#### THESIS

# PATHWAYS UNDERLYING DIFFERENCES IN HEALTH BETWEEN WHITE AND BLACK AMERICANS: EXPLORING THE ROLE OF RACIAL DISCRIMINATION

Submitted by

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#### ABSTRACT

# PATHWAYS UNDERLYING DIFFERENCES IN HEALTH BETWEEN WHITE AND BLACK AMERICANS: EXPLORING THE ROLE OF RACIAL DISCRIMINATION

This study explored the association between experiencing racial discrimination and poor health outcomes between White and Black Americans. Secondary data from wave 11 of HRS (N = 17,085) were used to test the research questions of whether the experience of racial discrimination mediates the relationship between race and poor health, and whether this association differs for Whites and Blacks. Much of the previous literature has focused on understanding how race differences in health may be explained by racial discrimination experiences, and the current study built on this work by testing the extent to which group differences in health between White and Black Americans may be explained (i.e., mediated) by different types of racial discrimination experiences: less severe everyday experiences vs. major racial discrimination. Moreover, much less is known regarding how racial discrimination experiences may be differentially linked to health outcomes for Whites compared to Blacks. To test these questions, self-reported and objective measures of health were used along with the Major Experiences of Lifetime Discrimination and Perceived Everyday Discrimination scales. Results indicated that experiences with major discrimination significantly accounted for differences in self-rated health and number of health conditions for Blacks. Further, for Blacks experiences with both types of discrimination were related to poorer health for total number of chronic health conditions and systolic and diastolic blood pressure, whereas for Whites

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experiences with either type of discrimination were associated with improvements in health in self-rated health and total number of chronic health conditions.

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#### INTRODUCTION

The effects of racism in all its forms (e.g. discrimination, institutional racism, etc.) has long been a topic of study. Racism includes attitudes, beliefs, or acts that disparage individuals or groups of people based on race (Clark, Anderson, Clark, & Williams, 1999). Racial discrimination, however, is specific to behaviors and can be defined as prejudiced or unfair treatment of different people, based on their race (Lee, Kim, & Neblett, 2017). Experiencing racial discrimination is often a stressful part of daily life for many Black people living in the United States, and this type of psychosocial stressor has been linked to deleterious physical health effects (Berger & Sarnyai, 2015; Chae et al., 2010; Lee et al., 2017). The consequences of chronic stress as a result of racial discrimination have been associated with senescence, high blood pressure, calcification of the coronary arteries, and cardiovascular disease (Berger & Sarnyai, 2015). Much of the previous work has focused on understanding how race differences in health may be explained by racial discrimination experiences. The current study built on this work by testing the extent to which group differences in health between White and Black Americans may be explained (i.e., mediated) by different types of racial discrimination experiences: less severe everyday experiences vs. major racial discrimination. Moreover, much less is known regarding how racial discrimination experiences may be differentially linked to health outcomes for Whites vs. Blacks. That is, are the associations between racial discrimination and health outcomes stronger for Whites compared to Blacks? The current study addresses these research questions.

#### **Theorized Pathways Between Racial Discrimination and Health**

#### Everyday and Major Discrimination as a Stressor

Racial discrimination is an ongoing, daily event experienced by many people of color, including Black Americans, even though existing legislation was developed to prevent these experiences from occuring (Chae et al., 2010). Racial discrimination is multifaceted and takes many forms, such as through major experiences such as discrimination in housing, employment, healthcare (Heldreth et al., 2016), education disparity, and racial profiling, which tend to have a greater impact on health and well-being, including socioeconomic status (Ayalon & Gum, 2011). Racial discrimination may also manifest as more common everyday discrimination including unfair treatment that may be focused primarily on assaults to one's character (Ayalon & Gum, 2011; Luo, Xu, Granberg, & Wentworth, 2012) such as being treated with less courtesy or respect, receiving poorer service, and others acting as if they are afraid of you. The present study adds to the literature by examining the role that major and everyday experiences with discrimination may play in uniquely predicting health outcomes. Exploring the degree to which differences in these types of discrimination may uniquely predict health outcomes is not as well researched in this topic area, allowing our study to build on and add to existing literature.

As of 2016, Black Americans are incarcerated approximately five times more than Whites, and within 12 state prisons more than half of the inmate populations are Black (Nellis, 2017). Audit studies have also found that Black Americans are less likely to be hired for jobs than White Americans (Lee et al., 2017; Quillian, Pager, Hexel, & Midtboen, 2017), and studies using nationally representative samples have found Blacks frequently experience racism which was associated with negative impacts in employment and housing opportunities, as well as in healthcare (Heldreth et al., 2016). Being incarcerated at higher levels than Whites, having differential access to resources (i.e. education, healthcare), and being less likely to be hired for jobs (Quillian et al., 2017) further illustrates how racial discrimination can be present in

everyday and major lifetime experiences in Black American's lives. Steps have been taken to reduce unfair treatment and create equal opportunity for Blacks in the domains listed previously, through government laws and policies such as affirmative action. The enforcement of these laws and policies have been related to Whites perceiving them as unfair, as well as Whites feeling they have been discriminated against (Kravitz & Klineberg, 2000).

#### Racial Discrimination, Health, and the Inflammatory Response

It is argued that Black people are currently one of the most discriminated against and stigmatized racial groups within the United States (Brondolo et al., 2011), and much research has focused on the psychological effects of such treatment leading to anxiety and depression (Lee et al., 2017). Black men in particular have an increased risk of cardiovascular disease, hypertension, stroke, myocardial infarction and heart failure (Chae et al., 2010). Black men also have the highest mortality risk and possess the lowest life expectancy out of any other racial or ethnic group within the U.S. (Chae et al., 2010). When compared to other racial groups within the U.S., Black Americans display more age-related chronic diseases with more severity at earlier stages of life (Brody et al., 2014) and increased risk of inflammation and metabolic risk factors (Berger & Sarnyai, 2015).

Inflammation occurs in the body in response to infection, injury, or psychological stress (Black, 2002; Medzhitov, 2008). The stress response in the human body evolved out of the inflammatory response, and these two responses are entangled with one another (Black, 2002). The inflammatory response serves to remove the source of inflammation and above all return the body back to its homeostatic state (Medzhitov, 2008). Experiencing stress has been shown to activate the acute phase response (APR) in the body, which is the bodily response to any type of tissue damage or infection. The APR specifically consists of physiological reactions to repair

damage, promote wound healing, and enlist defense mechanisms within the body to protect against further damage (Black, 2002). APR occurs as a part of a cascade effect, such that physical or psychological stress occurs which triggers the release of cytokines or corticosteroids. It is these cytokines or corticosteroids that induce the APR, leading to the production of acute phase proteins such as C-reactive protein (CRP). CRP serves as a marker of the inflammatory process, and has been found to increase 1000-fold during an inflammatory response (Black, 2002). Elevated levels of CRP are healthy when a part of an acute immune response, but chronic elevation can lead to physiological dysregulation and diseases such as myocardial infarction, stroke, atherosclerosis, cardiovascular disease or hypertension (Black, 2002; Crimmins et al., 2013). Thus, CRP is an important biomarker to study because it has also demonstrated independent predictive value for cardiovascular diseases along with conventional risk factors (Genest, 2010).

