial identity on relationship between microaggressions and BMI. Simple slopes analysis was undertaken to determine the effect of low, mean and high values of IAT on the relationship between microaggressions and BMI (Figure 4-6). At 1 standard deviation below the mean of the IAT D-score, indicating a pro-White bias, the simple slope regression was not significantly different from zero (Table 4-22). At a neutral implicit attitude, and at 1 standard deviation above the mean, indicating a pro-Black bias, the simple slope regressions were significant. Thus, the relationship between microaggressions and BMI depends on the level of implicit racial identity, with BMI increasing as microaggressions increase among participants with a neutral or pro-Black implicit bias.

Waist circumference. Waist circumference was not explained by the full model; F (9,126) = 1.72, p = .09. Significant Betas were found for threatening events (β = .20, p = .04), overt RD (β = -.33, p = .02), and microaggressions (β = .37, p < .001). No
Figure 4-5. Effects of Low and High Implicit Racial Identity on the Relationship between Overt Racial Discrimination and Body Mass Index.

Note: Note: Low implicit racial identity = pro-White preference, and High implicit racial identity = pro-Black preference.

Table 4-21.

*Slope Gradients and Significance Tests for Effects of Implicit Racial Identity on the Relationship between Overt Racial Discrimination and Body Mass Index*

<table>
<thead>
<tr>
<th>Level of Implicit Racial Identity</th>
<th>Slope Gradient</th>
<th>T-test</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-White Preference</td>
<td>0.042</td>
<td>0.242</td>
<td>.80</td>
</tr>
<tr>
<td>(low IAT; 1 SD below mean = -.31)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral Implicit Attitude (mean = .01)</td>
<td>-0.339</td>
<td>-2.680</td>
<td>.009</td>
</tr>
<tr>
<td>Pro-Black Preference</td>
<td>-0.720</td>
<td>-3.140</td>
<td>.002</td>
</tr>
<tr>
<td>(high IAT; 1 SD above mean = .33)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 4-6. Effects of Low and High Implicit Racial Identity on the Relationship between Microaggressions and Body Mass Index.

Note: Low implicit racial identity = pro-White preference, and High implicit racial identity = pro-Black preference.

Table 4-22.

*Slope Gradients and Significance Tests for Effects of Implicit Racial Identity on the Relationship between Microaggressions and Body Mass Index*

<table>
<thead>
<tr>
<th>Level of Implicit Racial Identity</th>
<th>Slope Gradient</th>
<th>T-test</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-White Preference (low IAT; 1 SD below mean = -.31)</td>
<td>4.910</td>
<td>0.774</td>
<td>.44</td>
</tr>
<tr>
<td>Neutral Implicit Attitude (mean = .01)</td>
<td>13.740</td>
<td>3.305</td>
<td>.001</td>
</tr>
<tr>
<td>Pro-Black Preference (high IAT; 1 SD above mean = .33)</td>
<td>22.570</td>
<td>3.845</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>
interaction terms were significant. BMI increased with threatening events and microaggressions and decreased with overt RD; no moderation was demonstrated (Table 4-20). Removal of 5 potentially influential cases did not change model significance or Betas.

Waist-hip ratio. Waist-hip ratio was not explained by the full model with all cases included; F (9,126) = 1.53, p = .14. Significant Betas were found for overt RD (β = -.26, p = .05), and microaggressions (β = .31, p = .01), and also for the interaction term vicarious RD x implicit racial identity (B = .022, p = .02). Removal of 7 influential cases resulted in a significant full model; F (9,119) = 2.57, p = .01, and increased adjusted R² from .043 to .099. Additionally, significant Betas were found for threatening events (LTE-Q, β = .24, p = .01), overt RD (EOD, β = -.47, p < .001), microaggressions (REMS, β = .44, p < .001), and two interaction terms were significant: overt RD x implicit racial identity (EOD x IAT, B = -.01, p = .02) and vicarious RD x implicit racial identity (B = .028, p = .01), indicating moderation (Table 4-20).

Effect of implicit racial identity on the relationship between overt RD and waist-hip ratio.

Because covariances of both the EOD and the IAT were .00, t-tests for the simple slope gradients of high and low IAT values (Figure 4-7) could not be calculated (Table 4-23); this interaction could only be explored graphically.

For the interaction between IAT and vicarious RD on waist-hip ratio, covariances of vicarious RD and the IAT were .00, so t-tests for the simple slope gradient of high and low IAT values (Figure 4-8) could not be calculated (Table 4-24).
Figure 4-7. Effect of Low and High Implicit Racial Identity on Relationship between Overt RD and Waist-Hip Ratio.

Note: Low implicit racial identity = pro-White preference, and High implicit racial identity = pro-Black preference

Table 4-23.

*Slope Gradients and Significance Tests for Effects of Implicit Racial Identity on the Relationship between Overt Racial Discrimination and Waist-Hip Ratio*

<table>
<thead>
<tr>
<th>Level of Implicit Racial Identity</th>
<th>Slope Gradient</th>
<th>T-test</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-White Preference</td>
<td>-0.001</td>
<td>not calculable</td>
<td>not calculable</td>
</tr>
<tr>
<td>(low IAT; 1 SD below mean = -.31)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral Implicit Attitude (mean = .01)</td>
<td>-0.004</td>
<td>not calculable</td>
<td>not calculable</td>
</tr>
<tr>
<td>Pro-Black Preference</td>
<td>-0.007</td>
<td>not calculable</td>
<td>not calculable</td>
</tr>
<tr>
<td>(high IAT; 1 SD above mean = .33)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 4-8. Effect of Implicit Racial Identity on Relationship between Vicarious RD and Waist-Hip Ratio.

Note: Low implicit racial identity = pro-White implicit preference, and High implicit racial identity = pro-Black implicit preference

Table 4-24.

*Slope Gradients and Significance Tests for Effects of Implicit Racial Identity on the Relationship between Vicarious Racial Discrimination and Waist-Hip Ratio*

<table>
<thead>
<tr>
<th>Level of Implicit Racial Identity</th>
<th>Slope Gradient</th>
<th>T-test</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-White Preference (low IAT; 1 SD below mean = -.31)</td>
<td>-0.011</td>
<td>not calculable</td>
<td>not calculable</td>
</tr>
<tr>
<td>Neutral Implicit Attitude (mean = .01)</td>
<td>-0.002</td>
<td>not calculable</td>
<td>not calculable</td>
</tr>
<tr>
<td>Pro-Black Preference (high IAT; 1 SD above mean = .33)</td>
<td>0.007</td>
<td>not calculable</td>
<td>not calculable</td>
</tr>
</tbody>
</table>
Summary of Key Findings

In general, the main effects of overt RD, microaggressions, private regard and ethnic identity explained variance in obesity and central adiposity. Overt RD, ethnic identity and private regard decreased as obesity and central adiposity increased. Microaggressions, however, increased as obesity measures increased. Public regard, centrality and implicit racial identity had no main effects on obesity or central adiposity, but interacted with RD measures in several models (Table 4-11).

Hair Cortisol Collection and Results

A secondary aim of this study was to determine acceptability of hair sampling to measure cortisol in young African American women. Sufficient hair samples were obtained to evaluate relationships between hair cortisol and RD, described below.

Question Seven: Is Measurement of Cortisol from Hair an Acceptable Strategy in Young African American Women?

A total of 73 participants (53.7%) agreed to provide a hair sample. Of these, two were ineligible and one withdrew, for a total sample of 71 participants. Of the 63 women who declined to have their hair sampled, 29 (46% of non-participants) reported that the reason they were not participating was that their hairstyles precluded it due to sewn-in or crocheted-in braids, weaves or other extensions, dreadlocks, or other high-maintenance styling. Appendix S contains narrative data describing participants' reasons for deciding whether or not to participate in hair sampling.

Table 4-25 describes reasons for participating in hair sampling and their cited frequency, and Table 4-26 provides factors for non-participation.
Table 4-25.

**Reasons Influencing Decision to Participate in Hair Sampling (N=71)**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of Participants</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helping with study/important to help other AA women</td>
<td>38</td>
<td>54%</td>
</tr>
<tr>
<td>Hair grows fast / hairstyle won't be affected / hair isn't too important</td>
<td>32</td>
<td>45%</td>
</tr>
<tr>
<td>Knowing own cortisol levels</td>
<td>25</td>
<td>34%</td>
</tr>
<tr>
<td>Additional compensation</td>
<td>12</td>
<td>16%</td>
</tr>
<tr>
<td>Interested in new technology /results / trying something new</td>
<td>8</td>
<td>11%</td>
</tr>
<tr>
<td>Small amount of hair requested</td>
<td>5</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>7%</td>
</tr>
</tbody>
</table>
  * "just because"
  * "no reason not to"
  * "I'm open about my hair and the processes I use"
  * having a choice in whether to participate or not
  * interested in others' hair care practices
Table 4-26.

*Reasons Influencing Decision to Decline Hair Sampling*

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of Participants Citing</th>
<th>Valid %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hairstyle would be adversely affected if sampled today</td>
<td>18</td>
<td>29</td>
</tr>
<tr>
<td>Hair is inaccessible due to weave/braiding/extension/sew-in/locs</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>Don't want it cut/don't feel comfortable having it cut</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>Hair is damaged/slow growing/might cause more hair problems</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>Hair is sensitive/&quot;I love my hair&quot;/&quot;I like my hair&quot;</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Trying to grow hair out</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Might be noticeable</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Too much hair requested</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Social meaning of hair in AA community</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Transitioning &amp; don't want to do anything at all to it</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Haven't washed recently/no advance warning to prepare</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Additional compensation not worth it</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Traumatizing experience with haircut</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Question Eight: Controlling for smoking, hair care practices and income, are measures of racial discrimination related to hair cortisol levels in young African American women?

In order to address the influence of hair care practices, they were dichotomized into chemically treated (n = 34, including perm/relaxer, bleach, and/or color) versus not chemically treated (n = 37). Using a previously described strategy suggested by Tabachnick and Fidell, extreme outliers for hair cortisol (n = 7) were recoded to create a more normal distribution. Multiple regression was then used to test relationships between discrimination and hair cortisol, controlling for hair care practices and income. Hair chemical treatment and income (subsidized lunch) were entered in Step 1, followed by three RD variables in the second step (Table 4-27). The model was non-significant.

A post-hoc multiple regression was performed using a simultaneous entry of overt RD and microaggressions on cortisol, because covariates were not significant in the first step of the original model and vicarious RD did not explain other dependent variables in the study. Using Tabachnick and Fidell's (2007) rule of thumb for multiple regression sample size (n > 50 + 8k), only 2 predictors should be included in the model to detect a medium effect size. With a sample size of 71, inclusion of 5 variables would be expected to predict cortisol only if the effect size were .15 or larger.

The initial model did not explain variance in hair cortisol; F (2,68) = .41, p = .84. However, removal of 4 outliers resulted in a model that was significant, with adjusted R² = .059; F (2, 64) =3.08, p = .05, A significant Beta was found for overt RD (β = -.38, p = .02); hair cortisol decreased as overt RD increased. Table 2-28 shows results.
Table 4-27.

Effects of Racial Discrimination on Hair Cortisol with Outliers Transformed and Covariates Included \( (N=71) \)

<table>
<thead>
<tr>
<th>Model</th>
<th>Variables</th>
<th>Beta</th>
<th>Adj R²</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chemical hair treatment</td>
<td>.04</td>
<td>-.015</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Subsidized lunch</td>
<td>.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Chemical hair treatment</td>
<td>.05</td>
<td>-.044</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Subsidized lunch</td>
<td>.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overt RD</td>
<td>-.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Microaggressions</td>
<td>-.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vicarious RD</td>
<td>.06</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p \leq .05, **p < .01

Table 4-28.

Relationship of Racial Discrimination to Hair Cortisol without Covariates

<table>
<thead>
<tr>
<th>Variables</th>
<th>Beta</th>
<th>t</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overt RD</td>
<td>-.38*</td>
<td>-2.41</td>
<td></td>
</tr>
<tr>
<td>Microaggressions</td>
<td>.12</td>
<td>1.14</td>
<td>.09</td>
</tr>
</tbody>
</table>

*p \leq .05, **p < .01
Post-Hoc Analyses

To aid in interpretation of study findings, several post-hoc analyses were undertaken.

Racial Discrimination and Body Mass Index ANOVAs

One-way ANOVAs were conducted to determine whether any single category of BMI was responsible for the relationships observed for overt RD or microaggressions in the multiple regression analyses. First, cases were coded into 3 categories based on WHO BMI cutoffs (normal/underweight, overweight, and obese). Next, a one-way ANOVA was conducted to assess whether a difference in mean overt RD scores existed for normal/underweight, overweight, and obese categories; none was found (F [3,132] = .22, p = .81). For microaggressions, the same obesity categories were used to determine whether significant differences existed in mean scores. Similarly, the ANOVA was not significant; F (3,132) =1.91, p = .15.

Suppression by LTE-Q

The multiple regression models used in this study to answer research questions 3 through 6 were suggestive of suppression effects described in Tabachnick and Fidell (2007, pp. 154-5). Specifically, the LTE-Q had no significant beta when entered on its own in any model, but became significant when included in step 2 with the RD main effects, and remained significant in step 3. Using the procedures described in Tabachnick and Fidell to assess suppression, the LTE-Q was identified empirically as a classical suppressor. MacKinnon, Krull and Lockwood (2000) describe this statistical relationship as potentially representing inconsistent mediation, the directionality of which cannot be determined empirically. They recommend using theory to guide exploration of the
suppression/ inconsistent mediation relationship. However, Tabachnick and Fidell (2007) suggest that a suppressor variable, once identified, should not be interpreted in light of its own beta weight on a dependent variable, but instead that suppressor variables function by removing irrelevant variance in other IVs.

To explore possible suppression effects further, post-hoc multiple regressions were conducted regressing BMI and waist circumference on overt RD (EOD), microaggressions (REMS) and vicarious RD (modified EOD) after controlling for income (subsidized lunch), which was entered by itself in step 1 (Table 4-29).

For BMI, one case was identified as an outlier. However, removal of the case resulted in non-independence of residuals, so the case was retained. BMI was explained by the model, $F (4,131) = 2.98, p = .02$, adjusted $R^2 = .083$. A significant Beta was found for microaggressions ($\beta = .38, p < .001$). The Beta for overt EOD nearly reached significance but was smaller than in previous models containing the LTE-Q; $\beta = -.23, p = .06$).

For waist circumference, 4 outliers were excluded from analysis because inclusion of all cases violated the assumption of independence of residuals. The full model with those 4 cases removed was not significant, $F (4, 127) = 2.15, p = .08$. A significant Beta was found for microaggressions ($\beta = .32, p = .01$) but not for overt RD ($\beta = -.18, p = .13$).

These results suggest that interactions between RD variables and the LTE-Q explain variance in obesity measures that would not have been identified without the inclusion of threatening events. In these models, the LTE-Q appears to remove
Table 4-29.

*Regression of BMI and Waist Circumference on Racial Discrimination Variables without Threatening Events*

<table>
<thead>
<tr>
<th></th>
<th>Outcome Variables</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>BMI (n=136)</td>
<td>Waist Circumference (n=132)</td>
<td>Beta</td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>.05</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td><strong>Step 1 Adjusted $r^2</strong></td>
<td><strong>.002</strong></td>
<td><strong>.001</strong></td>
<td></td>
</tr>
<tr>
<td>Income (Subsidized Lunch)</td>
<td>.04</td>
<td>.04</td>
<td></td>
</tr>
<tr>
<td>Overt RD (EOD)</td>
<td>-.23</td>
<td>-.18</td>
<td></td>
</tr>
<tr>
<td>Microaggressions (REMS)</td>
<td>.38**</td>
<td>.32**</td>
<td></td>
</tr>
<tr>
<td>Vicarious RD (Modified EOD)</td>
<td>-.13</td>
<td>-.13</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2 Adjusted $r^2</strong></td>
<td><strong>.083</strong>**</td>
<td><strong>.063</strong></td>
<td></td>
</tr>
</tbody>
</table>

*a outliers excluded
*p < .05, **p < .01*
extraneous variance from the model, allowing overt RD to significantly explain variance in obesity measures.

**IAT and Hair Cortisol**

A serendipitous finding occurred as a result of further correlational analyses to better interpret interaction effects in the multiple regression models. The implicit association test D-score was found to be positively correlated with hair cortisol at $r = .28$ ($p = .02$) once the outliers were recoded to achieve univariate normality. A partial correlation was undertaken to control for chemical treatment of the hair (permanents, coloring, or bleaching), and results were similar ($r = .28, p = .02$ [two-tailed], $df = 68$).