#### **Application of Theory to Racial Discrimination and Health Outcomes**

#### Chronic Stress and Allostatic Load.

Stressors induce emotional and physiological responses that may assist individuals with coping with potential threats (Berger & Sarnyai, 2015). These stress responses are adaptive when coping with acute stressors, but may lead to dysregulation and poorer health when stressor exposure and responses are frequent and/or prolonged. A heightened state of arousal allows stress hormones (e.g. corticosteroids, epinephrine, norepinephrine) and bodily responses to accumulate, leading to allostatic load. Allostatic load can be defined as a cumulative measure of the "wear and tear on the body's systems owing to repeated adaptation to stressors" (Geronimus, Hicken, Keene, & Bound, 2006, p. 826). The presence of multiple health conditions are a way bodily responses may accumulate such as through hypertension, cardiovascular disease, and high

blood pressure. Allostatic load is typically identified through two types of interrelated biomarkers that are associated with chronic stress. The first type is a proximal biomarker, which are hormones the body releases via the stress response systems (Geronimus et al., 2006) or inflammatory response systems such as CRP, which is a biomarker of interest in this study<del>.</del>

The second type of biomarkers that are of interest to this study are the distal effects these hormones have on the body, such as increased blood pressure, increased cholesterol and glycosylated hemoglobin (HbA1c) (Geronimus et al., 2006). Increased levels of blood pressure are associated with stroke, coronary heart disease, and kidney failure (Crimmins et al., 2008), and higher levels of total cholesterol can predict myocardial infarction, stroke, and kidney disease (Crimmins et al., 2013). The biomarker HDL cholesterol is an indicator of "good" cholesterol and is associated with lower prevalence of vascular conditions, and HbA1c is glycosylated hemoglobin, a summary of blood glucose over the past 120 days (Crimmins et al., 2013). Elevated HbA1c is considered a risk factor for cardiovascular disease and other diabetesrelated conditions (Little & Sacks, 2009). Objective measures of health such as blood pressure and hand grip strength are global measures of health that can be used to predict mortality, frailty, and health conditions (Bohannon, 2008; Geronimus et al., 2006). Hand grip strength has also been shown to be related to physical traits such as frailty and can be predictive of other conditions such as cardiovascular disease (Massy-Westropp, Gill, Taylor, Bohannon, & Hill, 2011).

Using multiple methods to assess an individual's health may aid in creating a more complete, comprehensive picture by utilizing self-reported (self-rated health) and objective health measures such as hand grip strength and cholesterol. Single item self-rated measures of health have been shown to have a strong association with morbidity and mortality outcomes

(DeSalvo, Bloser, Reynolds, He, & Muntner, 2005; Meng, Xie, & Zhang, 2014), and selfreported measures of health have demonstrated to be a reliable indicator of overall objective health measures (Brondolo et al., 2011; Fisher et al., 2005). They have also been shown to be a reliable and valid measure of global health, while also being predictive of morbidity and mortality (Brown & Hargrove, 2017). Biomarkers can help to validate and add information to self-reported health, and can assist in conceptualizing pathways underlying health characteristics that participant's may be unaware of and therefore not reported (Crimmins et al., 2013). Taken together, self-reported health and objective measures such as proximal and distal biomarkers can compliment each other to create a more comprehensive picture of an individual's health. In line with the previously discussed evidence of an overactive stress and inflammatory response system, it is clear how perceived experiences of racial discrimination can lead to poor health outcomes through cardiovascular disease, decreased immunologic functioning, and hypertension (Chae et al., 2010). The same physiological responses are activated when anticipating another discriminatory experience, which prolongs the activation of the stress and inflammatory responses (Lee et al., 2017). Concomitant with the evidence that many studies have found Black people to frequently experience racism (Heldreth et al., 2016), the chronicity and anticipation of such experiences may prolong stress responses and delay recovery. The prevalence of racial discrimination in Black American's lives, as well as how it can get under the skin and manifest in physical health outcomes illustrates the importance of examining whether everyday and major discrimination differentially predict health differences between Whites and Blacks.

#### Differences in Stressor-Health Linkages Between White and Black Americans

There is a multitude of evidence to suggest that experiencing racial discrimination is stressful for Black people (Brondolo et al., 2009; Clark et al., 1999; King, 2005; Lee et al., 2017; Nguyen et al., 2018; Soto, Dawson-Andoh, & BeLue, 2011; Taylor & Turner, 2002), but less is known about these effects on their White counterparts. Specifically, research is lacking on how experiencing or perceiving that one is experiencing a psychosocial stressor such as unfair treatment due to one's race can influence the health and psychological well-being of White Americans (Krieger & Sidney, 1996; Otiniano & Gee, 2012; Soto et al., 2011). While some scholars may argue that Whites cannot be discriminated against because they are the racial majority, this does not rule out that Whites cannot *perceive* that they have been discriminated against (Krieger & Sidney, 1996; Otiniano & Gee, 2012; Soto et al., 2011). Even the perception of experiencing racial discrimation can trigger the inflammatory response (Black, 2002). With the ever changing social and political climate in the United States, this topic is worthwhile to explore in an attempt to fully understand the potential effects of racial discrimination on the health of a wide array of people. The association between discrimination stressors and poorer health are hereafter referred to as *stressor-health links*.

As outlined previously, Black people disproportionately experience more race-related stressors and have been found to have disparities in chronic health conditions and diseases when compared to White Americans. However, while Black Americans experience more stressors, their appraisals of the stressors were labeled as less distressing and their overall well-being remained unimpacted (Brown, Mitchell, & Ailshire, 2018). Cognitive appraisals of stressors can be conceptualized as a process where one evaluates the stressful event and discerns whether it is relevant to them, how much it is relevant, and how significant it might be to their safety and well-being (King, 2005). Individual differences in how stressors are interpreted, along with one's coping efficacy may lead to variation in physiological reactivity to similar stressors (Carlson & Chamberlain, 2005). Within stress research frameworks, disparities in health between racial

minorities and the majority have been linked to experiencing racial discrimination, but existing research also points to racial minorities reporting less psychological distress although they report more ongoing, chronic stress (Brown et al., 2018). While it may appear to be unexpected that people who experience more stress would have comparable or even better mental health than those who do not, these conflicting patterns demonstrate the need for further research on stressor exposure and its association with health across races. However, it has been thought that these counterintuitive findings can be explained by members of the same racial group possessing protective factors such as a shared racial identity, as well as larger and more supportive social and religious networks (Brown et al., 2018). More work is needed to understand the extent to which stressor-health links differ for Whites and Blacks in physical health outcomes.

Given the lack of research in this area, it is unclear whether White individuals would find experiencing perceived racial discrimination as more or less distressing as they may encounter these experiences less frequently. It may be thought that because Whites do not experience or perceive they have experienced racial discrimination as often, that there would not be as strong of an effect on health. Lack of frequency and exposure to threats to identity may be at play, but it is worthwhile to consider that perceived 'control over one's destiny' may also be playing a role. Within public health research, Syme (1989) hypothesized how 'control over one's destiny' may be a basic social determinant of health (as cited by Whitehead et al., 2016). He posited that lack of control may be an underlying mechanism for socio-economic health disparities, specifically that feeling a sense of control over one's life (autonomy) and the opportunities for social engagement and participation are imperative for health and

longevity (Whitehead et al., 2016). Autonomy, control, and power to exercise choice are hypothesized to be important concepts towards ability to access resources to maintain and promote health. The perceived ability to exercise choice in daily life and have opportunities may begin to explain why Whites may not show associations between perceived experiences of racial discrimination and health outcomes. This same idea also supports why Blacks may show associations between experiencing racial discrimination and poorer health, as Black Americans may not feel autonomous or that there are opportunities for them in a society where they experience institutional and interpersonal maltreatment. When considering also how Blacks do not have equal access to resources, the 'control over one's destiny' theory may aid in understanding potential stressor-health link differences between races.

In a study by Reinka and Leach (2018), White participants were shown racialized images such as police force against both Whites and Blacks. Whites in their study appraised the images as more novel, reported being more surprised by these images, and displayed an increase in systolic blood pressure. Whites have been protected against threats to their majority status through a variety of means (Liu, 2017), for example through legislation such as felon disenfranchisement which prohibits convicted felons from voting in elections. This is a suitable example when considering the issue of racial profiling when law enforcement make stops and arrests, as well as the disproportionate levels of Blacks in prisons across the U.S. (Nellis, 2017). As White people are the racial majority in America, they may have more difficulty coping with unfair treatment attributed to their race because of the relative lack of historical precedence, as well as individuals having fewer opportunities to learn to cope with these situations. These experiences may lead to White Americans feeling marginalized. Novel stressors such as being discriminated against due to one's race may prolong the stress and inflammatory response, thus

potentially leading to poor health outcomes. Due to the novelty and threat to well-being, it is possible that Whites may be negatively affected by experiences of everyday or major discrimination. These new and significant developments demonstrate how more research is needed in this area, to better understand how these stressor-health links may differ for Whites and Blacks.

#### The Current Study

Previous research has investigated the association between experiencing racial discrimination and decreased psychological well-being in the forms of anxiety and depression (Lee et al., 2017) among other mental health conditions. The link between racial discrimination and poor health has also been examined, but the degree to which everyday and major experiences of racial discrimination differentially explains racial differences in health outcomes requires more study. Therefore, one goal of the current study is to determine if Black and White participant self-reported health and objective health measures are explained (i.e., mediated) by differences in everyday and major experiences of racial discrimination.

Another goal of the study is to explore whether the stressor-health associations differ for White and Black Americans, such that racial discrimination may be more strongly linked to poorer health outcomes for Whites compared to Blacks. That is, stressor-health associations may be moderated by race, given that Whites may experience racial discrimination less frequently, but may appraise these situations to be more threatening and novel.

#### **Research Aims and Hypotheses**

In the following study, racial discrimination and its association with health outcomes between White and Black Americans was explored. Specifically, two research questions address

the extent to which group differences in health between White and Black Americans are associated with experiencing racial discrimination. The first question is whether the experience of racial discrimination mediates the relationship between race and poor health. Specifically, we hypothesized that Black people will report poorer self-reported health and objective health measures than Whites. We further hypothesized that Black individuals will report more frequent everyday and major racial discrimination than their White counterparts, and that these differences in racial discrimination will mediate race differences in health outcomes. We will explore the extent to which everyday or major racial discrimination may explain more of the variance in race differences in health outcomes. The second research question is whether race moderates the association between racial discrimination and poor health. For the second research question, we hypothesized that for White people, experiences of racial discrimination will be more strongly associated with poorer self-rated health, chronic diseases, and poor health conditions compared to those for Black people. We expected this difference will be due to White Americans not having as much exposure to racial discrimination being directed towards them, and this lack of exposure will make the experience more difficult to cope with, which may cause more psychological and physical distress.

#### Method

#### Participants.

The Health and Retirement Study (HRS) is a longitudinal study on retirement and disability patterns, health and lifestyle information, and psychosocial data on middle-aged and older adults (Heeringa & Connor, 1995). The study began in 1991, with interview waves occurring approximately every two years and a refresher cohort added every six years. For the

purposes of this study only data from wave 2012 will be included as this wave is the most recent dataset including information on discrimination experiences.

HRS used probability sampling to select participants from a national sample (see Heeringa & Connor, 1995 for more details). HRS oversampled Blacks at a rate of 2:1 in comparison to Whites, such that group ratios were doubled during sampling procedures. This procedure was accomplished by sampling from higher density Black areas (Health and Retirement Study, 2008). Residents of Florida were also oversampled as this state had higher numbers and densities of older adults residing in it. The inclusion criteria for wave 1 (1991) of the HRS were any adults living in the contiguous United States who were born during the years of 1931-1941 (aged 51-61 at the time) who lived in a household (Heeringa & Connor, 1995). If there were multiple related or unrelated household members that fit this criteria, one member was randomly selected and invited to complete an interview. Spouses of selected household members were also invited to participate. Inclusion criteria for our study were those participants and their spouses who were a part of HRS in the 2012 wave, and who also self-identified as non-Hispanic White or Black. While including participant spouses in our study violates the assumption of independent observations within our data, spousal data were included so as not to lose power for Whites who report experiencing racial discrimination as these numbers were relatively small. We also retained spousal data so as not to lose any Black participants, as while they were oversampled their sample size compared to Whites is still considerably lower. Exclusion criteria for HRS were institutionalized persons such as those in jail, prison, or nursing homes (Heeringa & Connor, 1995), as well as those born outside of the 1931-1941 window. Exclusion criteria for our study are those who list their race as anything besides non-Hispanic White or Black, as we narrowed our focus on these groups for this study.

The final sample (N = 17,085) included in the current study was from wave 11 (year 2012) (Health and Retirement Study, 2017). After excluding 3,469 participants based on eligibility criteria, 76.8% of the sample were non-Hispanic Whites and 23.2% of the sample were Black. The average highest level of education was completing high school, at 30.3%. A high school GED was the next highest level of education at 24.9%, 14.8% of the sample held a bachelor's degree, 14.4% held no degree/diploma, 7.4% held a master's degree, 6.3% held an associate's degree, and 1.8% held either a law degree, medical degree, or doctorate of philosophy (PhD). As spouses or partners of participants were included in HRS, participant age ranged from 20 to 103 years (M = 67.7, SD = 11.54), and 41.5% of the sample was male with 58.5% being female. In this sample, 62.2% were not working for pay and 37.8% were working for pay at the time of sampling. Median total household income was \$41,844.

#### Procedure

#### **Study Overview.**

In the HRS, all participants completed an initial face-to-face (FTF) core baseline interview when joining the study. The core interview included questions on demographics, health, health services, employment and retirement, economic status, and family structure (Health and Retirement Study, 2018). Following this, participants completed a follow-up telephone interview every two years on these same topic areas mentioned above. In 2006, HRS added an enhanced face-to-face interview (EFTF) to their study procedures. EFTF interview questions were the same as the core interview questions above (i.e. demographics, health, health status, employment, housing, etc), but the EFTF also included physical measures (blood pressure, height, weight, grip strength, timed walk, balance and breathing tests, and waist circumfrence) biomarker collection (total and HDL cholesterol, Cystatin C, C-reactive protein,

and HbA1c), and a leave-behind psychosocial questionnaire on participant lifestyle stress, subjective well-being, and lifestyle circumstances (Health and Retirement Study, 2018). The EFTF took place every two years, as in the original follow-up telephone interview. The discrimination questionnaires were included in the leave-behind questionnaire in the EFTF procedures. The additional physical and biomarker measures were collected in the participant's home following the face-to-face interview. The self-administered questionnaire was left-behind with participants and asked to be mailed back to HRS via a pre-paid envelope.

When the EFTF was introduced in 2006, HRS began splitting half of the sample to complete the EFTF in place of the telephone follow-up interview. The other half of the sample who were not completing the EFTF at that particular wave in 2006 were assigned to complete the telephone follow-up interview as done in prior HRS waves. This was done at the same time as the other half of the sample who were completing the EFTF. For example, in 2006 one half of HRS were assigned the EFTF, while the other half were assigned to complete the telephone interview without the enhanced measures. The EFTF took place in alternating waves (which took place every 2 years), such that half of all HRS participants were randomly selected to begin the enhanced procedures in 2006, and the other half of the sample that did not complete the EFTF did so in 2008. Those who completed the EFTF in 2006 completed a phone interview in 2008 and another EFTF wave in 2010, whereas those who began their first EFTF in 2008, next did a phone interview in 2010 and completed their second wave of EFTF in 2012, and so on. Thus, by focusing on the 2012 EFTF wave, we included about half of the total HRS sample but were able to examine the most recent, relevant measures of discrimination experiences for the current study.