**Family of Errors**

To better identify the specific effects of individual RI variables on relationships between RD and obesity measures, and to ensure sufficient power to detect moderation, RI variables were tested separately as potential moderators. This decision meant creating many regression models and therefore increasing the probability of galloping alphas. Applying the most stringent correction, the Bonferroni, to the 18 separate multiple regression models used to answer research questions 5 and 6, a significance value of $p = .003$ is suggested as the value at which to reject the null hypothesis for these models. Using this value, the second step of the regressions of BMI on RD variables (and BMI and RD with centered racial identity variables) reached the threshold of significance, because those models demonstrated a significant $F$ change of $< .001$, as did the regression of waist circumference on RD variables with private regard.
Chapter 5. Discussion

The purpose of this study was to investigate relationships among racial discrimination, racial identity and obesity in young AA women. These relationships, if present, have relevance to racial disparities in perinatal health through preconceptional health status. Gallo and Matthew's Reserve Capacity model (2003) guided the study. Using a cross-sectional exploratory design, a sample of 136 African American collegiate women from a large, majority-White university in the Midwest was recruited through flyers, word-of-mouth, and emails sent to a random sample of AA women students. Questionnaires, biometrics, and a computerized matching task for implicit attitudes were used to collect data, as well as hair sampling for cortisol from a subset of participants.

This study conceptualized a priori that three manifestations of RD, as chronic stressors, would be positively associated with obesity, a health problem that disproportionately affects Black women. Additionally, racial identity attitudes were conceptualized as reserve capacities that could potentially reduce RD-related stress, protecting health. Effects of racial identity attitudes on relationships between RD and health outcomes have been inconsistent. Racial identity has demonstrated buffering effects on relationships between RD and mental health symptoms in some studies, but few studies have addressed physical health. The current study makes a unique contribution in identifying potentially protective effects of racial identity attitudes on obesity in young Black women, which could in turn improve perinatal outcomes. In bivariate analyses, private regard demonstrated significant inverse relationships with all
three obesity measures. Ethnic identity also demonstrated an inverse relationship with waist circumference.

In multivariate models, while microaggressions demonstrated expected positive relationships with obesity, overt RD demonstrated inverse ones; obesity measures consistently rose with microaggressions, and decreased with overt RD, private regard and ethnic identity. In some instances, public regard, centrality, and implicit racial identity attitudes moderated relationships between RD and obesity. Moderators performed in similar ways within the models. For example, centrality moderated the relationship between vicarious RD and both waist circumference and waist-hip ratio. For women low in centrality, waist circumference and waist-hip ratio decreased as vicarious RD rose.

A secondary aim of the study was to explore the feasibility and acceptability of hair sampling for cortisol among African American college women. Just over half the sample chose to participate in hair collection. In this sample, chemical processing of hair (perming, bleaching and/or coloring) did not significantly contribute variance to cortisol levels, an important contribution to the literature.

Sample Comparison

Obesity and Central Adiposity

Using criteria from the World Health Organization (2006), this sample had a higher BMI than is considered healthy (mean = 27.2, SD = 6.84). Further, almost 60% were classified as overweight or obese. However, the mean waist circumference in this sample was 82.3 cm (SD = 15.0) and within the healthy range. Similarly, the mean waist-hip ratio in this sample was .79 (SD = .06), also within the healthy range. In comparison, Bajaj et al. (2014) reported that a national sample of AA women aged 20 to
39 years had a mean BMI of 27.8; with mean waist circumference of 89.3 (SD = 16.2) cm and mean waist-hip ratio of .85 (SD = .08).

**Smoking**

This sample of AA women smoked cigarettes at a significantly lower rate (3%) than national samples of African American women aged 18-25 years (13 - 21.2%) (Caraballo, Sharapova, & Asman, 2016). Smoking was not included in the analysis as anticipated due to the low number of smokers.

**Income and Parental Education**

Using eligibility for free or reduced lunch as a proxy for income, 54% of these women had family income at or below 185% of the federal poverty line (National Center for Education Statistics, 2016). Comparing this sample to a national indicator of poverty among university students—the number of awarded income-based Pell Grants-- suggests income for this sample was likely somewhat lower than AA public university students nationally; 46% of AA students in the U.S. receive these grants, and 90% who do are eligible for free or reduced lunch (Kantrowitz, 2011).

In this sample, parental education was slightly higher than the national average for parents with Bachelor's degrees or more; 37.5% of participants had at least one parent with a Bachelor's degree or higher and additionally, 26% had at least one parent with an associate's degree. Nationally, 25% of Black college students have at least one parent who has earned a Bachelor's degree or higher, and 30% have a parent who has had some post-secondary education (U.S. Department of Education, 2010).

Many studies concerning Black women's health include only low-income women, a limitation to generalizability. Women in this study had parents with job titles ranging
from restaurant workers and nurses' aides to university professors, computer programmers and engineers, representing a wide variety of family economic and educational statuses. The distribution of income below and above the poverty line suggested by parents' jobs and educational attainment, combined with meal subsidy status, suggests increased generalizability for these findings as representative of young Black women from a variety of socioeconomic backgrounds.

Racial Discrimination

Reporting of overt lifetime racial discrimination experiences was, in general, high in this study compared with previous studies of emerging AA adults; the mean frequency of 9.40 indicates that these young AA women experienced at least 8 episodes of lifetime overt RD. Further, 94.9% reported at least one lifetime episode of overt RD. In a comparable group of students, the mean frequency of overt RD was just over half what this sample reported (Anglin, Lui, Espinosa, Tikhonov, & Ellman, 2016), and recent studies report up to 78% experiencing at least one episode of overt RD (Anglin et al., 2016; Ertel et al., 2012). While usual responses to unfair treatment was not a variable used in analysis, most women in this study reported on the EOD that they were likely to try to do something about unfair treatment (n = 95, 70%) rather than accepting it as a fact of life (n = 40, 30%), and most reported they would be more likely to talk about it with someone else (n = 119, 88%) rather than keeping it to themselves (n = 16, 12%). This suggests that most women in this sample usually adopt a more active than passive approach to dealing with overt discrimination.

Participants reported a moderate number of microaggressions, or subtle invalidations, occurring during the last 6 months (mean = .39, SD = .20), lower than in
the only other study available for comparison. However, this still represents a mean of 17 different microaggressions, and REMS scoring does not account for multiple occurrences of the same microaggression. In the original validation study for the newly developed REMS-Checklist, by Nadal (2011), the mostly female but racially diverse sample had a total REMS score averaging .56 (SD = .18).

In the current study, 77.8% of participants reported that someone close to them had been discriminated against (vicarious RD), and 90% of these close others were reported to be African American. Dominguez (2008) found that 48% of participants reported a close other had been discriminated against during childhood, and 49% reported this experience during adulthood. The mean score for vicarious RD was 1.96 (SD = 1.82), indicating most participants reported on 2 close others experiencing 1 episode of RD each, or one close other reporting 2 episodes of RD. This suggests low levels of vicarious RD overall, though direct comparisons with other studies are not possible. Dominguez (2008) reports a mean vicarious RD score of .73 for childhood (SD = .97) and .77 for adulthood (SD = .99), suggesting a higher exposure for the current study's sample.

In summary, this study sample of AA college women reported higher overt RD than in other recent studies of AA college students. The data comparing microaggressions to other samples is limited, but this sample reported fewer microaggressions; however, the mean still likely represents frequent exposure. There are no directly comparable studies to compare vicarious RD because Dominguez (2008) reported on two separate age ranges instead of her sample's lifetime vicarious RD; however vicarious RD in this study is likely higher based on mean scores.
Racial and Ethnic Identity Measures

In comparison with other studies of racial identity, this sample of AA women reported higher levels of private regard (mean = 6.35, SD = .92); similar levels of centrality (mean = 4.92, SD = 1.09), and lower levels of public regard (mean = 2.99, SD = 1.03) than other recent studies including AA university students. Mean ranges in these studies were 5.91 - 6.12 for private regard, 4.40 - 5.57 for centrality, and 3.27 - 3.53 for public regard (Durkee & Williams, 2015; Fuller-Rowell, Burrow, & Ong, 2011; Hoggard, Byrd, & Sellers, 2015; S. C. Jones, Lee, Gaskin, & Neblett, 2014). In the current study, women generally felt very affirmative and proud of being Black. Being Black was a moderately important part of their own identities, and participants felt a moderate degree of connection to other Black people. Most participants believed that members of other groups have a somewhat more negative than positive opinion about Black people and their contributions to American society.

Ethnic identity. Ethnic identity, as measured by the MEIM-R, is not often used in studies of the AA college population. The current study found a mean ethnic identity score of 3.85 (SD = .83). This indicates a moderately strong sense of belonging to the group, a moderately established personal meaning of group membership, as well as a moderate level of engagement in behaviors to learn more about the group. This mean is comparable, but with greater variability, than found in Durkee and Williams's (2015) AA college student sample in a majority White mid-Atlantic university.

Hair cortisol. In this study, after addressing the extreme outliers, the median level of hair cortisol was 8.67 pg/mg. This measure of central tendency will be used for comparison purposes with other published studies. Wosu et al (2015) found a median of
11.2 pg/mg for Black women aged 18 to 72 years, and Lehrer (2016), a median of 13.65 pg/mg for AA participants (85% women) with a mean age of 54 years. However, in these studies the age of women was older, so comparisons are limited (Appendix M, Table M3). Additionally, there are no clinical norms established for comparison of low, medium and high levels of hair cortisol or its specific relationship with chronic stress.

**Racial Discrimination, Racial Identity and Obesity: Main Effects**

The *a priori* conceptual model of this study considered racial discrimination to be a chronic stressor that could impact HPA functioning and contribute to racial disparities in obesity among AA women (Chao, Grilo, White, & Sinha, 2015; Isasi et al., 2015). In turn, obesity has implications for the perinatal health of AA women, contributing to maternal and infant morbidity and mortality. This study contributes new evidence to the literature regarding the relationships among RD, racial identity and obesity in young African American women.

**Overt RD**

In general, overt RD explained variance in body mass index, waist circumference, waist-hip ratio, and hair cortisol in this sample of young Black women, with all outcome measures decreasing as reports of overt RD experiences rose. This finding is contrary to *a priori* theoretical expectations, but joins a small number of other studies demonstrating this inverse relationship. There are several potential theoretical explanations that could account for this finding, but further exploration in future studies will be needed to better understand this inverse relationship.

**Overt RD may build reserve capacity.** Emerging adults often experience personal growth in response to adversity (Gottlieb, Still, & Newby-Clark, 2007). In this
sample, experiencing a high number of threatening events over the lifespan (mean = 5.6), high levels of overt RD, and being a first-generation university student (66%) could all be considered challenges. Overcoming these challenges might be perceived as evidence of strength and resilience for young AA women who may feel they have navigated these situations successfully, and could build reserve capacity that helps them cope with other stressors. For example, certain forms of cognitive coping with overt lifetime RD experiences may build stress resistance (Cho & Park, 2013), resulting in a lower overall stress burden and decreased likelihood of obesity. While Vaughn (2009) has validated the use of a stress-related growth scale in ethnic minority adolescents, no studies to date have examined RD experiences in this light among AA youth. The current study's findings suggest a direction for further research, to discover whether and in what circumstances overt RD may promote stress-related growth.

Additionally, young AA women with greater past experience of overt RD may have developed coping strategies, or reserve capacities, that could decrease both chronic stress and weight, factors relevant to perinatal outcomes. For example, Brodish et al. (2011) studied 815 African American adolescents and young adults and found that increased RD during adolescence was associated with more exercise among women at age 30 years; authors suggested that young adult Black women may use exercise or other healthy mechanisms to cope with RD-related stress. The current study did not measure positive health behaviors such as exercise, so this suggests a direction for future research.

**Healthier, more empowered women may report more overt RD.** It is possible that AA women who have healthier habits (Cozier et al., 2014), greater empowerment (Krieger et al., 2011), and therefore less obesity (Ovaskainen et al., 2015), are more likely
to perceive and report overt RD. This sample's high level of reporting of overt RD may suggest that these young AA women generally felt a high degree of empowerment. This is further supported by the number of participants (70%) who responded that they normally try to do something about unfair treatment, rather than accepting it as a fact of life.

The university campus where data collection occurred has an explicit commitment to diversity, inclusion and transparency that may have facilitated both disclosure of overt RD experiences, and empowerment for students of color generally. In addition, historical and cultural trends encouraging disclosure of RD experiences may have both influenced reporting of RD and increased empowerment among these young Black women. In the time during and just prior to data collection, #BlackOnCampus trended on Twitter, and many young AA students nationwide disclosed experiences of RD and provided each other with mutual support through social media. Social media campaigns like #SayHerName, which encouraged organizing to protest the deaths of young Black women during encounters with law enforcement, were an important part of a larger social movement to further Black civil and human rights, Black Lives Matter (M. Anderson & Hitlin, 2016). President Barack and First Lady Michelle Obama, in office since most of these participants' late childhood and teen years, had each individually spoken out about RD they had personally experienced, demonstrating that even at the highest levels of Black achievement in the United States, RD was universally encountered (Bacon Jr., 2015; Cottle, 2016).

These factors may have facilitated the development of greater empowerment through RD discussion and disclosure for some young women during their emergence
into adulthood. It is possible that young women who recognize the extent to which RD may influence Black lives and opportunities experience less chronic stress, as they navigate U.S. society based on an understanding that an awareness of racism promotes more strategic responses to it. Experiencing less chronic stress would, in turn, be expected to improve perinatal outcomes for young AA women.

Future longitudinal studies that include health habits and measures of empowerment may provide additional insights to the findings of this study.

Microaggressions

In this sample, as reported microaggressions increased, there were corresponding increases in waist circumference, waist-hip ratio and BMI. This finding provides support that subtle forms of RD may have negative impacts on health for young AA women. However, hair cortisol was not associated with microaggressions. This finding suggests microaggressions may not act as a chronic stressor in this sample, or that behavioral responses to microaggressions (or other intermediate pathways) could reduce the stress they generate. In addition, analytical or methodological issues could account for these findings; norms for levels of exposure to microaggressions have yet not been established for this relatively new measure, and clinical norms for hair cortisol levels have not been, either.

Microaggressions as chronic stressors: Frequency and subtlety. There are several reasons why microaggressions might be expected to be chronically stressful. AA women in this sample reported, on average, 17 different microaggressions occurring in the past 6 months, suggesting that microaggressions were a frequent occurrence in their lives. Enduring frequent stress may result in more negative emotions, changes in the HPA
axis, and obesity in the absence of sufficient reserve capacity to manage them (Gallo, Espinosa de Los Monteros, et al., 2009). Microaggressions are subtle and ambiguous, and may require considerable cognitive and emotional energy to determine their meanings, resulting in chronic stress and adverse health outcomes (Liang & Molenaar, 2016; Noh, Kaspar, & Wickrama, 2007). Young Black women are additionally faced with daily decisions regarding the extent to which they may alter their behavior, appearance or self-presentation to try to reduce exposure to microaggressions in majority-White environments (Domingue, 2015); this additional cognitive burden may itself be stressful. While microaggressions have not yet been studied in terms of perinatal outcomes, the relationships found here provide insight into harmful effects of racial discrimination.

**Microaggressions on campus.** Data collection occurred from October 2015 through February 2016, and so many of the microaggressions reported in this study may have occurred on campus through interactions with members of the campus community. These interactions could be particularly difficult to interpret on a campus that explicitly purports to value diversity. Experiencing dissonance between the university's values and microaggressions on campus could, itself, be stressful. Microaggressions committed by individuals who may be encountered again on a regular basis could also place recipients in the dilemma of how or whether to respond, or to let a subtle invalidation or microinsult go unchallenged (Brondolo et al., 2009). The dilemma could be heightened if the microaggressive behavior is performed by a person in a position of power, like a professor. Regular exposure to dilemmas of this nature, that cause a variety of cognitive and emotional responses (Sue, Capodilupo, & Holder, 2008), may cause chronic stress.
It is possible that some participants had limited prior exposure to microaggressions before coming to university, and thus did not yet have an opportunity to develop reserve capacity to manage them. Many participants (44%) attended high schools that were at least 50% African American, and these schools may have been located in communities of color where microaggressions may have been less frequent. However, this study did not collect data on participants' community demographics, so this possible contribution cannot be definitively determined.

**Microaggressions and overeating.** Microaggressions convey messages of social exclusion, which may predispose some individuals to overeat (Sproesser, Schupp, & Renner, 2014). Further, overconsumption of high carbohydrate foods may reduce circulating cortisol (Tryon et al., 2015), potentially accounting for why microaggressions explained variance in weight, but not hair cortisol. Hayman, McIntyre, and Abbey (2015) used a standardized simulation activity to assess 18 to 22-year-old African American college women's eating patterns after exposure to social exclusion. Participants who were exposed to social exclusion consumed statistically significantly more potato chips immediately after the activity. Many AA college women begin their university years already overweight or obese (Morales, Gordon-Larsen, & Guilkey, 2016; Ogden, Carroll, Fryar, & Flegal, 2015). However, a small weight gain that often occurs during the first term of university life may be sufficient to move into overweight or obese status (Vadeboncoeur, Townsend, & Foster, 2015). Those who are both overweight and exposed to stressors, such as microaggressions, are more likely to gain weight (Boyce & Kuijer, 2015). Approximately 27.5% of this study's participants were attending or had just completed their first semester. Weight change was not measured in this study,
limiting ability to detect whether recent weight gain accounted for the variance seen in obesity measures explained by microaggressions. However, if microaggressions increase weight gain in the preconception period, this may suggest that they contribute to racial disparities in perinatal health.