#### **Assessment of Physical Measures and Biomarkers.**

After the face-to-face interview was completed, the physical and biomarker health measures were assessed by the interviewer. For blood pressure assessment, an automated, inflated blood pressure cuff was used on their left arm (Crimmins et al., 2008). Three readings were taken 45-60 seconds apart. If participant blood pressure readings were higher than 160 systolic or higher than 110 diastolic, interviewers wrote that information on a pre-designed card and instructed participants to see their doctor as soon as possible (Crimmins et al., 2008). To assess hand-grip strength, two measurements were taken from each hand with a 30 second rest in between using a Smedley spring-type hand dynamometer. Participants alternated hands in between each measure, and completed it sitting or standing, depending on their level of ability (Crimmins et al., 2008). To complete the measure, participants squeezed the handle of the dynamometer as hard as they could and then were instructed to let go. To compute participant BMI, height and weight measurements were collected. To measure height, participants were asked to remove their shoes and stand with their heels and shoulders against the wall. The interviewer used a tape measure to record participant height to the nearest quarter inch. To measure weight, participants were asked to remove their shoes and any bulky clothing or heavy items from their pockets. Participants then stepped on the scale and their weight was recorded by the interviewer to the nearest half pound.

Blood was collected by using a sterile lancet, which was used to prick the participant's finger. Participants were given the option to prick their own finger if they preferred, and were given first aid instructions in the event that their finger continued to bleed. The finger was cleaned with an alcohol swab prior to being pricked (Crimmins et al., 2013). Blood droplets were squeezed from the finger and placed within circles directly on specially treated filter paper. The interviewer attempted to fill six circles if possible. The filter paper was then placed in special foil

envelopes with a desiccant packet. After the dried blood spot cards were collected, they were sorted, frozen, and shipped to laboratories for processing. Total and HDL cholesterol, CRP and HbA1c were assessed via dried blood spot collection.

#### Measures

#### Main Predictor Variables.

*Race.* Race was measured through self-reported demographic data. Participants in HRS were asked to report on their race at each assessment time point via the enhanced face-to-face interview or telephone interview (Health and Retirement Study, 2008). Participants were asked, "What race do you consider yourself to be: White, Black or African American, American Indian, Alaskan Native, Asian, Pacific Islander, or something else?" and "Do you consider yourself Hispanic or Latino?" Participants were then able to select which race they identify with as well as if they consider themselves to be of Hispanic or Latino ethnicity. Only data from non-Hispanic White and Black HRS participants were included in the current study, given the research questions. After the exclusion of those who identify as Hispanic or who do not identify only as White or Black, race was recoded as 0 = White, and 1 = Black. Including Hispanics who identify racially as White may complicate interpreting results and therefore were not considered for this study. Those who identify as multi-racial also were excluded to reduce threats to internal validity.

*Racial discrimination.* Racial discrimination was assessed through everyday experiences (Perceived Everyday Discrimination (PED) scale) and major lifetime experiences of discrimination (Major Experiences of Lifetime Discrimination (MELD) scale; Smith, Ryan, Fisher, Sonnega, & Weir, 2017). The PED scale measured more commonplace and less severe experiences of discrimination which can take place in daily life, whereas the MELD scale

measures more impactful, significant, and severe instances of discrimination over one's lifetime. Participants used a 6-point Likert scale ranging from 1 = Almost every day to 6 = Never to rate the frequency with which the 6 items occurred in their daily life by asking, "In your day-to-day life, HOW OFTEN HAVE ANY OF THE FOLLOWING THINGS HAPPENED TO YOU?". Sample items included, "You are treated with less courtesy or respect than other people" and "You are threatened or harassed" (Smith et al., 2017). The items were averaged and reverse scored such that higher scores indicated greater perceived everyday discrimination. The everyday discrimination scale included one follow-up question which allowed participants to attribute the reason(s) as to why they felt discriminated against or treated unfairly. Using a checkbox, participants could select multiple options from the following attributions: gender, race, age, weight, religion, national origin or ancestry, physical disability, financial status, sexual orientation, or other aspect of their physical appearance (Smith et al., 2017). Given the current research question specifically related to racial discrimination, we coded for the presence or absence of racial discrimination by coding any attributions that were made which include race and/or ancestry or national origin as 1, and any other attributions as -1. Ancestry or national origin were included along with race, as ancestry is defined as one's ethnic descent, and origin is defined as one's ancestry or social background (Oxford Dictionaries, 2018).

The MELD scale (7 items) measured more severe experiences of being treated unfairly at any point in their life (Smith et al., 2017). Participants were explicitly asked, "For each of the following events, please indicate whether the event occurred AT ANY POINT IN YOUR LIFE." Example items included, "Have you ever been unfairly stopped, searched, questioned, physically threatened or abused by the police?" and "For unfair reasons, have you ever not been hired for a job?" (Smith et al., 2017). Participants then indicated whether the event has happened to them,

through reporting "Yes" or "No." A summed score was computed across the seven items from the number of times a participant reported a major event of discrimination occurring, with scores ranging from 0 to 7.

For both the PED and MELD scales, the composite scores were respectively combined with the racial discrimination attribution variable to create individual constructs for everyday and major experiences of discrimination. Racial discrimination attributions were coded as 1 for the presence of racial discrimination, and any other attributions as -1. For both PED and MELD, larger positive numbers indicated more experiences with discrimination based on race and/or ancestry/national origin. For the inverse, numbers that were zero or negative indicated the participant either experienced no discrimination, or did experience discrimination but due to something other than their race and/or ancestry or national origin. By combining the attribution of experiencing discrimination based on one's race with everyday discrimination experiences and major experiences with discrimination, this allowed us to create everyday and major racial discrimination constructs to include in our statistical models.

The PED and MELD scales were included in the leave-behind Psychosocial and Lifestyle Questionnaire in HRS for the 2012 wave included in the study. These scales are suitable for measuring racial discrimination, as they provided a way for participants to reflect upon past experiences in which they felt discriminated against, and in the perceived everyday discrimination scale, chose why they perceived they were treated that way. A shortcoming of the MELD scale is that it only assessed for discrimination or unfair treatment in a broad way, and does not allow participants to indicate why they believe they experienced discrimination as in the PED scale. The PED scale has been found to be a reliable and valid self-reported measure of discrimination for either situational counts or frequency of occurrence, and has a high correlation

for the underlying discrimination construct (r = .79) (Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005). Cronbach's alphas for this scale in 2012 was .83, with values between .8 and .9 indicating 'good' reliability. Both measures of everyday and lifetime major experiences of discrimination have been used in other well-validated studies (Ayalon & Gum, 2011; Brown & Hargrove, 2017; Chae et al., 2010; Krieger et al., 2005; Lee et al., 2017; Parker, Ballington, Chisolm, Furr-Holden, & Thorpe, 2016). These findings demonstrate how each of these measures have substantial reliability and validity characteristics.

#### **Outcome Variables.**

Self-reported health. To measure self-rated health, HRS participants were asked to evaluate their overall health status through the single item, "Would you say your health is excellent, very good, good, fair, or poor?" For data analysis, self-rated health was reverse scored so that higher numbers reflected better health.

Lifetime experiences of *chronic health conditions* were assessed with a checklist of eight conditions including hypertension, stroke, diabetes, cancer, chronic lung disease, coronary heart disease, congestive heart failure, and arthritis (Fisher et al., 2005). A sum of the total number of chronic health conditions reported by participants was created (St. Clair et al., 2009) and included in data analysis.

*Objective health measures.* The objective health measures collected in the form of biomarkers were total and High-Density-Lipoprotein (HDL) cholesterol, C-reactive Protein (CRP), and glycosylated hemoglobin (HbA1c) through dried blood spot collection (Crimmins et al., 2013). Total and HDL cholesterol were measured in units of milligrams per deciliter (mg/ dL), CRP was measured in conventional units ( $\mu$ g/mL), and HbA1c was computed in percentage form of glycosylated HbA1c compared to total HbA (Crimmins, Faul, Kim, & Weir, 2013).

Other objective physical health measures included in this study were blood pressure and hand grip strength. HRS used an automated, inflated blood pressure cuff to measure diastolic and systolic blood pressure. Blood pressure was collected in units of millimeters of mercury (mmHg) and were taken in three measurements for each participant. These three measurements were averaged during data analysis to create one average score between each category, one average score for systolic and one for diastolic blood pressure. Hand grip strength was measured in kilograms of force units and was assessed using a Smedley spring-type hand dynamometer. Hand grip strength was also assessed in three separate measurements for both the right and left hands. The three measurements were averaged for the left hand and the three measurements were averaged for the right hand, and together these two averages were combined to create one mean hand grip strength score. Numerous existing research studies use mean hand grip strength as a method of assessing hand grip strength as a variable, thus indicating it is a well validated method of assessing it through averaging scores across trials (Massy-Westropp et al., 2011; Roush, Gombold, & Bay, 2018; Yorke, Curtis, Shoemaker, & Vangsnes, 2015).

#### Covariates

Participant age, gender, education level, body mass index (BMI), work status, and total household income were included as covariates in all models. Gender options for participants were either male or female, and age was assessed by inquiring about the participant's date of birth. Age at the time of the assessment was calculated based on birthdate. Education level was assessed through the question of, "What is the highest grade of school or year of college you completed?" Participants could report no formal level of education (0 years), grades 1-11, high school (12 years), some college (13-15 years), being a college graduate (16 years), or post college (17+ years) as their education level. Depending on the participant's answers, further

questions were asked whether a high school diploma or equivalency test was completed, and type of college degree obtained if applicable. BMI was computed by HRS through dividing participant weight by the square of their height (St. Clair et al., 2009). Height and weight were measured by HRS researchers in the EFTF procedures through using a tape measure and Healthometer 830KL scale. Work status was obtained through HRS asking participants whether they were working for pay, or not working for pay at the time of assessment. Total household income was computed for each household including income sources such as unemployment, work earnings, workers' compensation, Social Security, public assistance, alimony, interest, and dividends, among others (St. Clair et al., 2009). HRS collected information for each of the aforementioned income sources, and summed them together into one total household income variable.

#### Results

#### **Data Analytic Plan**

Descriptive statistics were first conducted to determine if there were significant differences between racial groups and to determine the characteristics of the sample for the demographic variables of education level, total household income, gender, BMI, work status, and age. Descriptive statistics were also completed to determine whether there were significant racial group differences in experiencing everyday and major discrimination, as well as if there were group differences in health outcomes, as group differences in these variables are at the basis of our research questions. Multiple linear regression analyses were used to test the questions of whether experiences of everyday and major discrimination were associated with racial group differences in health, and whether these associations were stronger between racial groups. The Hayes (2013) PROCESS macro was used to test indirect mediation effects between experiences of discrimination and health outcomes. For the moderator question, when significant interactions between race and experiences with discrimination were obtained these were plotted through simple slopes analyses to determine the nature of the interaction. This was also completed to determine if the racial group slopes were statistically significantly different from zero, indicating a moderating effect.

#### Descriptives

Table 1 presents descriptive statistics for all key variables. To determine whether Whites and Blacks had significant differences on key variables, independent samples t-tests were conducted. Prior to testing the research questions, we wanted to test our hypothesis that Blacks experience more everyday and major discrimination than Whites as well as have differences in self-rated and objective health. We also wanted to determine whether there were enough Whites who reported experiencing discrimination based on race to test our question of whether race moderates the association between experiencing racial discrimination and health outcomes. On average, within the sample Whites were five years older than Blacks, and Whites held higher levels of education compared to Blacks. Within both racial groups, there were significantly more women than men. Whites had significantly higher levels of total household income than Blacks, such that Whites earned approximately 1.5 times more total income than Blacks. At the time of sampling, significantly more Blacks were working for pay than Whites. Blacks reported significantly more experiences with everyday and major experiences with racial discrimination than Whites. Blacks had significantly higher BMI than Whites, as well as significantly higher systolic and diastolic blood pressure than their White counterparts. Blacks had significantly higher hand grip strength than Whites, as well as higher levels of CRP and HbA1c. Whites had significantly higher self-rated health than Blacks, with self-reported health reverse scored so that

higher numbers reflected better health. There were no statistically significant group differences in sum of health conditions, total and HDL cholesterol.

# Testing Indirect Effects of Everyday and Major Experiences with Racial Discrimination on Racial Group Differences in Health Outcomes

The first research question addresses the extent to which racial discrimination accounts for (i.e., mediates) racial group differences in health between White and Black Americans. We predicted that Blacks would report higher levels of experiencing both everyday and major experiences of racial discrimination than Whites, as well as that Blacks would have poorer health (both subjectively rated and within the objective measures) than Whites. Bivariate correlations were first conducted to examine if statistically significant associations existed between predictor and outcome variables. Statistical significance was obtained for all variables except HDL and total cholesterol, but multiple regression analyses were ran on all variables as even though we did not find statistically significant racial group differences in all health outcomes, it is possible for there to be significant indirect effects (Hayes, 2009). We tested the mediating effects between race and reported experiences with discrimination through multiple linear regression and the Hayes (2013) PROCESS macro to test for indirect effects.

The independent variable in this question is participant race, with the dependent variable being health outcomes, including both self-reported and objective measures of health. The outcome variables (e.g., self-rated health, sum of health conditions, systolic blood pressure, etc) were each ran in separate, individual models with race as the independent variable. Self-reported health includes self-rated health and sum of chronic health conditions. Objective measures of health includes hand grip strength, blood pressure, total and HDL cholesterol, C-reactive protein (CRP), and HbA1c. The mediators are the experiences of racial discrimination, both everyday

and major experiences. All models included the covariates education level, age, gender, BMI, work status, and total household income. Initially, each model was run separately with either everyday or major discrimination included as the mediator. Models where significance was obtained for both everyday and major experiences with discrimination were later combined to include both mediators in the same model per outcome to determine which mediator explains more of the variance and association. When testing for indirect effects in Hayes (2013) PROCESS macro, we included both everyday and major experiences with discrimination as multiple mediators in each model to determine which indirect effect may be stronger.

#### Self-rated health.

First we examined whether everyday or major experiences with discrimination at least partially accounted for differences in self-rated health between Whites and Blacks. The indirect effect was tested using a percentile bootstrap estimation approach with 5,000 samples, with both mediators of everyday and major discrimination included in the model, as well as the covariates listed previously. In mediation analyses testing whether racial differences in self-rated health were associated with discrimination experiences, regression analyses indicated that race was a significant predictor of experiences with everyday (B = 1.44, SE = .05, p < .01) and major racial discrimination (B = .56, SE = .039, p < .01), such that Blacks were significantly more likely to experience higher levels of both types of discrimination, as shown previously. Moreover, racial group differences were found between Whites and Blacks and self-rated health (B = -.27, SE = .04, p < .01), with Black's having significantly lower self-rated health compared to Whites (higher scores reflect better health). In both of the models described previously, the mediators were not included and only included the independent variable of race, outcome variable of self-rated health, and all six covariates. After including the mediators, everyday discrimination did

not significantly account for how race and self-rated health may be associated, as the CI included zero (95% CI = [-.0208, .0599]). Major discrimination, however, showed a significant indirect effect (B = .03, SE = .0095, 95% CI = [.0075, .0444]). With both mediators included, approximately 15% of the variance in self-rated health was accounted for by the predictors ( $R^2 = .151$ ). These results provide support that major racial discrimination partially explains race differences in self rated health (B = -.27, SE = .04, p < .01), as the direct effect between self-rated health and race remained statistically significant with the mediators included in the model. Major experiences of discrimination significantly accounted for differences in self-rated health between Whites and Blacks. Our hypothesis of Blacks experiencing higher frequency of everyday and major discrimination was supported, as for Blacks increases in racial discrimination experiences are associated with poorer health, in the form of decreased self-rated health.