**Obesity may increase racial microaggressions.** While microaggressions resulting in weight gain may explain the variance in obesity and central adiposity seen in this study, another possibility is that heavier AA women experienced more racial microaggressions. Both acquaintances and strangers may be more likely to behave in more racially marginalizing ways towards overweight or obese Black women, who might also experience more microaggressions relating to both their size and race. Stereotypes of aggressive/angry or sassy/outspoken large Black women are common in popular culture (Sewell, 2013; Tyree, 2011; S. A. Wallace, Townsend, Glasgow, & Ojie, 2011). These stereotypes, in combination with the socially stigmatizing condition of obesity, may cause larger Black women to be perceived as either threatening or as appropriate targets for ridicule (G. M. Chen, Williams, Hendrickson, & Chen, 2012) -- thus increasing the likelihood that others may respond with more frequent racial microaggressions. In this sample, microaggressions were positively correlated with BMI ($r = .17$), but no significant differences were found in mean microaggressions scores when compared by BMI category in post-hoc testing. Future longitudinal studies of relationships among microaggressions, weight, and weight-based discrimination are needed in order to better understand causal or reciprocal pathways, as the Reserve Capacity Model would support.
**Vicarious Racial Discrimination**

Vicarious RD, discrimination directed towards a close or known other, was positively and significantly correlated with both overt RD ($r = .44$) and microaggressions ($r = .43$), suggesting that young AA women who perceive and report RD directed towards the self are more likely to perceive and report RD directed towards close others. However, vicarious RD had no main effects on obesity measures, suggesting that either vicarious RD was not a significant stressor for these young women, or that participants had sufficient reserve capacity to manage vicarious RD-related stress. Additionally, measurement issues, as described below, may have affected these findings.

**Racial Identity: Private Regard**

In this study, private regard, a measure of racial identity relating to feeling affirmative and proud of being African American, was inversely related to BMI, waist circumference and waist-hip ratio in both bivariate and multivariate analyses. These relationships support the theoretical assumption that private regard functions as a reserve capacity in young Black women, one that could potentially promote health and better perinatal outcomes.

While it is not possible in a cross-sectional design to determine causal pathways, these findings are consistent with the argument posited by Rivas-Drake et al. (2014) that the racial and ethnic identities most likely to be health protective are those relating to feeling good, happy and proud about group membership. Prior studies have suggested health-protective effects for private regard and similar racial and ethnic identity attitudes in prospective analyses, e.g. Hoggard et al. (2015); Mandara et al. (2009); Rivas-Drake et al. (2014). If protective effects of private regard on obesity are found in future studies,
interventions implemented early and throughout development that are designed to increase positive feelings about being Black could reduce obesity development in young African American girls and women. Obesity reduction, in turn, could reduce perinatal health disparities.

**Ethnic Identity**

Ethnic identity -- which includes having an understanding of the personal meaning of ethnicity, feeling connected to the ethnic group, and engaging in behaviors to learn about the ethnic group -- explained variance in body mass index, waist circumference and waist-hip ratio, with all obesity markers decreasing as ethnic identity increased. Ethnic identity was directly and significantly inversely associated with waist circumference (r = -.18). Ethnic identity may therefore be a reserve capacity for young AA women, potentially reducing stress that leads to central deposition of fat, and improving metabolic health. Ethnic identity, like private regard, demonstrated main effects on central adiposity but did not moderate relationships between RD and obesity measures.

As expected, ethnic identity correlated positively and significantly with both private regard (r = .43) and centrality (r = .45), and was uncorrelated with public regard. How respondents believe others view their ethnic group is not a dimension of ethnic identity measured by the MEIM-R.

**Racial Identity Attitudes as Moderators**

In this study, the conceptualization of racial identity attitudes as reserve capacities capable of buffering negative health effects of RD - related stress was partially supported.
Public regard, centrality, and implicit racial identity moderated relationships between RD and obesity/central adiposity.

**Analytic Issues in Moderation**

Before describing results, a consideration of analytic issues that may have influenced the findings is warranted. Statistical moderation can be difficult to detect, because the reduction in reliability that results from multiplying variables (and therefore their error terms) to create interaction terms, reduces test power (Whisman & McClelland, 2005), requiring greater sample sizes. Small effect sizes and restricted distribution of variables also make detection difficult (Dawson & Richter, 2006).

Additionally, the inclusion or exclusion of a small number of outliers has a disproportionate effect on moderation models; while jointly extreme cases are necessary to detect interactions, it is also critical that models meet statistical assumptions (Whisman & McClelland, 2005). Thus, as cases are removed to meet assumptions, some jointly extreme cases may be lost, masking interaction effects. In this study, moderation was considered to have occurred if interaction term betas were significant, and the adjusted r-squared of the model increased when the interaction terms were added (Jaccard & Turrisi, 2003).

For interactions involving waist-hip ratio, it was not possible to perform simple slopes significance tests for different values of the moderators. The small range of variance for the dependent variable may have been responsible for this limitation; these analyses may have been underpowered. Another possibility is that for smaller sample sizes (<200) combined with small effect sizes, spurious interactions may paradoxically increase with less reliable data, due to increased randomness (Dawson & Richter, 2006).
Despite these potential issues, the support for racial identity as a buffer contributes to the literature conceptualizing RD as a chronic stressor.

**Public Regard**

Public regard, the belief that members of other groups generally respect and value Black people and their contributions to society, was generally low in this sample (mean = 2.99), and was significantly and inversely correlated with all three forms of RD. Thus, greater RD may reduce public regard, and lower public regard may increase RD perceptions and reporting among young Black women. Women with low levels of public regard generally demonstrated inverse relationships between overt RD and obesity. For these individuals, who may expect to experience discrimination, it may be a reserve capacity to be able to perceive and report overt RD experiences. However, women with low or mean levels of public regard generally showed positive relationships between microaggressions and obesity, suggesting that microaggressions may be chronically stressful for them. Expecting poor treatment could heighten stress-inducing rumination among young AA women when these more subtle or ambiguous incidents occur, and chronic stress could contribute to preterm birth and other adverse perinatal outcomes.

For young women in this study with high public regard (n = 25), the relationships between RD measures and obesity were non-significant. Because participants came from a variety of communities, some of these young AA women may have had little exposure to other ethnic groups and the negative views their members may hold about African Americans; others may have grown up in communities that were diverse but embraced Black achievement and contributions to society. These factors may have contributed to high public regard, and also may make it easier to dismiss RD as unusual, or not
representative of a wider cultural milieu that devalues African Americans (a perspective likely to be held by those with low public regard). Overt RD and microaggressions may be perceived by individuals with high public regard as exceptional, and therefore discountable. One recent experimental design reported that high public regard reduced immediate and short-term negative emotional responses to blatant RD (Hoggard et al., 2015). However, prior studies have found inconsistent effects of public regard on relationships between RD and health outcome variables (e.g. Jones, 2014, and Sellers, Copeland-Linder, Martin & Lewis, 2006).

**Racial Centrality**

As noted above, racial centrality, or the strength of connection young women felt with other Black people and the importance of being Black to their personal identity, was moderate in this group (mean = 4.92). Centrality was not significantly correlated with overt RD, microaggressions or vicarious RD, suggesting that centrality did not affect perceptions or reporting of RD in this sample. Previous studies have suggested that higher centrality may increase perceptions of RD (Sellers & Shelton, 2003). However, historical changes in how RD disclosure is viewed could account for the lack of relationship seen here. In past decades, respondents were more likely to report discrimination being directed towards other members of their group than towards themselves (D. M. Taylor, Wright, & Porter, 1994), and high centrality may have been important to overcome social desirability concerns in RD reporting. In the current study, these young AA women were more likely to report RD directed towards themselves than to report vicarious RD, suggesting a possible historical change in social desirability that could reduce the importance of centrality in RD reporting.
Centrality had no main effects on variance for any obesity measure in this sample, and had no bivariate relationships with obesity. However, moderation was observed in the relationship between vicarious RD and central adiposity measures. This study originally conceptualized high centrality as a potential reserve capacity; instead, young AA women low in centrality who reported more RD directed towards significant others (vicarious RD) tended to have lower waist circumferences and lower waist-hip ratios, suggesting a protective effect of low centrality in this context. Yip (2016) suggests that particularly for emerging adults, threats to identity based on group membership may be managed by ethnic/racial de-identification, a psychological distancing of the self from the group. This study’s findings suggest this strategy may be health-protective when vicarious RD is high, perhaps particularly for young AA women in a racially diverse social environment where many potential sources of social support will be members of other races.

Prior studies have found inconsistent moderator effects for racial centrality on relationships between RD and health outcomes, with some studies suggesting protective effects, others suggesting exacerbation of relationships between RD and negative health effects, and others showing no effects (Pascoe & Smart Richman, 2009). Sellers et al. (2003) suggested that greater centrality could potentially buffer the stress associated with RD, and that centrality often increases in response to RD. In this sample, no interactions were found between levels of centrality and the relationships between overt RD, microaggressions and obesity. It may be that the effects of centrality depend on who the target of RD is (the self, or close others), or that increasing one's centrality may be a more
useful strategy (or reserve capacity) to manage RD-related stress in some social contexts than in others.

**Implicit Racial Identity**

A limitation of most previous studies in the nursing literature is a lack of attention to implicit attitudes, which may influence health and health behaviors. As anticipated in this study based on prior research (Krieger et al., 2011), implicit racial identity attitudes were not correlated with explicit racial or ethnic identity attitudes in this sample. Implicit racial identity was also unrelated to RD variables, suggesting they neither affect, nor are affected by, explicit perceptions of racial discrimination. Implicit racial attitudes had no main effects on variance of obesity measures but did directly correlate with hair cortisol, a serendipitous finding (described below). As anticipated, implicit racial attitudes moderated relationships between RD and obesity measures.

**Implicit racial identity: Moderator effects.** In this study, the main effects of overt RD on obesity measures were generally inverse, and main effects of microaggressions on obesity measures were positive. Adding implicit racial identity to the model resulted in two interesting findings: 1) Individuals with pro-Black implicit bias or no implicit racial bias (neutral IAT scores) demonstrated these inverse relationships between overt RD and BMI, and positive relationships between microaggressions and BMI, potentially contributing to the main effects seen in these models. 2) However, for individuals with pro-White implicit bias, no relationships were seen between overt RD or microaggressions and BMI. Implicit pro-Black bias or neutral implicit attitudes may increase RD salience and the likelihood of negative health effects from RD. By contrast, implicit pro-White bias, particularly for AA women who spend time in majority White
environments like the study setting, may decrease the extent to which RD is salient or important.

Chae et al. (2012) found the best health outcomes--the lowest probability of hypertension in AA men--in individuals who held both a pro-Black implicit bias and who reported the highest levels of discrimination. Similarly, in the current study, women with neutral or high D-scores (pro-Black implicit attitudes) and high reported overt RD had lower BMI. Chae et al. additionally found that individuals with pro-White implicit racial bias showed a positive and linear relationship between levels of RD (low, medium and high) and probability of HTN. In the current study, however, no relationship was found between overt RD and BMI or waist-hip ratio among those with pro-White bias, or among microaggressions and BMI.

Implicit attitudes also moderated relationships between both overt and vicarious RD and waist-hip ratio. For overt RD, implicit attitudes appeared to operate in the same directions on waist-hip ratio as on BMI. For vicarious RD, pro-White implicit bias appears to decrease WHR, and pro-Black bias to increase it. It may be that individuals high in pro-White implicit preference might be less likely to experience vicarious RD as personally stressful due to an implicit psychological distancing of the self from the group, similar to holding low centrality. Those with an implicit pro-Black bias might find vicarious RD more personally stressful, predisposing towards the development of central adiposity.

The findings of this study are suggestive, but should be interpreted with caution given the potential analytic limitations. The measurement of vicarious RD was relatively new and not frequently used. Reliability and validity data are not well supported for
vicarious RD, and reliability was not assessed for this sample. Simple slopes analysis using study-specific waist hip ratio data suggests that any effect of implicit racial identity was limited to women with waist-hip ratio in the healthy range. Over time, however, effects of implicit racial identity on relationships between RD and obesity might become more important, as obesity rates rise with age.

**Implicit racial identity: Direct relationship with hair cortisol.** This study, based on prior research, originally conceptualized a strong unconscious/automatic association between Black faces and positive words (high IAT D-score, or pro-Black bias) as a reserve capacity. Instead, an implicit pro-Black bias tended to be positively and significantly associated with cortisol levels in this study ($r = .28$), suggesting greater chronic stress exposure---the opposite of what was expected. This finding was serendipitous and has not been previously reported, and should be interpreted with caution. As a new contribution to the literature, it requires further exploration to determine the stability, validity, and importance of this relationship.

Given this unexpected finding, it is important to revisit the nature of the IAT and its scoring and interpretation. A high D-score that represents a pro-Black implicit preference *also* represents an anti-White implicit preference, because this result is obtained through faster matching speeds obtained under *both* of these conditions: 1) "African American" paired with positive words categories, and 2) "European American" paired with negative words categories.

If anti-White implicit attitudes are partially responsible for high D-scores, with individuals more quickly associating White faces with negative attributes, it is conceivable that some African American college students on a predominantly White
campus are continuously exposed to individuals they may be automatically associating with negative qualities or threat. Possibly, this could cause physiologic stress, raising cortisol. Recent studies of implicit threat and affect, using functional MRI, suggest that brain activation and HPA axis hormonal activation occur even in the absence of conscious awareness of threat, e.g. Berger and Sarnyai (2015); Mossink, Verkuil, Burger, Tollenaar, and Brosschot (2015); van der Ploeg, Brosschot, Thayer, and Verkuil (2016); Dunkley et al. (2016).

Implicit racial identity attitudes correlating significantly with hair cortisol but not with obesity measures in this study is intriguing, in that elevated cortisol often precedes the development of central adiposity. For individuals in this study with higher levels of hair cortisol, HPA dysfunction may already be established; alternatively, these higher levels could represent the potential for development of HPA dysfunction over time. Either could predispose these participants to obesity in later life. Kuehl et al. (2015) found that hair cortisol positively related to waist circumference and other markers of metabolic syndrome in their study of men and women with a mean age of 41 years.

**Study Findings and the Reserve Capacity Model**

This study's findings largely support the relationships postulated in the Reserve Capacity Model (Figure 1-1). RD as a stressor explained variance in what the model posits as intermediate paths to poor health outcomes (obesity and central adiposity).

In the Reserve Capacity model, reserve capacities both directly impact intermediate paths and also, through cognitions and emotions, moderate relationships between threats of harm or loss and these paths (Gallo, 2009). This study supports those suppositions, with private regard and ethnic identity directly explaining variance in
obesity and central adiposity among young Black women, and other racial and ethnic attitudes moderating relationships between RD and obesity.

The Reserve Capacity model suggests exposure to threats or actual harm is increased when an individual is in a lower position within a social hierarchy. Within the United States, social hierarchy was established based on race and continues to be enforced through interpersonal RD and structural racism. The high levels of exposure to both RD and threatening events among this sample are consistent with this part of the model. Findings suggest that threatening events functioned as a suppressor with overt RD in this study's regression models. While the intention of including threatening events as a covariate was to isolate the effects of RD analytically, both the Reserve Capacity model and this study's findings suggest there may be additive and/or interactive effects between threatening life events and RD for young Black women that could be considered for future studies.

The Reserve Capacity model does not directly address the mechanisms through which social hierarchies, the proposed basis for differential exposure to stressors, are maintained. Microaggressions themselves are often subtle and may be a form of preserving and reinforcing a lower position for African Americans in the social hierarchy. Microaggressions thus may warrant consideration as having reciprocal effects with social status, rather than being conceptualized solely as a harm that occurs more often due to lesser social standing.

In sum, findings support, at least in part, that racial identity attitudes function as reserve capacities, sometimes directly associating with obesity and/or central adiposity. RD measures explained variance in the model's intermediate paths, though not always in
the expected directions. Vicarious RD only explained variance in central adiposity when interactions with centrality were included, supporting low centrality as a reserve capacity potentially capable of protecting health in this sample and study setting. Similarly, effects of overt RD and microaggressions on variance in obesity and central adiposity depended on levels of public regard and implicit racial identity.

**Hair Sampling**

No published studies to date have examined acceptability of hair sampling in collegiate African American women. Ford, Boch, and McCarthy (2016) recently reported on hair sampling in an ethnically diverse group of adolescents, and found high rates of participation (91%), though non-Hispanic Black youth were significantly less likely to participate, O.R. 0.24, 95% CI (0.09, 0.60).

In this current study, just over half (52%) of the eligible sample agreed to participate in hair sampling. As expected, over half of the women who agreed specifically cited the importance of helping with the research to benefit other women. About one third also cited interest in knowing their own cortisol levels as a reason to participate, even though they were informed that the measure is not normed or diagnostic. For future studies, offering personalized results for hair cortisol may assist with recruitment for hair sampling. A small number of women cited the additional compensation for hair collection as a factor in their decisions, and 2 cited it as the only reason for participation.

As anticipated based on potential concerns about breakage, a number of women cited adverse effects on styling or hair health as reasons not to participate; others had hairstyles that made sampling impractical. Ford et al. (2016) reported that only 3 Black female teens did not participate due to difficulty obtaining hair due to extensions or other
styles, but the total number of Black female participants was unreported. In general, the expectation that these issues would affect hair sampling acceptability in this population was supported.