#### Sum of chronic health conditions.

Next, we examined whether everyday or major experiences with discrimination at least partially accounted for differences in sum of health conditions between Whites and Blacks. As in the prior model, mediation analyses using 5,000 bootstrapping resamples were used to test whether experiences of everyday and major racial discrimination mediated the association between race and sum of chronic health conditions. As in the first mediation test with self-rated health, race was a significant predictor of experiences with everyday (B = 1.44, SE = .05, p <.01) and major experiences of racial discrimination (B = .56, SE = .04, p < .01). Blacks were more likely to experience greater everyday and major experiences of racial discrimination. Significant racial group differences were found in the sum of health conditions without the mediators included in the model, with Blacks having more health conditions than Whites (B =.17, SE = .06, p < .01). With both mediators included, approximately 21% of the variance in selfrated health was accounted for by the predictors ( $R^2 = .212$ ). Everyday discrimination did not significantly mediate race differences in sum of health conditions, as the CI included zero (95% CI = [-.077, .029]). Major discrimination did, however, partially explain racial differences with number of health conditions (B = -.08, SE = .05, p < .01), as these results indicated the indirect coefficient was significant, (B = -.04, SE = .013, 95% CI = [-.072, -.019]). These results provide support for the mediation hypothesis, as when major experiences of discrimination were included in the model it significantly accounted for differences in number of chronic health conditions between Whites and Blacks. These findings support our hypothesis that for Blacks, increases in racial discrimination experiences is associated with poorer health, in the form of increased number of health conditions.

#### **Objective health measures.**

As described previously with self-rated health and sum of chronic health conditions, the objective health measures (hand grip strength, total and HDL cholesterol, systolic and diastolic blood pressure, CRP and HbA1c) were tested to see if there were significant mediating effects between experiences with everyday and major racial discrimination predicting objective health measure differences between Whites and Blacks. As in the prior models, age, gender, BMI, education, total household income, and work status were included as covariates in all objective health measure models. The mediation analyses showed no statistically significant mediating effects of either everyday or major racial discrimination between racial groups and all objective health measures, suggesting that both instances of discrimination did not explain group differences in these outcomes. Zero was included in all confidence intervals, suggesting no mediating effect of everyday or major discrimination on hand grip strength, total and HDL cholesterol, systolic and diastolic blood pressure, CRP, and HbA1c.

# Testing the Moderating Effect of Race on the Strength of Everyday and Major Experiences of Racial Discrimination on Health Outcomes

Multiple linear regression was also utilized to test the second research question of whether the strength of the associations between racial discrimination and health outcomes differ for Whites and Blacks. We hypothesized that race will moderate the relationship between racial discrimination and health outcomes, such that the stressor-health associations will be stronger for Whites compared to Blacks, specifically that Whites will show stronger associations between experiences with discrimination and differences in health. It is expected that Whites will show poorer health when experiencing everyday and major discrimination when compared to Blacks.

Using multiple linear regression, everyday experiences with racial discrimination were mean-centered in order to reduce non-essential collinearity. This was accomplished by the mean score of the perceived everyday discrimination measure being subtracted from each participant's individual score. First, race was tested as a moderating effect between everyday and major discrimination and each health outcome independently. Once significant moderation effects were found, these significant outcomes were included in analyses with both interaction terms included. Interaction terms were created through Race × Everyday Discrimination and Race × Major Discrimination. If statistical significance were obtained for either type of discrimination independently, both interaction terms of Race × Everyday Discrimination and Race × Major Discrimination were included in each model. The lower-ordered main effects of race and discrimination experiences were also included. Both interaction terms were included in each analysis, as in the mediation analyses, to attempt to discern whether each type of discrimination is associated with differences in the strength and/or direction in health outcomes between racial groups. In each of these analyses, the experience of both everyday and major racial

discrimination are the independent variables and participant race is the moderator. The dependent variables in these analyses are the health outcomes of sum of chronic health conditions and self-rated health, as well as the biomarkers total and HDL cholesterol, systolic and diastolic blood pressure, hand grip strength, CRP and HbA1c. As in research question one, control variables were education level, age (mean-centered), gender (mean-centered), BMI (mean-centered), work status (0 = not working for pay, 1 = working for pay), and total household income. Age, gender, and BMI were mean-centered by subtracting the mean of each variable from the participant's individual scores, as done for everyday discrimination. This resulted in the mean being equal to zero. This was completed for these variables specifically as zero was not included in the scales of measurement, and therefore zero needed to be included to make it a meaningful value.

#### Self-rated health.

First, we tested the extent to which race moderated the association between everyday and major discrimination and self-rated health. We expected that Whites would show stronger associations between experiencing either type of discrimination and poorer self-rated health than Blacks. As shown in Table 2 (Model 1), the interaction between race and everyday discrimination significantly predicted self-rated health, but this effect was not present between race and major experiences of discrimination. To determine the association between everyday discrimination and self-rated health for Whites and Blacks, a simple slopes analysis was conducted. Whites had a positive association, such that increases in everyday discrimination were associated with increases in self-rated health (B=0.05, SE = .02, p < 0.01). There was no association between everyday discrimination and self-rated health for Blacks (B=-0.03, SE=.04, p = 0.39). There was no significant interaction between race and major experiences of racial

discrimination for the outcome of self-rated health. The results did not support our hypothesis that Whites would be negatively affected between associations of discrimination and self-rated health, but rather shows that for Whites, increases in discrimination were associated with increases in self-rated health.

#### Sum of chronic health conditions.

Next, the extent to which race moderated the association between everyday and major discrimination and sum of health conditions was tested. We expected that Whites would show stronger associations between experiencing either type of discrimination and sum of health conditions than Blacks, specifically that higher instances of both types of discriminations would be associated with more health conditions for Whites. Moderation analyses revealed both interactions significantly predicted sum of health conditions (see Table 2, Model 2). For each racial group, simple slopes analyses were conducted to determine the strength and direction of the associations between everyday and major discrimination and sum of health conditions. For the race and everyday discrimination interaction, Whites had a negative association, with increases in everyday discrimination being associated with decreases in sum of chronic health conditions (B = -0.06, SE = .03, p = 0.043). Blacks had a positive association, such that increases in everyday discrimination were associated with increases in health conditions (B = 0.03, p < .01). In this interaction, the association is stronger for Whites than Blacks.

Simple slopes analyses found that for the race and major experiences of racial discrimination interaction, Whites had a negative slope, with increases in major discrimination being associated with decreases in sum of health conditions (B = -0.12, SE = .03, p < .01). There was no association between major discrimination and sum of health conditions for Blacks (B = -0.02, SE = .03, p = 0.45). The results did support our hypothesis that Whites would have stronger

associations between both types of discrimination, but not in the expected direction. Rather than everyday and major discrimination being associated with more health conditions, they were each associated with decreases in total number of health conditions.