No potential participant voiced concerns about genetic or other analyses being performed on their hair samples as a reason for non-participation, although other studies have suggested this may be a concern (B. L. Jones et al., 2016), particularly for well-educated African Americans (Cain et al., 2016). In this study, 5 women who opted not to participate chose not to disclose their reasons.

The following suggestions for future research using hair sampling with young AA women are based on the findings of the current study, with regard to recruitment and methodology:

1. Provide rationale for the importance of the hair sampling to the scientific goals of the study, with particular reference to AA women's health.

2. Emphasize the small amount of hair required, but appreciate that the cultural meanings of hair and/or concerns about hair damage may, for some women, preclude participation.

3. Whenever possible, optimize data collection timing in light of individual participants' hair care needs and practices.

4. Provide explanation and rationale for hair cortisol collection procedures and modifications that can be made, e.g. small extensions that are attached with adhesive or crochet may be removed and reattached after collection. Facilitate restyling post-collection by ensuring that participants have access to mirrors, time, and privacy.
Limitations

This study included a convenience sample of AA women recruited using several different approaches, with a subset of randomly sampled individuals. While efforts were made to avoid sampling bias--by leaving racial discrimination out of the recruiting literature and scripts, and by asking participants not to reveal specific contents of the questionnaire to other potential participants--it remains a possible influence on findings. Specifically, women who had strong feelings about their experiences (or lack of experiences) with RD or threatening events might have been more motivated to participate in the study. Women who were uncomfortable disclosing RD to a White researcher may have chosen not to enroll.

This study was conducted on the main campus of a large public university in the Midwest. Findings may differ for students from other geographic regions, and for students at historically Black colleges and universities, as a result of varying exposure to RD and how different social environments may interact with or influence racial identity attitudes. This study included fewer smokers than expected based on the population rates for this age group, and the income measurement was based on eligibility for meal subsidies. Because socioeconomic status may influence the extent to which RD affects health, imprecision about income levels in this study may reduce generalizability. The cross-sectional design makes causality indeterminate, and future studies of RD, racial identity and obesity in this population should include longitudinal designs.

Measure Limitations

Three measures of RD were used in this study. Measures for overt RD and microaggressions have been used in other samples and have strong evidence of
reliability. However, the measure for vicarious RD has had limited testing and thus evidence for reliability and validity was not available. In future studies, test-retest reliability would be a strategy to assess the stability of vicarious discrimination, although memory recall bias would be a potential limitation. However, one-time data collection methods precluded using test-retest procedures, so the vicarious RD measure was used with caution in an exploratory manner.

Similarly, threatening events were measured by the modified 16-item LTE-Q, which had adequate reliability via Kuder-Richardson 20. Test-retest reliability might also be considered to provide evidence for the modified LTE-Q, because the tool relies on reporting remembered events rather than dimensions of attitudes. The lack of established validity of this measure in the college population weakens confidence in the generalizability of the findings. In a study with a larger sample that would meet more stringent criteria for subject-to-item ratios, examining the factor structure would be an important consideration.

In the original IAT, the polar category names were labelled ‘good’ and ‘bad’. In this study, those names were inadvertently changed to ‘Positive words’ and Negative words’. Despite this change, the category labels had consistent valence terms (positive and negative) and therefore the IAT was still a measure of implicit racial attitudes. Whether the addition of the ‘words’ to the category label changes the matching of stimuli is unknown. Stimuli were likely matched with the categories based on an implicit association between European Americans and African Americans with positivity and negativity. However, it is conceivable that the addition of "words" to the category label could mean that scores additionally represent implicit attitudes about whether European
Americans or African Americans are more likely to speak or use positive or negative words. The alpha reliability in this study was .72 and not substantially different than the race IAT reliability reported in previous studies, .78 (Lane et al., 2007).

Measuring RD has proved challenging historically in studies of RD and health (Chae et al., 2015), and a focus on interpersonal RD, in this study, excluded measures of structural racism such as neighborhood segregation effects, which are increasingly linked to health outcomes in the literature, e.g. Kershaw, Osypuk, Do, De Chavez, and Diez Roux (2015); Lukachko, Hatzenbuehler, and Keyes (2014); and M. E. Wallace, Mendola, Liu, and Grantz (2015). Further, only explicit measures were used for RD in this study, and implicit measures may be useful to fully capture RD perceptions (Krieger et al., 2011).

**Social Desirability**

Social desirability may have affected responses in this study. Private regard, the extent to which a participant felt positive about being Black, was high overall in this study compared to previous work, potentially reflecting social desirability bias that could relate to interacting with a White researcher, or to a campus environment that explicitly values diversity, among other factors. The extent to which congruence between the race of data collectors and study participants affects reporting of RD has not been extensively explored in the literature, and social desirability could have affected RD and racial identity attitude reporting for other reasons as well.

**Cortisol and Obesity Co-Factors**

Several factors that could influence hair cortisol and/or obesity and central adiposity have emerged from the literature since this study was designed, and the size of
the sample made controlling for these and other factors challenging. Obesity as a public health problem has been explored from many environmental, social and physiologic perspectives (Braig et al., 2016; Gribbin, Watamura, Cairns, Harsh, & Lebourgeois, 2012; T. R. Taylor et al., 2015; Tsukumo, Carvalho, Carvalho Filho, & Saad, 2015; Zhang et al., 2015). This study was limited to the relationship between chronic stress from racial discrimination and obesity, which would be expected to play a small role in the multifactorial phenomenon. Many of the other factors that are known to influence obesity, like genetics, physical activity, dietary patterns, and access to healthy foods (Winkler, Bennett, & Brandon, 2016), were not addressed.

Conclusions

This section will include a summary of major findings, contributions to nursing science, and implications for future research.

Summary of Major Findings

This study is the first to examine racial discrimination, racial identity and obesity together in young AA collegiate women. It included measures for microaggressions and vicarious RD, and is one of the first studies to include both explicit and implicit measures for racial identity. It also included a newer strategy to measure cortisol in hair, and contributes findings related to hair care practices and cortisol levels among Black women as well as the acceptability of hair sampling in this population.

Microaggressions, private regard, and ethnic identity were all significantly associated with obesity measures, with microaggressions rising with BMI. Ethnic identity and private regard were inversely related to waist circumference and all three obesity measures, respectively. In multivariate models, RD and racial identity explained
up to 12% of variance in BMI and waist circumference, a clinically relevant amount. Reporting higher levels of overt RD explained variance in both obesity and hair cortisol in an inverse direction, suggesting health-protective effects for young Black women of perceiving and reporting overt RD that may extend to improving perinatal outcomes through reduction of chronic stress.

Public regard, implicit racial identity and racial centrality all moderated relationships between RD and obesity. Young AA women who believe that African Americans and their contributions to society are devalued by members of other groups showed relationships between overt RD, microaggressions and some obesity measures, while those who believe African Americans are, in general, esteemed, did not. Vicarious RD only explained variance in central adiposity in combination with racial centrality, suggesting that the strength of connection to the group is important in whether RD directed towards close others affects obesity in young Black women.

Implicit racial identity demonstrated a significant positive relationship with hair cortisol in bivariate analysis; individuals with a strong pro-Black/anti-White bias were more likely to have higher levels of cortisol. Implicit identity also moderated relationships between RD measures and obesity, such that individuals holding a pro-Black or neutral implicit racial identity demonstrated relationships between RD and obesity measures, and individuals holding a pro-White implicit bias did not.

**Contributions to Nursing Science and Implications for Future Research**

Despite its limitations, this study makes a unique contribution to the literature to date by investigating relationships among obesity, central adiposity, RD and racial identity in young AA women. Its findings are potentially important in explaining racial
disparities in perinatal outcomes, particularly among socioeconomically advantaged AA women. Poor AA women's adverse perinatal outcomes have often been linked to factors relating to poverty, to the extent that racial disparities are attenuated or disappear among the most economically disadvantaged women (Braveman et al., 2015; Kramer, Cooper, Drews-Botsch, Waller, & Hogue, 2010; Messer, Oakes, & Mason, 2010). Among affluent women, racial disparities may be more influenced by race-related stressors (Braveman et al., 2015).

This study provides additional support to using multivariate approaches to investigating racial disparities in perinatal outcomes. Often, obesity is treated as a medical risk factor that is modeled as a potential confounder in epidemiological studies of perinatal health disparities. Obesity and other risk factors for poor perinatal outcomes, such as hypertension, may be affected by chronic race-related stress. Treating these contributions to outcome disparities as confounders rather than as intermediates may reduce attribution to race-related stress, discounting a potentially critical factor in poorer outcomes.

Nursing has long been concerned with the impact of the environment on health (Nightingale, 1860), and the environment is a major concept of the nursing metaparadigm (Kim, 2009). However, the conceptualization of the environment has typically included either the environment of nursing care or the broader material or ecological environment (Kim, 2010), and symbolic and social aspects of the concept have received less attention. The social environment, including all of the people and groups with whom patients interact (Kim, 2010), is increasingly acknowledged in other disciplines as a critical environmental component that
affects human health and well-being (Marmot, 1993). Likewise, the symbolic environment-- including ideas, roles, expectations, constraints, beliefs, and history-- impacts the emotions and cognitions of individuals and is enacted within the social environment (Kim, 2010). Nursing science has yet to fully integrate these dimensions of environment and their importance to health and nursing as a practice discipline. Racism is a component of the social and symbolic environments in the United States, and evidence to date suggests it has effects on human mental and physical health. This study therefore contributes to nursing’s theoretical basis by lending support for a broadening of the conceptualization of the environment within the metaparadigm concepts.

Nursing has historically been interested in attitudes as shapers of health-related behaviors. However, the conceptualization of attitudes currently understood in nursing science is limited to explicit attitudes. Although implicit attitudes likely affect decision-making in many health-related and caregiving contexts, nursing has lagged behind the development and measure of implicit attitudes, which represents a gap in nursing science. The current study incorporated implicit attitudes in its conceptualization and its measurements, and these attitudes demonstrated moderator effects on health outcomes, providing initial evidence explaining relationships between implicit attitudes and health.

Finally, this study adds to growing evidence about potentially protective roles for racial/ethnic identity in AA physical health and perinatal outcomes. Private regard and ethnic identity are attitudes that could be promoted through psychosocial prevention and intervention activities (S. C. Jones & Neblett, 2016). Future research efforts that improve understanding of how different racial and ethnic attitudes interact with RD and other
stressors to affect perinatal health may, in turn, improve existing interventions and allow development of new approaches.

The collegiate women of today are the mothers of tomorrow, and this study adds to a growing body of work that RD and racial identity matter to physical, not just behavioral and mental, health. In turn, physical health prior to pregnancy matters to both AA mothers' outcomes, and the health of future generations.
List of References


Hunte, H. E. (2011). Association between perceived interpersonal everyday discrimination and waist circumference over a 9-year period in the Midlife


Stalder, T., Steudte, S., Alexander, N., Miller, R., Gao, W., Dettenborn, L., & Kirschbaum, C. (2012). Cortisol in hair, body mass index and stress-related...


## Appendix A. Selected Studies of Racial Discrimination, Stress, and Health Outcomes

<table>
<thead>
<tr>
<th>Authors (Year)</th>
<th>Description of Sample</th>
<th>Key Variables</th>
<th>Key Findings</th>
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<tbody>
<tr>
<td>Armstead, Lawler, Gorden, Cross, and Gibbons, 1989</td>
<td>27 African American college students</td>
<td>Blood pressure and self-report of anger before and after vignettes: 1) RD vignette 2) anger-provoking non-RD vignette 3) neutral vignette</td>
<td>Mean arterial pressure higher after exposure to RD scene compared to anger scene or neutral scene; anger scores similar after both RD and anger-provoking scenes.</td>
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<tr>
<td>Krieger (1990)</td>
<td>51 Black &amp; 50 White women aged 20-80 years in one CA city</td>
<td>RD, sex discrimination, taking action vs. remaining quiet in response to discrimination, hypertension</td>
<td>Black women who reported no discrimination and said they usually kept quiet about unfair treatment had 4.4 OR of HTN vs. women who said they took action and talked with others (p=.001). No associations were found among white women. Black women who reported 0 instances of either RD or sex discrimination had OR for HTN of 2.6 compared to Black women who reported 1+ instances (95% CI, 0.7 – 10.5) No association among White women between sex discrimination and HTN.</td>
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<tr>
<td>Krieger and Sidney (1996)</td>
<td>831 Black men, 1143 Black women, 1006 White men, 1106 White women aged 25 to 37 years</td>
<td>RD, responses to unfair treatment, class, and blood pressure</td>
<td>BP 7 mmHg higher in working class Black adults who reported no RD and usually kept quiet about unfair treatment than those reporting challenging unfair treatment and experiencing RD. Among Black professionals, BP 9 mmHg lower in those reporting challenging unfair treatment and who reported no RD. Taking into account experiences of RD and responses to unfair treatment substantially reduced Black-White differences in BP.</td>
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<td>Authors (Year)</td>
<td>Description of Sample</td>
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<td>Barnes and Lightsey, Jr. (2005)</td>
<td>114 African American college students</td>
<td>RD, stress, life satisfaction, coping styles, social support</td>
<td>RD was positively correlated with stress (0.22, p&lt;.01) and negatively correlated with life satisfaction (-0.42, p&lt;.001), but these relationships did not persist once coping style added to MR model. Coping style did not appear to moderate relationship between RD and stress, but sample underpowered to detect moderation.</td>
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<tr>
<td>Peters (2006)</td>
<td>162 AA community-dwelling adults aged 18-80 years; used SEM (small sample size for SEM, underpowered to detect relationships with BP)</td>
<td>RD, BP, coping style, anger, and chronic stress emotions</td>
<td>83% reported experiencing RD in daily life and 68% while receiving healthcare. Older participants (&lt;40) experienced more stress related to racism. RD accounted for 15% of variance in chronic stress emotions. No relationship between RD and BP in final SEM model.</td>
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<tr>
<td>Vines et al. (2006)</td>
<td>476 Black women aged 36 – 49 years randomly selected from a health insurance pool</td>
<td>RD, emotional responses to RD</td>
<td>68% of women reported they personally experienced RD and 93% said Black people in general often experience RD. 83% reported experiencing moderate to strong emotions including anger, frustration, anxiety or sadness in response to RD. 45% reported experiencing moderate to strong sense of powerlessness or helplessness. Higher education positively correlated with personally experienced RD, while higher income was associated with lower RD but less passive responses to RD. 46% reported thinking about their race at least daily, and 30% reported thinking about their race rarely or never.</td>
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<td>Authors (Year)</td>
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<td>Utsey and Hook (2007)</td>
<td>215 African American college students</td>
<td>RD, Resting heart rate variability (as a proposed moderator), &amp; psychological distress</td>
<td>Among women, RD positively associated with psychological distress (0.19, p &lt; .05) but dropped from interaction analysis due to small magnitude of correlation. No relationship between RD and psychological distress for men (but large correlation for men between institutional racism &amp; psychological distress, 0.49, p &lt; .01).</td>
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<tr>
<td>Vines et al. (2007)</td>
<td>447 AA women</td>
<td>RD, passive coping, feelings of hopelessness/powerlessness, and waist-to-hip ratio (WHR)</td>
<td>Waist-to-hip ratio (WHR) was adjusted for BMI. Higher RD was associated with lower WHR (OR 0.5, 95% CI 0.3 – 0.9). High stress after controlling for RD was related to high WHR (OR 2.7, 95% CI 1.1 – 6.7)</td>
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<tr>
<td>Buchanan and Fitzgerald (2008)</td>
<td>91 AA women involved in a sexual harassment lawsuit against the same financial company</td>
<td>RD, sexual harassment, life satisfaction, job stress &amp; psychological distress.</td>
<td>RD was positively associated with job stress and psychological distress and accounted for an additional 4 -9% of variance over sexual harassment alone.</td>
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<td>Brondolo et al. (2008)</td>
<td>362 Latino and African American adults</td>
<td>State and trait negative affect, perceived racial discrimination</td>
<td>African Americans &amp; men reported more RD than Latinos and women. RD accounted for 12% of variance in trait negative affect. RD positively correlated with daily anger, nervousness &amp; sadness for AA individuals and for daily anger &amp; nervousness for Latinos. Educational levels moderated the association, with higher levels reducing the association between RD and negative affect.</td>
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<td>Greer (2009)</td>
<td>183 AA college students on a predominantly White campus</td>
<td>RD, institutional racism, cultural racism, and 4 mental health symptoms: obsessive-compulsive symptoms, interpersonal sensitivity, depression, &amp; anxiety.</td>
<td>Women scored higher on mental health symptoms. Exposure to RD (though not institutional or cultural racism) was positively associated with OCD symptoms, interpersonal sensitivity, anxiety, and somaticization for women only.</td>
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<tr>
<td>Vines and Baird (2009)</td>
<td>476 Black women aged 36 – 53 years randomly selected from a health insurance pool</td>
<td>RD, concern for children related to experiencing RD now or in the future</td>
<td>Mothers who experienced more RD were more concerned about their children experiencing RD (p &lt; .0001). More than 70% of mothers were very concerned about the possibility of police harassment due to race. Majority of mothers (60% +) reported being very concerned about 6 of 8 possible RD situations for their children.</td>
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<tr>
<td>Szymanski and Stewart (2010)</td>
<td>160 AA women aged 18 - 77 years</td>
<td>RD, gender discrimination, negative racial identity attitudes, negative gender identity attitudes, &amp; psychological distress</td>
<td>More frequent RD was associated with both more gender discrimination and more psychological distress. Negative racial identity attitudes moderated relationship between RD and psychological distress so those who reported less RD and more positive racial identity had less distress.</td>
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<td>Everage et al. (2012)</td>
<td>571 Black men and 791 Black women in the CARDIA study (aged 33 to 45 years)</td>
<td>RD, Coronary Artery Calcification (CAC) adjusted for age, gender, SES, psychosocial variables &amp; heart disease risk factors—prospective study.</td>
<td>RD negatively associated with CAC (OR 0.94, 95% CI 0.90 – 0.98 per 1 unit increase in Experiences of Discrimination Scale. Positive weak correlations between RD &amp; depressive symptomatology, and RD and anger expression.</td>
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<td>Anderson (2013)</td>
<td>32,585 participants in the 2004 Behavioral Risk Factor Surveillance System study: White, Black, Hispanic &amp; Other (Asians, Native Americans or Alaskan Natives, Pacific Islanders, multiracial respondents)</td>
<td>RD, mental stress from RD, physical stress from RD, # days of poor mental health in last 30, + days of poor physical health in last 30</td>
<td>Highest emotional stress from RD (OR 3.140, p &lt; .001), physical stress from RD (OR 3.134, p &lt; .001), and highest associations between RD and poor mental &amp; poor physical health, in Black population (Whites= reference category). Once all other factors controlled for, being Black was associated with fewer poor mental health and physical health days compared with White &amp; other groups. Self-reported poor physical health was associated with experiencing emotional stress due to RD for all racial groups. Thinking about one’s race daily or hourly positively associated with emotional &amp; physical stress due to RD, though race of respondent substantively influenced this relationship with higher stress experienced by Blacks. Physical stress and emotional stress from RD was the best predictor in the model for poor mental health days. Education and employment status not related to symptoms, though higher income was protective for emotional and physical stress from RD.</td>
</tr>
</tbody>
</table>

*Note.* Bolded studies had paradoxical findings
Appendix B. Pathophysiology of the HPA Axis and Effects on Eating and Obesity

Effects of Chronic Stress on Appetite

Many individuals who are under acute stress actually consume fewer calories; about 40% of people eat less under stress, 20% eat the same amount, and 40% increase caloric consumption (Dallman, 2010). It is not clear why some individuals increase their caloric consumption and others do not during acute stress episodes; however, experiencing chronic stress may affect how appetite signaling unfolds under conditions of acute stress.