#### **Objective health measures.**

Lastly, the extent to which race moderated the association between everyday and major discrimination and systolic and diastolic blood pressure was tested. We expected that Whites would show stronger associations between experiencing either type of discrimination and higher systolic and diastolic blood pressure than Blacks, specifically that higher instances of both types of discriminations would be associated with higher systolic and diastolic blood pressure for Whites. The race by major discrimination interaction significantly predicted systolic blood pressure (see Table 2, Model 3). Simple slopes analyses found Blacks had a positive association, with increases in major discrimination being associated with increases in systolic blood pressure (B = 4.34, SE = 1.86, p = .02). There was no association between major discrimination and systolic blood pressure for Whites (B = -2.32, SE = 1.31, p = 0.07). No significant interaction effects were found between race and everyday discrimination in respect to systolic blood pressure.

The race by everyday discrimination interaction significantly predicted diastolic blood pressure (see Table 2, Model 4). Simple slopes analyses for diastolic blood pressure revealed a similar pattern of results, with Blacks having a positive association, such that increases in everyday discrimination were associated with increases in diastolic blood pressure (B = 2.02, SE = .58, p < 0.01), whereas there was no significant association between everyday discrimination and diastolic blood pressure for Whites (B = 0.14, SE = .47, p = 0.77). No associations were found between race and major discrimination in respect to diastolic blood pressure. These results

did not support our hypothesis, as no significant association was obtained for Whites between either type of blood pressure or discrimination. The objective health measures of total cholesterol, HDL cholesterol, CRP and HbA1c did not have statistically significant interactions between race and everyday or major experiences with racial discrimination (See Table 2).

#### Discussion

The first research question examined the extent to which everyday and major experiences with racial discrimination were associated with differences in health outcomes between Whites and Blacks. We hypothesized that Blacks would experience higher frequency of everyday and major racial discrimination, as well as show poorer self-rated and objective health outcomes compared to Whites. As shown previously, the results supported our hypothesis, with Black Americans reporting experiencing more everyday and major experiences of racial discrimination than Whites, and these higher frequencies of experiences with discrimination were associated with poorer health outcomes. Significance was obtained for self-rated health and sum of health conditions, but were not found for the objective health measures of total and HDL cholesterol, systolic and diastolic blood pressure, hand grip strength, CRP and HbA1c. Major experiences with racial discrimination explained more of the association over and above everyday discrimination, suggesting there is something unique in how experiencing major discriminatory events predicts poorer health.

When considering how racial discrimination is a psychosocial stressor that can activate the stress and inflammatory response, it makes sense how more severe and significant experiences with racial discrimination would be associated with poorer health. While the accumulation of smaller slights and unfair treatment could potentially explain differences in health, our results did not support this. It is possible that statistical significance was not obtained

for any of the objective health measures due to their static nature. While using objective measures of health can contribute to creating a well-rounded picture of health, biomarkers capture these physical indicators at one moment in time. As participants were asked to report on racial discrimination experiences both at any point in their life as well as within their day-to-day life, this could explain why no significant differences were found within the biomarkers and objective health measures. It is possible that racial discrimination may affect health more broadly, as captured in the self-reported measures.

The second research question tested whether race moderated the association between experiences of everyday and major racial discrimination and differences in health. We hypothesized that Whites would have a stronger association between experiences of both types of discrimination and health, specifically that for Whites experiences with racial discrimination would be more strongly associated with poorer health than Blacks. Contrary to our hypothesis, in general experiences with discrimination were associated with improvements in health for Whites and associated with reductions in health for Blacks. Specifically, for Whites increases in everyday racial discrimination were associated with improvements in self-rated health and a reduction in number of health conditions. For Blacks, increases in everyday discrimination were associated with an increase in number health conditions and diastolic blood pressure, and increases in major discrimination were associated with increases in systolic blood pressure. For sum of health conditions, the results of this variable specifically should be interpreted with care, as while we did find statistical significance it does not translate into practical significance. Everyday discrimination was measured on a 6-point Likert scale, and sum of health conditions were assessed either by having a medical condition(s) or not. In order to see a one unit increase in health conditions, a 12 unit increase in everyday discrimination is required, illustrating how

more research is needed between the association of everyday discrimination and sum total number of health conditions.

These results allude to how aspects of major and everyday experiences of discrimination may get under the skin differently across multiple races, specifically for White and Black Americans. It is possible that the mechanisms underlying everyday discrimination, such as the less overt characteristics, take on more insidious outcomes that manifest more broadly and present in overall self-rated health. The accumulation of these experiences, though less impactful are still occurring more frequently, may speak to how they present in total number of health conditions and diastolic blood pressure. For major discrimination, these experiences can be more severe and thus be more strongly linked to the stress and inflammatory response system, playing into various health conditions and systolic blood pressure.

The presence of a significant moderating effect suggests that Whites and Blacks may have differential stressor-health links, as in how racial discrimination is associated with health differs between groups. For Blacks, increases in discrimination were associated with poorer health, which is consistent with prior research (Brondolo et al., 2011) and makes sense in regards to the concept of allostatic load. The results support that for Blacks, racial discrimination is perceived as stressful and may be tied to the stress and inflammatory response. In respect to Whites, the 'control over one's destiny' theory may begin to explain why our hypothesis was not supported, and why the association between higher racial discrimination experiences and improvements in health were not present for Blacks. It is unclear whether Whites did not perceive experiences with racial discrimination as stressful, whether it was perceived as stressful but did not initiate the stress and inflammatory response, or due to another factor. Regardless, 'control over one's destiny' could act as a protective factor for Whites against experiences of real

or perceived racial discrimination. Whites may recognize, either consciously or unconsciously, that within American society they possess more privilege, autonomy, and freedom of choice over their lives in comparison to other groups (Liu, 2017). The perception of autonomy or external control may serve as a buffering effect, such that even when experiencing or believing they are being treated unfairly in that moment, unfair treatment is generally not present for them in larger societal contexts. For Blacks, experiences with racial discrimination may serve as habitual reminders that they are a stigmatized group, and reinforce the perception that they do not have 'control over one's destiny'. While 'control over one's destiny' theory may begin to explain how increases in racial discrimination are associated with improvements in health for Whites, more research should be conducted to attempt to replicate these findings and gain a better understanding of what mechanisms may be at work.

The implications of our study's findings have the potential to further reinforce the harmful effects of racial discrimination on health outcomes for Black Americans. These results add to the existing stress health literature, and underline the lasting effects of maltreatment on health. Our findings reveal that major experiences with racial discrimination uniquely predict differences in health between Whites and Blacks, as well as that Whites may not experience harmful effects to their health upon real or perceived experiences of racial discrimination. By gaining more insight into which type of racial discrimination is a stronger predictor of health, this can help future research efforts narrow their focus as well as aid in prevention and intervention programs developing more specifc and targeted approaches to combatting the consequences associated with them. More effective prevention and intervention can be accomplished by targeting critical components such as building on ethnic minority protective factors (e.g. racial socialization, racial identity, ethnic/racial worldview) monitoring health

indicators that are associated with experiencing racial discrimination more closely within vulnerable populations, and using research findings to advocate for change at the systemic and institutional level. Prevention and intervention programs could also seek to utilize the 'control over one's destiny' theory to implement strategies around helping minorities feel empowered and increase perceptions of control within their lives. This theory is worthwhile to consider, as many national and global strategies of reducing inequalities and promoting health include increasing control and empowerment as pivotal recommendations for action (Whitehead et al., 2016). Prevention and intervention programs could seek to lessen the potential effects of racial discrimination on ethnic minorities through building on the protective factors mentioned above, utilizing 'control over one's destiny', and monitoring health outcomes that have been associated with discrimination, as eradicating discrimination may not be in the foreseeable future nor is it realistic to suggest. Rather, having a better understanding of the mechanisms that underlie racial disparities in health can facilitate more useful and targeted interventions towards those who are more vulnerable and stand to benefit most.