Individuals with healthy HPA regulation and cortisol secretion may experience more appetite suppression hormone signaling in response to acute stressors than those experiencing chronic stress (Tomiyama, Puterman, Epel, Rehkopf, & Laraia, 2012). For example, Tomiyama et al. (2011) found that women with high levels of chronic stress actually mounted a lower cortisol response to an acute experimental stressor than women with lower levels of chronic stress. The women in the high stress group had higher BMIs, and reported eating more after the experimental stressor than the lower stress group. In a similar experiment, van Strien et al. (2013) found that among women who reported eating more in response to stress, blunted cortisol responses to acute experimental stress were associated with increased post-stress eating, whereas normal cortisol responses were not.

Stress may make fatty or sugary foods more pleasurable to eat. Within the brain, cortisol-mediated CRF secretion in the amygdala prompts increased caloric intake. Specifically, amygdala-derived CRF stimulates dopamine secretion in the nucleus accumbens, activating reward systems (Dallman et al., 2006). The neurotransmitter enkephalin likely augments hedonic aspects of the eating experience, making the
ingestion of highly palatable foods more pleasurable when consumed under conditions of stress (Dallman et al., 2006). Enkephalin-expressing neurons actually decrease in the nucleus accumbens in rats surgically deprived of corticosterone (a hormone analogous to cortisol in humans), and increase when these rats are treated with exogenous corticosterone, raising enkephalin in a dose-dependent manner (Dallman et al., 2006). This suggests that the brain’s pleasure response to consumption of fat and sugar is mediated at least partially by cortisol.

Increased pleasure from highly palatable foods during times of stress may actually be protective to the brain, though potentially contributory to obesity. It is currently suggested from animal studies that intake of highly palatable (i.e. high fat and sugar content) foods may directly calm the stress response within the brain by reducing the expression of CRF within the amygdala and ACTH in the pituitary (Dallman, 2010). This reduction of hormonal expression in the brain has been observed in rats, which, if given a choice, will increase intake of highly palatable foods (but not calories via bland chow) proportionally with corticosterone levels.

**Chronic Stress and Fat Deposition**

The neuroendocrine mechanisms underlying relationships between chronic stress and appetite, eating behaviors, and obesity are in the early phases of investigation at this time; many human and animal studies in this area have been published in the last five years. Relationships are complex and sometimes circular, making them challenging to study in humans and difficult to fully explicate. However, relationships between stress and particularly central adiposity have more clearly established mechanisms, including an
increased tendency toward fat deposition in the abdomen under conditions of chronic stress.

Fatty tissue, long believed to have mere energy storage functions, is now understood to exercise endocrine functions, particularly fat stored in the central abdominal area. Glucocorticoids rearrange fat storage from the periphery of the body to the abdomen. Visceral adipocytes express more glucocorticoid receptors than subcutaneous adipocytes (Tamashiro, 2011), and visceral adipocytes may express more of the enzyme 11β-HSD1 in the presence of glucocorticoids (Scott, Melhorn, & Sakai, 2012). 11β-HSD1, in converting inactive cortisone to cortisol, makes bioavailable cortisol more available within visceral fat stores, and cortisol and insulin play key roles in transforming adipocyte precursor cells into fat storage units (Coccurello et al., 2009), favoring storage of fat in the abdomen (central adiposity). A twin study illustrated these proposed mechanisms; central adiposity, but not other obesity, was correlated with both urinary cortisol and psychosocial stressors in higher-stressed twins (Marniemi et al., 2002). Because of interrelationships between cortisol and sex hormones, women in particular demonstrate associations between chronic stress and central adiposity (Pasquali, 2012).
### Appendix C. Selected Studies of Racial Identity and Health Outcomes

<table>
<thead>
<tr>
<th>Authors &amp; Year</th>
<th>Sample</th>
<th>Key Variables</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones, Harrell, Morris-Prather, Thomas, and Omowale (1996)</td>
<td>60 AA women college students</td>
<td>Used vignettes with imagined encounters to assess mood responses &amp; physiological responses to RD. For racial identity, used Black Nationalistic Coping Style Scale (Harrell, Colon &amp; Harris, 1997); used Afrocentrism subscale because it has more acceptable psychometrics.</td>
<td>Racial discrimination vignettes had physiological &amp; mood effects; higher Afrocentrism increased heart rate reactions to one vignette but not the other. No clear relationship with responses (mood or physiology) otherwise.</td>
</tr>
<tr>
<td>V.R. Clark, Cobb, Hopkins, and Smith (2006)</td>
<td>72 AA male college students</td>
<td>RD, MIBI</td>
<td>Higher Private Regard predicted poorer cardiac output and stroke volume in response to vignettes of police traffic stops involving racial profiling. Low reliability of Private Regard (.60) compared to most studies.</td>
</tr>
<tr>
<td>Banks and Kohn-Wood (2007)</td>
<td>AA college students</td>
<td>RD, depressive symptoms and racial identity (using cluster analysis of MIBI scores).</td>
<td>Students whose Centrality and Regard scores were lower, and whose ideology included blending with the mainstream and reducing emphasis on race, experienced stronger relationships between RD and depressive symptoms. Clusters with higher scores on MIBI measures of Centrality and Regard all showed weaker relationships between RD and depressive symptoms despite a similar level of reported RD among clusters.</td>
</tr>
<tr>
<td>Harris-Britt, Valrie, Kurtz-Costes, and Rowley (2007)</td>
<td>128 AA 8th graders</td>
<td>Racial socialization messages from parents re: racial pride and preparation to encounter bias were measured, as were RD and self-esteem.</td>
<td>Both types of racial socialization messages moderated relationship between RD and low self-esteem, with weakening for youth who reported more racial pride messages and moderate preparation for bias. Low race pride socialization, and both high and low preparation to encounter bias, were associated with lower self-esteem when discrimination was higher.</td>
</tr>
<tr>
<td>Authors &amp; Year</td>
<td>Sample</td>
<td>Key Variables</td>
<td>Key Findings</td>
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<tr>
<td>Chae et al. (2008)</td>
<td>1977 Asian American adults in the National Latino &amp; Asian American Study</td>
<td>RD, racial centrality and importance of cultural commitment, and smoking</td>
<td>High levels of RD were associated with increased likelihood of smoking, after controlling for other types of unfair treatment (OR = 2.40). Ethnic identity moderated this relationship such that low levels of Centrality and importance of cultural commitment were associated with smoking when RD levels were high, though there was no independent relationship between identity and smoking. Among those with high levels of Centrality and commitment, the relationship between high levels of RD and smoking was significantly reduced (OR = 0.79).</td>
</tr>
<tr>
<td>Szymanski and Stewart (2010)</td>
<td>AA women aged 18-77 years, mean 43.</td>
<td>Negative racial identity attitudes measured using the self-hatred subscale of the Cross Racial Identity Scale (CRIS).</td>
<td>Negative racial identity attitudes moderated the relationship between RD and psychological distress. In women with low negative racial identity attitudes, RD was positively correlated with psychological distress. Women with high negative racial identity attitudes had higher levels of distress even at low levels of RD, and high levels of RD did not increase distress among these women.</td>
</tr>
<tr>
<td>Seaton, Neblett, Upton, Hammond, and Sellers (2011)</td>
<td>AA adolescents aged 12-17 years</td>
<td>RD frequency, psychological well-being and racial identity measured via the MIBI-Teen</td>
<td>At baseline, adolescents who experienced higher RD had lower levels of psychological well-being. Over a 3-year period, these relationships held, and at times 2 and 3, higher RD frequency and increased feelings of being bothered by RD were negatively correlated with well-being. Increased exposure to RD did not reduce well-being over time. Racial identity did not moderate relationships between RD and psychological well-being. High attrition (55%).</td>
</tr>
<tr>
<td>Authors &amp; Year</td>
<td>Sample</td>
<td>Key Variables</td>
<td>Key Findings</td>
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<tr>
<td>Forsyth and Carter (2012)</td>
<td>233 Black American adults aged 18-72 years, mean age 33.</td>
<td>Participants asked to think of a racially charged situation where they felt they had been treated unfairly, and asked to answer questions based on that episode. Used Racism-Related Coping Scale (Forsyth &amp; Carter, 2011) (their own instrument) to measure coping. RIAS-B (Helms &amp; Parham, 1996) used for racial identity. Mental health status: Brief Symptom Inventory (BSI) used as outcome.</td>
<td>No significant differences in cluster groups for well-being, but some clusters had more negative affect than others.</td>
</tr>
<tr>
<td>Tynes, Umana-Taylor, Rose, Lin, and Anderson (2012)</td>
<td>125 AA adolescents</td>
<td>Online RD, ethnic identity as measured by Multigroup Ethnic Identity Measure (MEIM), anxiety &amp; depression.</td>
<td>Holding stronger and more positive ethnic identity reduced anxiety (though not depression) in the face of exposure to RD via social media and the web, particularly among girls.</td>
</tr>
<tr>
<td>Stevens-Watkins et al. (2012)</td>
<td>204 drug-using and non-drug-using AA women (half in each category)</td>
<td>Lifetime RD, ethnic identity scores on MEIM, and likelihood of substance use</td>
<td>No direct relationships found between ethnic identity and likelihood of drug use. However, higher ethnic identity scores (more positive attitudes about ethnicity’s importance and valence) were associated with lower likelihood of substance use as exposure to RD increased, and women who scored lower on the ethnic identity measure and experienced higher RD had a greater likelihood of being in the substance abusing group.</td>
</tr>
<tr>
<td>Fuller-Rowell et al. (2012)</td>
<td>AA adolescents</td>
<td>RD from teachers only was measured, as was substance abuse and racial identity via modified (shortened) MIBI.</td>
<td>Increased discrimination from teachers predicted increased substance abuse over time. Neither Centrality nor Private Regard moderated this relationship, though Public Regard did; participants with high Public Regard showed positive associations between discrimination and substance abuse, and those with low Public Regard scores did not. Teens with the highest Public Regard scores who also experienced the least PRD had the lowest substance use scores.</td>
</tr>
<tr>
<td>Authors &amp; Year</td>
<td>Sample</td>
<td>Key Variables</td>
<td>Key Findings</td>
</tr>
<tr>
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<td>--------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Perry et al. (2013)</td>
<td>204 drug-using and non-drug-using AA women (half in each category); same sample as Stevens-Watkins 2012.</td>
<td>Gendered racism exposure, skin color, ethnic identity (MEIM), and suicidal ideation.</td>
<td>Higher ethnic-group affiliation and pride strongly moderated suicidal ideation in African American women confronting racial and gender discrimination.</td>
</tr>
<tr>
<td>Richman, Boynton, Costanzo, and Banas</td>
<td>AA participants in the NIMH Collaborative Psychiatric Epidemiological Surveys</td>
<td>RD, problem alcohol use, and a single item for racial centrality (&quot;How close do you feel in your ideas and feelings about things to Black people in this country?&quot;)</td>
<td>Individuals who highly identified with their racial/ethnic group and experienced high levels of RD were less likely than those with low identification with their group to be dependent on alcohol (OR 0.07, 95% CI 0.01-0.97).</td>
</tr>
</tbody>
</table>
Appendix D. Kent State Institutional Review Board Approval Letter

RAGS Research Compliance <researchcompliance@kent.edu>

to: "ANTHONY, MARY" <manthony@kent.edu>

cc: "Imannsja@kent.edu" <Imannsja@kent.edu>

date: Wed, Jul 22, 2015 at 2:56 PM

subject: IRB approval for protocol #15-365 - retain this email for your records


Hello,

I am pleased to inform you that the Kent State University Institutional Review Board reviewed and approved your Application for Approval to Use Human Research Participants as a Level II/Expedited, category 3 project. Approval is effective for a twelve-month period:

July 22, 2015 through July 21, 2016

*A copy of the IRB approved consent form is attached to this email. This “stamped” copy is the consent form that you must use for your research participants. It is important for you to also keep an unstamped text copy (i.e., Microsoft Word version) of your consent form for subsequent submissions.

Federal regulations and Kent State University IRB policy require that research be reviewed at intervals appropriate to the degree of risk, but not less than once per year. The IRB has determined that this protocol requires an annual review and progress report. The IRB tries to send you annual review reminder notice by email as a courtesy. However, please note that it is the responsibility of the principal investigator to be aware of the study expiration date and submit the required materials. Please submit review materials (annual review form and copy of current consent form) one month prior to the expiration date.

HHS regulations and Kent State University Institutional Review Board guidelines require that any changes in research methodology, protocol design, or principal investigator have the prior approval of the IRB before implementation and continuation of the protocol. The IRB must also be informed of any adverse events associated with the study. The IRB further requests a final report at the conclusion of the study.

Kent State University has a Federal Wide Assurance on file with the Office for Human Research Protections (OHRP); FWA Number 00001853.
If you have any questions or concerns, please contact the Office of Research Compliance at Researchcompliance@kent.edu or 330-672-2704 or 330-672-8058.

Kent State University Office of Research Compliance
224 Cartwright Hall | Fax 330.672.2658

Victoria Holbrook | Graduate Assistant | 330.672.2384 | vholbroo@kent.edu
Tricia Sloan | Administrator | 330.672.2181 | psloan1@kent.edu
Kevin McCreary | Assistant Director | 330.672.8058 | kmccrea1@kent.edu
Paulette Washko | Director | 330.672.2704 | pwashko@kent.edu

For links to obtain general information, access forms, and complete required training, visit our website at www.kent.edu/research.
RE: IRB # 15-365 entitled “Discrimination, Identity, and Obesity Among Collegiate African American Women”
Hello,

The Kent State University Institutional Review Board (IRB) has reviewed and approved your Annual Review and Progress Report for continuing review purposes. The protocol approval has been extended and is effective:

July 22, 2016 through July 21, 2017

Federal regulations and Kent State University IRB policy requires that research be reviewed at intervals appropriate to the degree of risk, but not less than once per year. The IRB has determined that this protocol requires an annual review and progress report. The IRB will try to send you an annual review reminder notice by email as a courtesy. However, please note that it is the responsibility of the principal investigator to be aware of the study expiration date and submit the required materials. Please submit review materials (annual review form and copy of current consent form) one month prior to the expiration date.

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If you have any questions or concerns, please contact our office at 330-672-2704 or researchcompliance@kent.edu.

Doug Delahanty | IRB Chair | 330.672.2395 | ddelahan@kent.edu
Tricia Sloan | Administrator | 330.672.2181 | psloan1@kent.edu
Kevin McCrea | Assistant Director | 330.672.8058 | kmcrea1@kent.edu
Paulette Washko | Director | 330.672.2704 | pwashko@kent.edu
Appendix E. Effect Sizes in Prior Studies including Racial Discrimination and/or Racial/Ethnic Identity Measures

<table>
<thead>
<tr>
<th>Authors/Year</th>
<th>Population Studied</th>
<th>Effect Size for Racial Discrimination</th>
<th>Effect Size for Racial Identity Attitudes</th>
<th>Interaction effects</th>
<th>Statistical Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Szymanski and Steward (2010)</td>
<td>AA women 18+, internet-based study</td>
<td>None, $r^2$ both non-significant for psychological distress</td>
<td>$r = -.27$, $p &lt; .05$ for “internalized racism”, $r^2$ non-significant</td>
<td>$r^2 = .10$</td>
<td>Multiple regression</td>
</tr>
<tr>
<td>Tovar-Murray, Jenifer, Andrusyk, d'Andelo, and King (2012)</td>
<td>AA college students in an urban, predominantly White university</td>
<td>$r^2 = .08$ (racism-related stress, IRRB on career aspirations)</td>
<td>$r^2 = .09$ (ethnic identity)</td>
<td>$r^2 \Delta = .03$</td>
<td>Multiple regression</td>
</tr>
<tr>
<td>Tynes et al. (2012)</td>
<td>AA adolescents aged 14-19 years, from 3 Midwestern small urban high schools with high % AA students (25-50%)</td>
<td>$r = -.29$, $p &lt; .05$ (online racial discrimination) for self-esteem; $r = .52$ for depressive symptoms; $r = .38$, $p &lt; .01$ for anxiety symptoms among girls.</td>
<td>$r = .49$, $p &lt; .01$ for self-esteem among girls (ethnic identity)</td>
<td>$\beta$ ethnic identity x online racial discrimination on anxiety $= -.39$, $p &lt; .01$ (interaction $r^2$ included gender at this step; $r^2 \Delta$ for ethnic identity, online discrimination x gender on depressive symptoms $= .14$; on anxiety $= .27$)</td>
<td>Multiple regression</td>
</tr>
<tr>
<td>Perry et al. (2013)</td>
<td>AA adult women, mean age 36 years</td>
<td>OR $= 1.06$ for gendered racism on suicidality, $p &lt; .01$</td>
<td>OR=NS</td>
<td>Strong ethnic affirmation x gendered racism OR $0.90$, $p &lt; .05$</td>
<td>Logistic regression</td>
</tr>
<tr>
<td>Stevens-Watkins et al. (2012)</td>
<td>AA adult women, mean age 36 years (same sample as Perry et al. 2013)</td>
<td>Racist life events on drug use: non-significant</td>
<td>Ethnic identity measures on drug use: also non-significant.</td>
<td>Medium ethnic affirmation x racist life events OR$=0.92$, $p &lt; .05$. High ethnic identity x racist life events OR $= .91$, $p &lt; .05$</td>
<td>Logistic regression</td>
</tr>
<tr>
<td>Chae et al. (2008)</td>
<td>Asian American adults, mean age 40 years</td>
<td>OR $= 2.40$ for high racial/ethnic discrimination (vs. none reported) on current smoking</td>
<td>OR for current smoking with high ethnic identification $= .79$, but not statistically significant.</td>
<td>$F_3 = 3.25$, $p = .03$ for moderation of ethnic identity on relationship between high discrimination and current smoking</td>
<td>Logistic regression</td>
</tr>
</tbody>
</table>
Appendix F.  Experiences of Discrimination (EOD)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Question</th>
<th>Stem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience of Discrimination</td>
<td>Introduction: “This next section is going to ask about how you and others like you are treated, and how you typically respond.”</td>
<td>1. accept it as a fact of life. 2. try to do something about it.</td>
</tr>
<tr>
<td>Response to unfair treatment</td>
<td>If you feel you have been treated unfairly, do you usually: (please select the best response)</td>
<td>1. talk to other people about it. 2. keep it to yourself</td>
</tr>
<tr>
<td>Discrimination</td>
<td>Have you ever experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior in any of the following situations because of your race, ethnicity, or color? 1) at school? 2) getting hired or getting a job? 3) at work? 4) getting housing? 5) getting medical care? 6) getting service in a store or restaurant? 7) getting credit, bank loans, or a mortgage? 8) on the street or in a public setting? 9) from the police or in the courts?</td>
<td>For each situation to which the participant replied “yes” (versus “no), the follow-up question was: How many times did this happen? 1. once 2. two or three times 3. four or more times</td>
</tr>
</tbody>
</table>


Krieger et al. (2005).
Appendix G. Racial and Ethnic Microaggressions Scale (REMS) Checklist

Racial and Ethnic Microaggressions Scale (REMS)
Kevin L. Nadal, Ph.D.
John Jay College of Criminal Justice- City University of New York

Instructions: Think about your experiences with race. Please read each item and think of how many times this event has happened to you in the PAST SIX MONTHS.
0 = I did not experience this event.
1 = I experienced this event at least once in the past six months.

1. I was ignored at school or at work because of my race.
2. Someone’s body language showed they were scared of me, because of my race.
3. Someone assumed that I spoke a language other than English.
4. I was told that I should not complain about race.
5. Someone assumed that I grew up in a particular neighborhood because of my race.
6. Someone avoided walking near me on the street because of my race.
7. Someone told me that she or he was colorblind.
8. Someone avoided sitting next to me in a public space (e.g., restaurants, movie theaters, subways, buses) because of my race.
9. Someone assumed that I would not be intelligent because of my race.
10. I was told that I complain about race too much.
11. I received substandard service in stores compared to customers of other racial groups.
12. I observed people of my race in prominent positions at my workplace or school.
13. Someone wanted to date me only because of my race.
14. I was told that people of all racial groups experience the same obstacles.
15. My opinion was overlooked in a group discussion because of my race.
16. Someone assumed that my work would be inferior to people of other racial groups.
17. Someone acted surprised at my scholastic or professional success because of my race.
18. I observed that people of my race were the CEOs of major corporations.
19. I observed people of my race portrayed positively on television.
20. Someone did not believe me when I told them I was born in the US.
21. Someone assumed that I would not be educated because of my race.
22. Someone told me that I was “articulate” after she/he assumed I wouldn’t be.
23. Someone told me that all people in my racial group are all the same.
24. I observed people of my race portrayed positively in magazines.
25. An employer or co-worker was unfriendly or unwelcoming toward me because of my race.
26. I was told that people of color do not experience racism anymore.
27. Someone told me that they “don’t see color.”
28. I read popular books or magazines in which a majority of contributions featured people from my racial group.
29. Someone asked me to teach them words in my “native language.”
30. Someone told me that they do not see race.
31. Someone clenched her/his purse or wallet upon seeing me because of my race.
32. Someone assumed that I would have a lower education because of my race.
33. Someone of a different racial group has stated that there is no difference between the two of us.
34. Someone assumed that I would physically hurt them because of my race.
35. Someone assumed that I ate foods associated with my race/culture every day.
36. Someone assumed that I held a lower paying job because of my race.
37. I observed people of my race portrayed positively in movies.
38. Someone assumed that I was poor because of my race.
39. Someone told me that people should not think about race anymore.
40. Someone avoided eye contact with me because of my race.
41. I observed that someone of my race is a government official in my state.
42. Someone told me that all people in my racial group look alike.
43. Someone objectified one of my physical features because of my race.
44. An employer or co-worker treated me differently than White co-workers.
45. Someone assumed that I speak similar languages to other people in my race.

Kristin Davidoff <kristin.davidoff@gmail.com> 4/19/14
to me

Hi Laura,

Thank you for your interest in the Racial and Ethnic Microaggressions Scale (REMS). Attached please find the original Nadal (2011) article with psychometric properties, and the REMS Packet with scoring information.

Let me know if you have any questions. Please do keep us informed of your psychometric data, and good luck with your dissertation!

Best,
Kristin

--
Kristin C. Davidoff, B.S.
Doctoral Student, Clinical-Forensic Psychology
Clinical Co-Chair, JJPSC
John Jay College of Criminal Justice
The City University of New York
524 W 59th Street, Suite 10.61.02
New York, NY 10019
k davidoff@gc.cuny.edu
Appendix H. Various Modifications to the EOD for Vicarious Racial Discrimination (Domínguez et al., 2008)

This next set of questions asks about people who are close to you who may have been discriminated against or treated poorly due to their race or color.

1. Do you feel that someone close to you has been discriminated against or treated poorly because of his or her race, ethnicity or color?

□ no □ yes

If you answered no, please go on to SECTION E on page 11.

Please tell us more about the person or people you are close to who have been discriminated against, and where it happened. First, write in the person's relationship to you and their race/ethnicity. Next, check all the boxes that apply to where it occurred. Use as few or as many of the lines and boxes as you need.

Person #1

Relationship to you: ______________ Person's Race/Ethnicity: ____________

Where the unfair treatment happened (please check a box or boxes):

<table>
<thead>
<tr>
<th>At school or college</th>
<th>Getting hired or getting a job</th>
<th>At work</th>
<th>Getting housing</th>
<th>Getting medical care</th>
<th>Getting service in a store or restaurant</th>
<th>Getting credit, a bank loan, or a mortgage</th>
<th>On the street or in a public setting</th>
<th>From the police or in the courts</th>
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</table>
**Person #2**

Relationship to you: ______________ Person's Race/Ethnicity: _____________

Where the unfair treatment happened (please check a box or boxes):

<table>
<thead>
<tr>
<th>At school or college</th>
<th>Getting hired or getting a job</th>
<th>At work</th>
<th>Getting housing</th>
<th>Getting medical care</th>
<th>Getting service in a store or restaurant</th>
<th>Getting credit, a bank loan, or a mortgage</th>
<th>On the street or in a public setting</th>
<th>From the police or in the courts</th>
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</tbody>
</table>

**Person #3**

Relationship to you: ______________ Person's Race/Ethnicity: _____________

Where the unfair treatment happened (please check a box or boxes):

<table>
<thead>
<tr>
<th>At school or college</th>
<th>Getting hired or getting a job</th>
<th>At work</th>
<th>Getting housing</th>
<th>Getting medical care</th>
<th>Getting service in a store or restaurant</th>
<th>Getting credit, a bank loan, or a mortgage</th>
<th>On the street or in a public setting</th>
<th>From the police or in the courts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Person #4**

Relationship to you: ______________ Person's Race/Ethnicity: _____________

Where the unfair treatment happened (please check a box or boxes):

<table>
<thead>
<tr>
<th>At school or college</th>
<th>Getting hired or getting a job</th>
<th>At work</th>
<th>Getting housing</th>
<th>Getting medical care</th>
<th>Getting service in a store or restaurant</th>
<th>Getting credit, a bank loan, or a mortgage</th>
<th>On the street or in a public setting</th>
<th>From the police or in the courts</th>
</tr>
</thead>
</table>
**Person #5**

Relationship to you: ________________ Person's Race/Ethnicity: ___________

Where the unfair treatment happened (please check a box or boxes):

<table>
<thead>
<tr>
<th>At school or college</th>
<th>Getting hired or getting a job</th>
<th>At work</th>
<th>Getting housing</th>
<th>Getting medical care</th>
<th>Getting service in a store or restaurant</th>
<th>Getting credit, a bank loan, or a mortgage</th>
<th>On the street or in a public setting</th>
<th>From the police or in the courts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Person #6**

Relationship to you: ________________ Person's Race/Ethnicity: ___________

Where the unfair treatment happened (please check a box or boxes):

<table>
<thead>
<tr>
<th>At school or college</th>
<th>Getting hired or getting a job</th>
<th>At work</th>
<th>Getting housing</th>
<th>Getting medical care</th>
<th>Getting service in a store or restaurant</th>
<th>Getting credit, a bank loan, or a mortgage</th>
<th>On the street or in a public setting</th>
<th>From the police or in the courts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Person #7**

Relationship to you: ________________ Person's Race/Ethnicity: ___________

Where the unfair treatment happened (please check a box or boxes):

<table>
<thead>
<tr>
<th>At school or college</th>
<th>Getting hired or getting a job</th>
<th>At work</th>
<th>Getting housing</th>
<th>Getting medical care</th>
<th>Getting service in a store or restaurant</th>
<th>Getting credit, a bank loan, or a mortgage</th>
<th>On the street or in a public setting</th>
<th>From the police or in the courts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Person #8

Relationship to you: ____________________ Person's Race/Ethnicity: ______

Where the unfair treatment happened (please check a box or boxes):

<table>
<thead>
<tr>
<th>At school or college</th>
<th>Getting hired or getting a job</th>
<th>At work</th>
<th>Getting housing</th>
<th>Getting medical care</th>
<th>Getting service in a store or restaurant</th>
<th>Getting credit, a bank loan, or a mortgage</th>
<th>On the street or in a public setting</th>
<th>From the police or in the courts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scoring: 1 point for each checkmark. Points per participant summed, then divided by the number of significant others reported as experiencing unfair treatment based on race/ethnicity.
Appendix I. The Multidimensional Inventory of Black Identity (MIBI) (Sellers et al., 1997)

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Neutral</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Centrality Scale**
1. Overall, being Black has very little to do with how I feel about myself. ®
2. In general, being Black is an important part of my self-image.
3. My destiny is tied to the destiny of other Black people.
4. Being Black is unimportant to my sense of what kind of person I am. ®
5. I have a strong sense of belonging to Black people.
6. I have a strong attachment to other Black people.
7. Being Black is an important reflection of who I am.
8. Being Black is not a major factor in my social relationships. ®

**Regard Scale**

**Private Regard Subscale**
1. I feel good about Black people.
2. I am happy that I am Black.
3. I feel that Blacks have made major accomplishments and advancements.
4. I often regret that I am Black. ®
5. I am proud to be Black.
6. I feel that the Black community has made valuable contributions to this society

**Public Regard Subscale**
1. Overall, Blacks are considered good by others.
2. In general, others respect Black people.
3. Most people consider Blacks, on the average, to be more ineffective than other racial groups. ®
4. Blacks are not respected by the broader society. ®
5. In general, other groups view Blacks in a positive manner.

® = reverse scored.
# Appendix J. Reliability Estimates for MIBI Centrality, Public and Private Regard Scales in Validity Studies

<table>
<thead>
<tr>
<th>Author(s), Year</th>
<th>Sample Characteristics</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sellers et al. (1997)</td>
<td>474 African American college students</td>
<td>.60</td>
</tr>
<tr>
<td>Walsh (2001)</td>
<td>95 Black Britons, aged 18-60 years</td>
<td>Not reported</td>
</tr>
<tr>
<td>Cokley and Helm (2001)</td>
<td>279 African American undergraduates</td>
<td>.76</td>
</tr>
<tr>
<td>Johnson-Maxwell, Kurpius, Rayle, Arredondo, and Tovar-Gamero (2005)</td>
<td>European Americans (n=550) Latino (n=104) Native American (n=40) college students</td>
<td>European Americans .82 Latino .78 Native American .88</td>
</tr>
<tr>
<td>Simmons, Worrell, and Berry (2008)</td>
<td>225 African American undergraduates</td>
<td>.78</td>
</tr>
<tr>
<td>Wandert et al. (2009) (shortened version with only 4 items used per scale)</td>
<td>170 Black Germans, aged 19-60 years</td>
<td>.74</td>
</tr>
<tr>
<td>Vandiver, Worrell, and Delgado-Romero (2009)</td>
<td>272 African American college students</td>
<td>.62</td>
</tr>
<tr>
<td>Casey-Cannon et al. (2011)</td>
<td>14-18 year olds, ethnically diverse group (53% Latino, 27% African American)</td>
<td>.77</td>
</tr>
</tbody>
</table>
Appendix K. The Multigroup Ethnic Identity Measure-Revised (MEIM-R) (Phinney & Ong, 2007)

My own ethnicity is: ________________________________ (please write in)

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

1. I have spent time trying to find out more about my ethnic group, such as its history, traditions and customs.
2. I have a strong sense of belonging to my own ethnic group.
3. I understand pretty well what my ethnic group membership means to me.
4. I have often done things that will help me understand my ethnic background better.
5. I have often talked to other people in order to learn more about my ethnic group.
6. I feel a strong attachment towards my own ethnic group.

7. My father’s ethnicity is (please use the numbers to indicate): ______
   (1) Asian or Asian American, including Chinese, Japanese, and others
   (2) Black or African American
   (3) Hispanic or Latino, including Mexican American, Central American, and others
   (4) White, Caucasian, Anglo, European American; not Hispanic
   (5) American Indian/Native American
   (6) Mixed: Parents are from two different groups
   (7): Other (write in):___________________________________________

8. My mother’s ethnicity is (please use the numbers to indicate): ______
   (1) Asian or Asian American, including Chinese, Japanese, and others
   (2) Black or African American
   (3) Hispanic or Latino, including Mexican American, Central American, and others
   (4) White, Caucasian, Anglo, European American; not Hispanic
   (5) American Indian/Native American
   (6) Mixed: Parents are from two different groups
   (7): Other (write in):___________________________________________
Appendix L.  The List of Threatening Events (LTE-Q) (Brugah & Cragg, 1990)

Have any of the following life events or problems happened to you within the last 6 months? Please check the box for yes or no.