A limitation of this study were the adapted racial discrimination measures. HRS shortened the PED and MELD scales for their leave-behind questionnaires, resulting in a less comprehensive measure of everyday and major experiences with discrimination. The original scales included additional items, and following each item within the PED and MELD scales were attribution questions assessing as to why the individual believed each event occurred. Due to the lengthy nature of the HRS leave-behind questionnaire, it was necessary to use abbreviated versions of scales so as not to overburden participants. Another limitation of this study were that assumptions of independent observations were violated, as HRS and our study included spouses or partners. Including spousal data in our study while using statistical analyses that are intended

for independent observations was a concern as it allowed relational confounds to influence our results. Including spouses and partners in our study was necessary to ensure we had adequate numbers of Whites who reported experiencing racial discrimination, as well as retaining as many Black participants as possible. To address this limitation, a sensitivity analysis was conducted to determine if our results remained significant when spouses were removed. When only single, unpartnered participants were included in the analyses, overall the mediation and moderation outcomes remained significant. The outcome variable we lost significance for across the mediation and moderation analyses was sum of health conditions. Specifically, when only looking at un-partnered participants there was no significance found between race and sum of health conditions in the mediation analyses and within the moderation analyses the race by major discrimination interaction was no longer significant. While some significance was lost for aspects of the sum of health conditions outcome, overall the majority of our results remained unchanged. This suggests that including spouses in our study did not have a significant confounding influence on our results.

It is recommended that future research address these limitations by using the complete PED and MELD scales, as the full scales include more attribution questions as well as assess more in-depth for varying experiences with discrimination. Future research should also consider not including family members within the sample, unless this is the topic of study or by using statistical analyses such as multilevel modeling that would account for the nested structure within the data. Future research may also benefit from exploring whether the 'control over one's destiny' theory intersects with external and internal locus of control for Whites, and whether it is the perception of external control over one's environment that buttresses 'control over one's

destiny'. Future research could also examine whether political climate is associated with 'control over one's destiny' within Whites and Blacks.

The current study contributes to the literature by exploring whether everyday and major experiences with racial discrimination uniquely predict differences in health between Whites and Blacks, a topic that has been understudied in this research area. The study also adds to the racial discrimination and health literature by exploring whether these associations differ between racial groups, an aspect thus far unexamined, particularly how real or perceived racial discrimination may be associated with White's health. By using self-rated and objective measures of health, our study created more comprehensive measures of health to test between race and experiences of racial discrimination. This study elucidated how stressor-health links differ between races, and how experiences with racial discrimination do not predict the same outcomes between the racial majority and minority. What remains unclear, is how to remedy the harmful outcomes associated with experiences of racial discrimination, as well as prevent them from occurring. If researchers can begin to uncover these factors, perhaps America can begin to fulfill one of its central ideologies, "liberty and justice for all."

	Mean (SD)		
Variable	Whites	Blacks	
Covariates			
Age**	68.94(11.5)	63.58(10.7)	
Gender (Percentage Female)**	.57	.62	
Level of Education**	2.98(1.82)	2.29(1.78)	
Total Household Income**	\$84,859.21(14,6	\$47,848.22(57,4	
	724.83)	39.89)	
Work Status (Percentage Working for Pay)**	.20	.20	
BMI**	28.15(5.88)	30.24(6.67)	
Outcome Variables			
PED Composite Score**	1.52(.68)	1.7(.84)	
MELD Composite Score**	.44(.85)	.8(1.22)	
Everyday Discrimination with Race/Ancestry Attribution**	-1.34(.98)	.1(1.89)	
Major Discrimination with Race/Ancestry Attribution**	38(.88)	.11(1.46)	
Self-rated health**	3.22(1.09)	2.92(1.06)	
Sum of health conditions	2.26(1.53)	2.28(1.54)	

## **Table 1.** Descriptive Statistics of Key Study Variables by Race

Average systolic blood	138.08(70.37)	146.94(83.14)
pressure**		
Average diastolic blood	79.02(28.21)	85.16(45.88)
pressure**		
Average hand grip strength**	29.67(12.2)	31.13(12.32)
Total cholesterol	297.2(67.09)	295.6(65.54)
HDL cholesterol	84.48(22.15)	83.51(22.59)
CRP**	4.25(9.37)	5.93(9.49)
HbA1c**	5.48(.56)	5.85(.88)

*Note.* Level of Education Categories were 0 = no degree, 1 = GED, 2 = High School, 3 = High School/GED, 4 = Associate's degree, 5 = Bachelor of Arts degree, 6 = Master of Arts/Master of Business Administration, 7 = Law degree/MD/PhD, 8 = Other, PED Composite Score was computed through averaging scores on the Perceived Everyday Discrimination scale (PED), MELD Composite Score was computed through summing number of affirmative responses on Major Experiences with Lifetime Discrimination scale, the Everyday and Major Discrimination with Race/Ancestry Attribution was computed those multiplying the PED and MELD composite scores with race/ancestry attributions, if present, Self-rated health, higher numbers reflect better health (values ranged 0-5), Sum of health conditions could range from 0-8, HDL= High Density Lipoprotein, CRP= C-reactive Protein, HbA1c= Glycosylated Hemoglobin.

Variable	Model 1 Outcome Variable: Self- rated health	Model 2 Outcome Variable: Sum of health conditions	Model 3 Outcome Variable: Average systolic blood pressure	Model 4 Outcome Variable: Average diastolic blood pressure
	B(SE)	B(SE)	B(SE)	B(SE)
Covariates				
Intercept	2.78(.03)**	2.664(.042)**	137.89(2.07)**	78.13(.83)**
Age	.00(.002)	.04(.002)**	.57(.10)**	14(.04)**
Gender	.13(.03)**	08(.039)*	1.47(1.92)	.68(.77)
Level of Education	.12(.008)**	092(.011)**	25(.54)	008(.22)
Total Household Income	4.45(.00)**	-3.27(.000)*	-5.32(.000)	-2.14(.000)
Work Status	.42(.03)**	59(.05)**	84(2.27)	1.26(.91)
BMI	02(.002)**	.06(.003)**	2.14(.16)**	.4(.065)**
Predictor Variables				
Race	24(.04)**	.14(.06)*	5.11(2.99)	1.54(1.20)
Perceived Everyday Discrimination (PED)	.05(.02)**	06(.02)**	2.32(1.16)*	.14(.47)
Major Experiences of Discrimination				
(MED)	.07(.02)**	12(.03)**	-2.32(1.31)	48(.53)
Race x PED	08(.03)**	.09(.04)**	-1.8(1.9)	1.88(.74)*
Race x MED	05(.03)	.09(.05)*	6.66(2.78)**	1.00(.92)
<i>Note.</i> * <i>p</i> < .05. ** <i>p</i>	< .01.			

## **Table 2.** Summary of the Findings from the Five Sets of Moderation Analyses



*Figure 1.* Plotted Interaction of Race x Everyday Discrimination for Selfrated health; ED= Everyday Discrimination



*Figure 2.* Plotted Interaction of Race x Major Discrimination for Sum of health conditions; MD= Major Discrimination



*Figure 3.* Plotted Interaction of Race x Everyday Discrimination for Sum of health conditions; ED= Everyday Discrimination



*Figure 4.* Plotted Interaction of Race x Everyday Discrimination for Diastolic blood pressure; ED= Everyday Discrimination



*Figure 5.* Plotted Interaction of Race x Major Discrimination for Systolic blood pressure; MD= Major Discrimination

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