1. You yourself suffered a serious illness, injury, or an assault □ yes □ no
2. A serious illness, injury, or assault happened to a close relative □ yes □ no
3. Your parent, child, or spouse died. □ yes □ no
4. A close family friend or another relative (aunt, cousin, grandparent) died. □ yes □ no
5. You had a separation due to marital difficulties. □ yes □ no
6. Your parent(s) had a separation due to marital difficulties □ yes □ no
7. You broke off a steady relationship. □ yes □ no
8. You had a serious problem with a close friend, neighbor, or relative. □ yes □ no
9. You became unemployed or were seeking work unsuccessfully for more than one month. □ yes □ no
10. You were fired from a job. □ yes □ no
11. Your parent was fired from a job. □ yes □ no
12. You yourself had a major financial crisis. □ yes □ no
13. Your parent(s) or family had a major financial crisis □ yes □ no
14. You yourself had problems with the police and a court appearance. □ yes □ no
Have any of the following life events or problems happened to you **within the last 6 months**? Please check the box for yes or no.

15. **Someone close to you** had problems with the police and a court appearance. □ yes □ no

16. Something you valued was lost or stolen. □ yes □ no

**Modifications* to the List of Threatening Events**

The next set of questions is very similar to the last set. They will ask you about life events or problems that may have happened to you, and when they occurred. Please check the box or boxes corresponding to the time period or ages in which any event happened to you or began. You may check more than one box if the event happened more than once. If the event never happened, please leave the boxes blank.

1. **You yourself** suffered a serious illness, injury, or an assault.

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. A serious illness, injury, or assault happened to a **close relative**.

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Your parent, child, or spouse died.

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. A close family friend or another relative (aunt, cousin, grandparent) died.

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. You had a separation due to marital difficulties.

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Your parent(s) had a separation due to marital difficulties.*

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. You broke off a steady relationship.

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. You had a serious problem with a close friend, neighbor, or relative.

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. You became unemployed or were seeking work unsuccessfully for more than one month.

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. You were fired from a job. **

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. Your parent was fired from a job.*

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. You yourself had a major financial crisis.

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
13. **Your parent(s) or family** had a major financial crisis.*

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

14. **You yourself** had problems with the police and a court appearance.

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. **Someone close to you** had problems with the police and a court appearance.*

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16. Something you valued was lost or stolen.

<table>
<thead>
<tr>
<th>Birth to Age 10</th>
<th>Age 11 to 13</th>
<th>Age 14 to 17</th>
<th>Age 18 to 25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*new items

** "sacked" in the original was changed to "fired"**
Sound like some great ideas - hope you can manage them. Attached is our standard information pack.

You asked for further information (suggestions?). Ideally one should check reliability and validity in a new population but the LTE has been widely used so evidence of it being reliable in similar populations previously should be found a cited as a 'next best'.

We have a list of similar life event items that we use to look back into childhood but these are likely to be highly unreliable (this we know from prospective follow-up of child developmental cohorts such as those carried out in New Zealand). To find the list of similar life event items that we use to look back into childhood search on google for APMS England HSCIC (APMS is adult psychiatric morbidity). Technical annexes and reports should include the questions asked.

Permission granted.

Good luck!

Terry (Traolach) Brugha MD FRCPsych
Professor of Psychiatry
Department of Health Sciences
College of Medicine, Biological Sciences and Psychology
University of Leicester
Leicester General Hospital
Leicester LE5 4PW
Tel: + 44 116 252 3211
Email: tsb@le.ac.uk
Homepage: http://tinyurl.com/bhzwsqf
Twitter: @TerryBrugha

http://www.hs.le.ac.uk
http://www2.le.ac.uk/colleges/medbiopsych
http://www2.le.ac.uk/departments/health-sciences/research/psychiatry/staff/tsb
http://twitter.com/terrybrugha

Follow us on Twitter http://twitter.com/uniofleicsnews
Dear Professor Brugha,

Greetings! I am a PhD candidate working on a dissertation at Kent State University's College of Nursing in Ohio, U.S.A. I'm planning to study racial discrimination and physiologic health indicators in young African American collegiate women of childbearing age. I would like to use the List of Threatening Events Questionnaire to measure stressful life events my participants may have experienced. I'm hoping to obtain your permission to use it, and to modify it slightly to ask about 1) timeframes in which the events occurred, and 2) events that happened to a participant's parents during her childhood or adolescence. I would be happy to share any psychometric data with you. Please let me know if any further information about me or my proposed study would be helpful. I can be reached at your convenience through this email address.

Sincerely,
Laura

---

Laura Manns-James, PhD (candidate), CNM, WHNP-BC, menopause clinician
Frontier Nursing University
(440) 985-8776 Eastern
office hours Monday, Weds & Friday 11 am - 3:30 pm
  Tues & Thurs 9 am - 3:30 pm
  and by appointment
Faculty Mentor, classes 104, 106 (selected students), 116-118 (selected students), and 127
NM701 Course Faculty
PC701 Course Faculty
# Appendix M. Additional Tables

**Table M1.**

*Reliability Indicators for Threatening Life Events as Measured by LTE-Q and Modifications*

<table>
<thead>
<tr>
<th>Timeframe / Scale</th>
<th>Number of Items</th>
<th>Standardized Alpha (KR-20)</th>
<th>Mean Inter-item Correlation</th>
<th>Items Mean</th>
<th>Items Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past 6 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original LTE-Q</td>
<td>12</td>
<td>.62</td>
<td>.12</td>
<td>.24</td>
<td>.01 - .48</td>
</tr>
<tr>
<td>Modified LTE-Q</td>
<td>16</td>
<td>.67</td>
<td>.11</td>
<td>.25</td>
<td>.01 - .48</td>
</tr>
<tr>
<td>Birth to Age 10 Years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original LTE-Q</td>
<td>7</td>
<td>.43</td>
<td>.10</td>
<td>.13</td>
<td>.01 - .31</td>
</tr>
<tr>
<td>Modified LTE-Q</td>
<td>11</td>
<td>.52</td>
<td>.09</td>
<td>.12</td>
<td>.01 - .31</td>
</tr>
<tr>
<td>Age 11 to 13 Years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original LTE-Q</td>
<td>8</td>
<td>.47</td>
<td>.10</td>
<td>.11</td>
<td>.01 - .27</td>
</tr>
<tr>
<td>Modified LTE-Q</td>
<td>12</td>
<td>.56</td>
<td>.10</td>
<td>.11</td>
<td>.01 - .27</td>
</tr>
<tr>
<td>Age 14 to 17 Years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original LTE-Q</td>
<td>11</td>
<td>.58</td>
<td>.11</td>
<td>.19</td>
<td>.03 - .44</td>
</tr>
<tr>
<td>Modified LTE-Q</td>
<td>15</td>
<td>.64</td>
<td>.11</td>
<td>.20</td>
<td>.03 - .44</td>
</tr>
<tr>
<td>Age 18 to 25 Years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original LTE-Q</td>
<td>11</td>
<td>.67</td>
<td>.15</td>
<td>.29</td>
<td>.04 - .50</td>
</tr>
<tr>
<td>Modified LTE-Q</td>
<td>15</td>
<td>.70</td>
<td>.14</td>
<td>.28</td>
<td>.04 - .50</td>
</tr>
</tbody>
</table>
Table M2.

*T-tests of Key Variables: Identification as African-American/Black vs. Other Ethnicity*

<table>
<thead>
<tr>
<th>Variable</th>
<th>AA/Black n = 115</th>
<th>Other Ethnicity n = 20</th>
<th>95% CI for Mean Difference</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>EOD Frequency (replaced; n=28)</td>
<td>8.98 7.05</td>
<td>11.95 6.91</td>
<td>-6.33, .40</td>
<td>-1.75</td>
<td>133</td>
</tr>
<tr>
<td>EOD Situation (replaced; n=28)</td>
<td>3.30 1.79</td>
<td>3.85 1.81</td>
<td>-1.41, .31</td>
<td>-1.28</td>
<td>133</td>
</tr>
<tr>
<td>REMS Total</td>
<td>.36 .19</td>
<td>.47 .20</td>
<td>-.20, -.02</td>
<td>-2.42*</td>
<td>131</td>
</tr>
<tr>
<td>Vicarious RD</td>
<td>1.95 1.83</td>
<td>2.09 1.83</td>
<td>-1.03, .73</td>
<td>-.34</td>
<td>133</td>
</tr>
<tr>
<td>MIBI Centrality</td>
<td>4.92 1.06</td>
<td>4.94 1.27</td>
<td>-.55, .50</td>
<td>-.10</td>
<td>133</td>
</tr>
<tr>
<td>MIBI Private Regard</td>
<td>6.36 .85</td>
<td>6.33 .70</td>
<td>-.37, .42</td>
<td>.18</td>
<td>133</td>
</tr>
<tr>
<td>MIBI Public Regard</td>
<td>2.96 .98</td>
<td>3.19 1.32</td>
<td>-.73, .27</td>
<td>-.91</td>
<td>133</td>
</tr>
<tr>
<td>MEIM-R Total</td>
<td>3.80 .83</td>
<td>4.18 .79</td>
<td>-.78, .01</td>
<td>-1.94</td>
<td>133</td>
</tr>
<tr>
<td>IAT</td>
<td>.02 .33</td>
<td>-.08 .26</td>
<td>-.06, .25</td>
<td>-.60</td>
<td>133</td>
</tr>
<tr>
<td>LTE-Q modified</td>
<td>4.16 2.70</td>
<td>4.65 3.50</td>
<td>-.06, .25</td>
<td>1.26</td>
<td>133</td>
</tr>
<tr>
<td>BMI</td>
<td>27.40 7.11</td>
<td>26.29 5.20</td>
<td>-2.19, 4.40</td>
<td>.67</td>
<td>133</td>
</tr>
<tr>
<td>waist circumference</td>
<td>82.98 15.46</td>
<td>78.68 11.70</td>
<td>-2.88, 11.48</td>
<td>1.19</td>
<td>133</td>
</tr>
<tr>
<td>waist-hip ratio</td>
<td>.79 .06</td>
<td>.77 .05</td>
<td>-.01, .05</td>
<td>1.30</td>
<td>133</td>
</tr>
<tr>
<td>hair cortisol (n=56 AA, n=13 other)</td>
<td>15.32 24.93</td>
<td>10.35 4.34</td>
<td>-8.96, 18.89</td>
<td>.71</td>
<td>67</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01
Table M3.

*Measures of Central Tendency for Hair Cortisol Reported in Recent Studies*

<table>
<thead>
<tr>
<th>Authors/Year</th>
<th>Hair Cortisol in pg/mg</th>
<th>Sample Description</th>
<th>Control Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lehner, Dubois, Maslowsky, Laudenslager, and Steinhardt (2016)</td>
<td>Median of participants whose HbA1C &lt; 6.5 = 13.65 (SD = 28.03)</td>
<td>61 African American adults, 85% female, mean age 54 years.</td>
<td>sex, age, chronic health conditions, exercise, diabetes medication use, depressive symptoms</td>
</tr>
<tr>
<td>Wester, van der Wulp, Koper, de Rijke, and van Rossum (2016)</td>
<td>Mean = 6.1 (95%CI: 3.9, 9.6)</td>
<td>9 &quot;healthy volunteers&quot; (all adults)</td>
<td>none</td>
</tr>
<tr>
<td>Vliegenthart et al. (2016)</td>
<td>Mean = 3.37 (range: 0.28-38.26)</td>
<td>270 children, 4 - 17 years old</td>
<td>sex, age, ethnicity</td>
</tr>
<tr>
<td>McLennan, Ihle, Steudte-Schmiedgen, Kirschbaum, and Kliegel (2016)</td>
<td>Mean =15.08 (SD =14.62)</td>
<td>257 German nurses, mean age 42 years, 90% women.</td>
<td>washing frequency</td>
</tr>
<tr>
<td>Gidlow, Randall, Gillman, Silk, and Jones (2016)</td>
<td>Mean =10.8 (SD = 9.4)</td>
<td>132 adult public sector workers in the UK, mean age 41 years, 81% women</td>
<td>washing frequency, chemical processing, BMI, age</td>
</tr>
<tr>
<td>Wosu et al. (2015)</td>
<td>Median= 11.2 for Black women (range: 6.8 - 26.4)</td>
<td>102 adults aged 18 - 72 years (mean age 32), including Black, Hispanic &amp; White individuals, recruited from 5 hair salons and barbershops in Greater Boston area.</td>
<td>smoking (higher hair cortisol), chemical hair treatment (lower cortisol for those Black women who used processing.)</td>
</tr>
</tbody>
</table>
Appendix N. Demographic Data Questionnaire

SECTION A: Who Am I?

To start, we'd like to learn more about you. Please write in your answers or check the appropriate box.

1. I am ___ years old today.

2. I attend this college or university: (please write in name) ________________________________

3. **Right now**, I am studying to earn a(n):
   - [ ] Associate's Degree
   - [ ] Bachelor's Degree
   - [ ] Master's Degree
   - [ ] Doctoral Degree
   - [ ] Professional Degree

4. My year in college is:
   - [ ] Freshman
   - [ ] Sophomore
   - [ ] Junior
   - [ ] Senior/ 5th year
   - [ ] Graduate Student

5. I earned a GED:  
   - [ ] no
   - [ ] yes

6. I graduated/attended this high school: (please write in name) ________________________________
   which is located in: ____________________________ city ____________________________ state
Please write in your answers or check the appropriate box.

7. Right before I came to college or graduate school, I lived in:
   
   city                     state

8. I am:
   - single
   - married
   - divorced
   - widowed

9. My cigarette smoking status is:
   - I have never smoked cigarettes.
   - I used to smoke cigarettes but don't anymore.
   - I currently smoke cigarettes.

SECTION H

Now we'd like to ask you a few questions about you and your family. Please write in your answers or check the appropriate box.

1. Did your **mother**, or the person who raised you (for example, grandmother, foster mother, guardian) work outside the home when you were growing up?

   [ ] yes  [ ] no

2. **If yes**, what kind of work did this person do?

   (please write in name of job/type of work)
3. Did your **father**, or the other person who raised you (for example, grandfather, foster father, guardian) work outside the home when you were growing up?

   [ ] yes  [ ] no

4. **If yes**, what kind of work did this person do?

   (please write in name of job/type of work)

5. The highest level of education my **mother** (or the person who raised me) completed was:

   - [ ] less than 8th grade
   - [ ] less than high school
   - [ ] high school or G.E.D.
   - [ ] Associate's Degree
   - [ ] Bachelor's Degree
   - [ ] Master's Degree
   - [ ] Doctoral Degree

6. The highest level of education my **father** (or the person who raised me) completed was:

   - [ ] less than 8th grade
   - [ ] less than high school
   - [ ] high school or G.E.D.
   - [ ] Associate's Degree
   - [ ] Bachelor's Degree
   - [ ] Master's Degree
   - [ ] Doctoral Degree

7. My parents or guardians help me pay my bills and expenses now:

   [ ] yes  [ ] no
8. When I was in high school, I was eligible for:

- [ ] free lunch or breakfast
- [ ] reduced price lunch/breakfast
- [ ] neither free nor reduced price lunch/breakfast

THANK YOU!
Appendix O. Hair Cortisol Questionnaire

Thank you for agreeing to participate in the hair cortisol portion of this study. Please fill out the short questionnaire below. Thank you!

1. **During the past 3 months, have you used any kind of medicated ointment, lotion, cream, gel or other treatment that you apply to your skin or scalp with your hands or fingers, whether it is prescribed by a healthcare professional or is available over-the-counter?** (Not moisturizers, only medicated ointments or lotions that are used to treat a skin condition)

   [ ] no (please go on to question 3 below)

   [ ] yes

2. **IF yes, please name the lotion(s), ointments or treatment(s).** If you can't remember what it is called, please tell us what it is used for (for example: eczema, psoriasis, acne). Use as many lines as you need. *Then please raise your hand so study staff can determine whether you are eligible for this part of the study.* (Please leave this area blank if you haven't used any medicated skin treatments.)

3. **Have you used a chemical hair perm or relaxer in the last 12 months?**

   [ ] no

   [ ] yes

4. **IF you have used a perm or relaxer, when was your most recent treatment or touch-up?** (Please leave the boxes blank if you haven't used this in the past year.)

   [ ] less than 4 weeks ago

   [ ] 4 weeks to 12 weeks ago

   [ ] 3 to 6 months ago

   [ ] 6 to 12 months ago
5. Are you currently transitioning to a natural hairstyle?

- [ ] no
- [ ] yes

6. If you are transitioning, when was your LAST chemical treatment or touch-up? (Please leave boxes blank if you are not transitioning.)

- [ ] less than 4 weeks ago
- [ ] 4 weeks to 12 weeks ago
- [ ] 3 to 6 months ago
- [ ] 6 to 12 months ago

7. Have you or your hairdresser **bleached** your hair during the past 3 months?

- [ ] No
- [ ] Yes

8. Have you or your hairdresser **colored** your hair during the past 3 months?

- [ ] No
- [ ] Yes

9. How many times **a month** do you usually wash your hair with **shampoo/cleanser**?

- [ ] I don't use shampoo/cleanser
- [ ] 1 time a month
- [ ] 2 or 3 times a month
- [ ] 4 or 5 times a month
- [ ] 6 or 8 times a month
- [ ] more than 8 times a month
10. Do you use a hair **conditioner**?

- [ ] no
- [ ] yes

What do you usually use to condition your hair?

(Please write in above, and leave blank if you don't use one.)

11. What do you usually use as a **moisturizer** for your hair?

(Please write in above, and leave blank if you don't use one.)

12. **How often do you use organic products on your hair?**

- [ ] almost never
- [ ] occasionally
- [ ] most of the time
- [ ] almost always

13. Do you use a **hot comb** or **flat iron** on your hair?

- [ ] no
- [ ] yes

14. **IF** you use a hot comb or flat iron, about how often do you use it?

(please leave boxes blank if you never use one)

- [ ] more than once a week
- [ ] weekly
- [ ] two or three times a month
- [ ] once a month
- [ ] less than once a month
15. We would like to know about the factors that influenced your decision to participate in hair collection. Please use your own words to tell us in the blank area below.

16. At the completion of the study, would you like to receive the results of your hair cortisol analysis?

[ ] yes

[ ] no
IF you would like to receive results of your hair cortisol analysis, please provide contact information (an email or street address) where we can inform you of your results. Please write in your information carefully on the line(s) below, and be sure this is an address that will be valid as long as 12 months from now. Your results will not have your name on them, but will be addressed to "Study Participant" for privacy. **If you do not want your results mailed to you, leave these lines blank.**

___________________________________________________________

___________________________________________________________

Thank you! Please let us know you are finished.
Informed Consent to Participate in a Research Study

Study Title: Discrimination, Identity and Obesity among Collegiate African American Women

Principal Investigator: Mary K. Anthony PhD; Laura Manns-James, PhD (c) (student co-investigator)

You are being invited to participate in a research study. This consent form will provide you with information on the research project, what you will need to do, and the associated risks and benefits of the research. Your participation is voluntary. Please read this form carefully. It is important that you ask questions and fully understand the research in order to make an informed decision. You will receive a copy of this document to take with you.

Purpose: The purpose of this study is to better understand relationships between stressors experienced by young African American women and their health, and whether feelings and attitudes about group membership influence those relationships.

Procedures: If you choose to participate in this study, it will take about one hour and 15 minutes, and you will be asked to complete the following steps:

1. You will be asked to fill out questionnaires about stressors you may have experienced in the past, including perceptions about discrimination. You will also be asked to fill out questionnaires about your thoughts and feelings about being an African American woman. You will be asked about whether you have ever smoked cigarettes and about whether you have used certain medications. As is standard with most research studies, you will be asked some questions about your marital status, income, socioeconomic status, family and personal educational attainment, and where you live (but not your address).

2. You will be asked to complete a short activity on a computer that will ask you to match images and words with the categories they belong in. This takes about 5 or 10 minutes and uses two keys on the computer keyboard.

3. Your height and weight will be measured, and study personnel will measure your waist and hip circumference with a tape measure.
The last part of the study is optional. In this step, we will try to measure a stress hormone called cortisol. If you are interested, here are the steps:

1. You will be provided with a short questionnaire about your hair care practices to fill out, and we will ask you about why you chose to participate in hair sampling.

2. You will select a location on the upper back portion of your head. Before the actual hair sampling is done, you will be able to see the amount of hair to be included in the cut, and verify the location using a mirror.

3. A member of the research team will part the hair on the back of your head in that area, and cut a small amount of hair (about half the diameter of a pencil) near your scalp. This will be taken from an area underneath the top layers of hair, and will not be visible for most hairstyles. This hair sample will be analyzed for levels of a hormone called cortisol, which is normally produced in the body by the adrenal gland.

If you choose to participate in hair sampling and wish to know your own measurement for hair cortisol, we will provide you with that information at the time the analysis is complete at the end of the study. We will provide you with your own results compared to the average level and range of study participants. However, your own results cannot be used for diagnostic or clinical reasons because the clinical ranges for normal levels of hair cortisol have not been set.

If you choose NOT to participate, we will ask if you are interested in sharing your reasons for not participating. We are very interested in learning more about why women choose to participate or not participate in this part of the study, because that information will be important for future studies about African American women and stress.

Please pick one of the choices below:

☐ I agree to have my hair sampled.

☐ I do not agree to have my hair sampled, but am willing to provide information about my reasons for deciding not to participate in that part of the study.

☐ I do not agree to have my hair sampled, and do not agree to provide information about my reasons for deciding not to participate in that part of the study.
Benefits

This research will not directly benefit you, but participation may help improve understanding of the relationships between stressors, group identity and health in young African American women.

Risks and Discomforts

This study uses questionnaires and modifications to questionnaires that have been validated in the health literature and used in other studies. Some of the questions may be upsetting, or you may feel uncomfortable answering them. If you do not wish to answer a question, you may skip it and go on to the next question. Also, resources will be available to help you access counseling services if anything you think about or experience during the study causes you to want extra support. We do not anticipate that the questions in general will be more upsetting than what you may encounter in daily life.

While we anticipate that hair sampling may involve slight temporary discomfort (a pulling sensation), it is not expected to cause pain. The very small amount of hair removed will in most cases not be noticeable, but it is possible that you will decide you need to visit your stylist at your own expense for an additional treatment or hairstyle as a result of participation in hair collection.

Privacy and Confidentiality

Your participation in this study and all of the records from it (laboratory results, measurements, and your responses to questionnaires and the computerized matching task) will be kept confidential. At no time will your answers to questionnaires, your weight or measurements, or your computerized matching task results be linked to your name or other personally identifying information. Your signed consent form will be kept separate from your study data, and no data will be linked to your name and contact information unless you wish to know your own cortisol results at the end of the study.

Research participants will not be identified in any publication or presentation of research results; only group summaries will be used. If you decide to participate in hair sampling and wish to receive your cortisol results, we will ask you to provide us with contact information so we can mail or email your results. The contact information will be kept separate from the results and won't be known to anyone except study personnel.

Your study-related information will be kept confidential within the limits of the law. We will make every effort to protect your confidentiality, however absolutely confidentiality cannot be guaranteed. Should you disclose an intention to harm yourself to a member of the research team, we would break confidentiality in order to ensure you are linked with appropriate mental health care to protect your safety.
Compensation

To compensate you for your time in participating in the entire study, you will receive a gift card worth $45 at Amazon.com. If you do not wish to complete the hair questionnaire and sampling, but complete all of the other components of the study, you will receive a gift card worth $30.

Voluntary Participation

Taking part in this research study is entirely up to you. You may choose not to participate or you may discontinue your participation at any time without penalty or loss of benefits to which you are otherwise entitled. Participating or not participating in this study will not affect your grades or academic standing in any way.

Contact Information

If you have any questions or concerns about this research, you may contact Laura Manns-James at (study-specific number TBA) or Dr. Mary Anthony, the doctoral advisor for this project, at (330) 672-8824. This project has been approved by the Kent State University Institutional Review Board. If you have any questions about your rights as a research participant or complaints about the research, you may call the IRB at (330) 672-2704.

Study Consent Statement and Signature

I have read this consent form and have had the opportunity to have my questions answered to my satisfaction. I voluntarily agree to participate in this study. I understand that a copy of this consent will be provided to me for future reference.

__________________________________________________________
Participant Signature                                      Date

__________________________________________________________
Witness                                                    Date
Dear Study Participant,

Several months ago, you participated in a study for African American women about stress and health, and you provided a hair sample for cortisol analysis. Thank you for your participation!

Enclosed with this letter is the result of your hair cortisol analysis that you requested. Hair was tested in the Behavioral Immunology and Endocrinology Lab of the University of Colorado Anschutz Medical Campus. All samples met the criteria for adequate amounts of hair to test.

This lab is not in a healthcare institution. Your results cannot be used for diagnostic or clinical reasons because the clinical ranges for normal levels of hair cortisol have not been set. We also are not able to provide any additional information about your personal cortisol results. Ranges listed are only from this study's participants. The results have not been adjusted for hair care practices like perming, coloring, frequency of washing or product use.

Testing hair cortisol is a new technology, and many things can influence hair cortisol results. While cortisol levels may be influenced by stress, cortisol is not a direct measure of exposure to stress and cannot tell you how much stress you are under. If you are concerned about your results, you may share them with your primary care clinician (doctor or advanced practice nurse). If you have any concerns about your health, the University Health Center includes services for physical and mental health issues. The number to schedule an appointment at the University Health Center is (330) 672-2322, or you may schedule online at https://deweese.uhs.kent.edu/.

Thank you again for participating in the study!

Contact information you shared with us:

Your result for hair cortisol:

Median hair cortisol for this study: 8.67 pg/mg

Range of hair cortisol for this study: 1.84 pg/mg - 7248.0 pg/mg
### Appendix R. Model-Specific Decision-Making for Multiple Regression Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Potential Issues with MR Assumptions? yes (Y)/no (N)</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolerance VIF Durbin-Watson linearity normality homoscedasticity Mahalanobis Leverage Studentized Residual Cook's</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main effects: RD and BMI</td>
<td>N N N N N N N N N N Y</td>
<td>All cases used</td>
</tr>
<tr>
<td>Main effects: RD and waist circumference (WC)</td>
<td>N N N N Y Y Y N N N N Y</td>
<td>Excluded 7 cases on basis of Cook's.</td>
</tr>
<tr>
<td>Main effects: RD and waist-hip ratio (WHR)</td>
<td>N N N N N Y N N N N Y</td>
<td>Excluded 3 cases based on Cook's.</td>
</tr>
<tr>
<td>Private Regard on BMI</td>
<td>N N N N N Y N Y Y N Y</td>
<td>5 cases based on Cooks &amp; Mahalanobis, no change in model; all cases used.</td>
</tr>
<tr>
<td>Private Regard on WC</td>
<td>N N N N N Y Y Y Y Y</td>
<td>1 influential case identified with studentized residual &gt; 4 and Cook's distance near 1 (&gt;.08); removing it improved normality of residuals, but not other parameters. 13 other cases were potential outliers. Removing these reduced independence of residuals, so these cases were retained.</td>
</tr>
</tbody>
</table>

252
<table>
<thead>
<tr>
<th>Model</th>
<th>Potential Issues with MR Assumptions? yes (Y)/no (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tolerance</td>
</tr>
<tr>
<td>Private Regard on WHR</td>
<td>Y</td>
</tr>
<tr>
<td>Public Regard on BMI</td>
<td>Y</td>
</tr>
<tr>
<td>Public Regard on WC</td>
<td>Y</td>
</tr>
<tr>
<td>Public Regard on WHR</td>
<td>Y</td>
</tr>
<tr>
<td>Centrality on BMI</td>
<td>N</td>
</tr>
<tr>
<td>Centrality on WC</td>
<td>Y</td>
</tr>
<tr>
<td>Centrality on WHR</td>
<td>N</td>
</tr>
<tr>
<td>Ethnic Identity on BMI</td>
<td>Y</td>
</tr>
<tr>
<td>Ethnic identity on WC</td>
<td>Y</td>
</tr>
</tbody>
</table>

<p>| Decision                        | Removed 3 influential cases.  |
|                                | 6 outliers identified, Analysis run with and without  |
|                                | 8 cases removed, resolving issues  |
|                                | 4 outliers identified based on Cook's &amp; Mahalanobis, no changes in model with or without; all cases included.  |
|                                | 3 outliers, no changes in model; all cases included  |
|                                | 7 cases excluded, removal resolved issues with discontinuity of normal distribution. Changed betas.  |
|                                | 4 outliers removed, resolving issues.  |
|                                | 2 outliers identified, no change in model. All cases included.  |
|                                | 5 cases identified as outliers, removal did not improve P-P or change model significance.  |</p>
<table>
<thead>
<tr>
<th>Model</th>
<th>Tolerance</th>
<th>VIF</th>
<th>Durbin-Watson</th>
<th>linearity</th>
<th>normality</th>
<th>homoscedasticity</th>
<th>Mahalanobis</th>
<th>Leverage</th>
<th>Studentized Residual</th>
<th>Cook's</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnic Identity on WHR</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>2 cases identified, no change in model. All cases included.</td>
</tr>
<tr>
<td>Implicit Racial Identity on BMI</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>4 possible outliers identified; no change in model with removal. All included.</td>
</tr>
<tr>
<td>Implicit Racial Identity on WC</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>removal of 9 cases resolved issues.</td>
</tr>
<tr>
<td>Implicit Racial Identity on WHR</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>7 cases identified; removal changed model and improved normality and homoscedasticity.</td>
</tr>
</tbody>
</table>
Appendix S.  Narrative Data for Hair Sample Decision-Making

Narrative Data for Hair Sample Decision-Making

Participants described many reasons why they chose to participate or not participate in hair sampling. Opinions about the amount of hair requested were varied. Some women felt the amount needed to participate was minimal, and expressed sentiments to the PI such as "my hair grows fast" or "I lose that much when I brush it out". Other women were concerned about the cosmetic impact of sampling and felt that the amount was more than they were comfortable losing. One woman who originally decided to participate changed her mind at the point of collection. Initially, she wrote:

- When I realized that the sample amount that they would be using wouldn't impact my hairstyle as a whole, I was a little less apprehensive. I was also interested in know my cortisol level. An additional $15 on the gift card was also a factor I took into consideration. And finally it's a painless process.

After she decided to decline, she wrote:

- The sample size of the hair they needed was a little much. For African American women our hair is almost a part of who we are. It takes African American women a significantly long time to grow hair especially past their shoulders. The task of having to lose a chunk is a little daunting. I was also worried about how noticeable the sample would be.

Several women who declined (n=5) discussed the cultural importance of hair to African American women. One woman reported:
• I chose not to participate in the section of the study that requires taking a hair sample because I don't wish for a piece of my hair to be cut. Even though it would only be a small piece, I've worked hard to grow my hair and keep it healthy in its natural state and I wouldn't want a small piece not growing at the same rate as the rest of it. Hair is a big thing in the African American community, and many women like myself have converted to being "natural" which means wearing out hair in the curly, kinky state in which it grows instead of perming it (relaxing) to make it straight or covering it up with weave. I take pride in my hair and its growth and I just don't want a piece of it being snipped off.

Another woman explained,

• I'm really curious about cortisol and what the analysis would mean. However, besides the Amazon gift card, I do feel like the hair sample may not really be worth it to most African American women because our hair is something we're very sensitive about. It seems that the study would not offer enough for the price of cutting our hair (even if it’s a small bit). Perhaps compensate more for volunteers (not in money exactly) but maybe offer more data or analysis besides cortisol. That way it may be worth it (to cut our hair) for the sake of the study.

Several women discussed sensitivity about their hair based on its manageability and meaning within their family. Two women specifically cited their mothers' opinion in their reasons to decline collection:
- I do not want to participate in the hair collection simply because I do not want anyone to cut my hair that much. Maybe a little trim on the ends but not all the way up to the shaft. I'm also afraid it will not grow back all the way. My hair is considered "good hair" for black people. I have never had a perm and never bleached it with color dye. My hair is full, long and thick. My mother would be upset if I did this.

- I have been dealing with a lot of hair problems recently. It has not been growing in in the way it should. My mother suggested a hair style that will allow my hair to grow better. With that, we will not be able to take the hair sample from the area in which is required. Even it was possible, I would not want to risk more hair problems.

Many women reported wanting to further the research goals as an important part of participating, often citing the need for more research on African American health as important. One woman explained:

- I think that it is important to help in research, especially research that closely relates with me. By participating, other African American women can get help when it comes to stress and racial identity as well as overall health.

Another stated:

- I would want to help people recognize about this study and I believe it could help African Americans/Blacks come together. I am also interested in this study because it has something to do with my race and I would like to represent.
Most participants who provided samples (87.3%) were interested in learning their own results for hair cortisol, and for some women this was their primary rationale for participating:

- The main reason that influenced my decision to participate in the hair collection is to know the cortisol levels. I think it would be a fascinating learning experience about myself.
- I am actually very interested in the amount that cortisol is deposited into the hair. I have no problem with releasing some hair because I know it will grow back.

Participants who chose to have their hair sampled were compensated an additional $15 because of the extra time hair sampling took. Several participants cited this as a factor in decision making (n=12) or even the sole reason for participating (n=2):

- It didn't seem too invasive to me personally, and I figured it is just hair, and it will grow back. I also feel the 15 extra dollars was worth it.
- Honestly, the price difference for the gift card b/c that will be someone Xmas gift.

Another woman cited the additional compensation as a factor in non-participation, and additionally identified hair as being both personal and an important part of the self.

- My hair is a part of me. I feel giving my hair away for an additional amount on a gift card would be a start to something I would rather not begin. For me, I would feel shallow because I greatly value my hair. I love my hair and I work hard to maintain it. Would you want to give up something that you loved,
invested in, and worked hard to maintain for $15 when it would take years (+) to grow back?

A few other women echoed the idea that hair was important and personal, and that it would feel strange or even damaging to part with it:

- I've always had a good amount of hair. As a Black woman I find it that I face a lot of criticism about my beauty if my hair wasn't/isn't aline (sic) with current trends. Within the last year I decided to go natural, as in not chemical treatment to straighten my natural textures. My hair is final at a socially pleasing length and to cut it, even a small selection seems like self-harm.

- I have not participated in the hair collection part of this research because I have a weave, also known as false hair sew-in to my real hair and therefore my real hair in the spot that they would like to sample is not visible. I am also really attached to my hair at the moment and if I see it get chopped out, I will probably freak out because it has taken me forever to grow it out to this length.

- I'm very sensitive about my hair. It is healthy and has just been cut into a new style, cutting it just isn't in my best interest.