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Understanding the Association of Depressive Symptomology, Race-Related Stress, and Chronic Kidney Disease among African Americans

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Arnold School of Public Health, University of South Carolina
2020

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An abstract of
a thesis submitted to the Faculty of the
Rollins School of Public Health at Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Behavioral, Social, and Health Education Sciences
2022

Abstract

Understanding the Association of Depressive Symptomology, Race-Related Stress, and Chronic Kidney Disease among African Americans

By Maggie Pustinger

Introduction: African Americans have an increased likelihood of progression through the stages of chronic kidney disease (CKD) more quickly than their White counterparts. Studies have assessed possible explanations, and there is no clear reason for this difference in status. While a number of studies have assessed the effect of race-related stress and depression on other health outcomes, few known quantitative studies have thoroughly assessed the role of race-related stress and depression on CKD status. The purpose of this study is to understand how depressive symptomology and race-related stress are associated with CKD stage.

Methods: This study applied the Brondolo et al. (2011b) framework through a secondary analysis of data originally collected for the study "A Randomized Trial of Race-Related Stress among African Americans with Chronic Kidney Disease" (n=68). Logistic regressions produced odds ratios (ORs) for perceived race-related stress and depressive symptomology.

Results: A chi-square test was conducted to examine the association between chronic experiences of discriminatory stress and depressive symptomology. Results suggest that there is a statistically significant association (x^2=8.873; df=1; p=0.003) with those with more frequent experiences of discriminatory stress reporting depressive symptomology (n=18, 81.8%) compared to those reporting less frequent experiences of discriminatory stress (n=4, 18.2%). To address aim one, the association between depressive symptomology and CKD, a bivariate analysis was conducted. Results to test aim one did not suggest a statistically significant association (p=0.601). A bivariate test was run to address aim two, the association between perceived race-related stress and CKD. Results to test aim two did not suggest a statistically significant association (p=0.354). The multivariate logistic conducted to test for the independent effects between depressive symptomology (p=0.959) and perceived race-related stress (p=0.726) in chronic kidney disease status showed no significant results.

Discussion: Given the exploratory nature of the grant used to fund this study and the nature of this research, the sample size was small. The small sample size may have been a reason that the findings of this study were nonsignificant. However, given the significance in the analysis between chronic experiences of discrimination and depressive symptomology, there is indication that frameworks such as the Brondolo et al. (2011b) framework should be applied to more research on health outcomes that may be adversely impacted by racism.

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Acknowledgments

I would like to thank my incredible support system, both here in Atlanta and across the country. Both my family and friends have supported and encouraged me during my academic journey and without their unwavering support I would not be where I am today. Especially, I am thankful for my friends here in Atlanta who encouraged me every single day throughout this project. I would also like to express gratitude for my incredible mentors from graduate and undergraduate school who have challenged me to become the student I am today so that I could even attempt to complete a project of this magnitude. Finally, and with the utmost gratitude I would like to thank Dr. Kimberly Jacob Arriola and Dr. Eric Nehl for all of their support, encouragement, and expertise that they bestowed upon me throughout this entire project. I am extraordinarily appreciative of all the wisdom you shared and patience you extended.

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Chapter 1: Introduction

Background

Chronic kidney disease (CKD) is the result of long-term damage that causes the kidneys to lose their function of filtering blood properly. Kidneys that are fully functioning remove waste products and excess fluid from the blood. If kidneys are not functioning properly an individual may require dialysis in order to have the excess fluid and waste products filtered out (National Kidney Foundation, 2021a). Kidney disease can lead to kidney failure, which eventually results in the need for dialysis and possibly a kidney transplant (U.S. Department of Health and Human Services, 2017). Chronic Kidney Disease is the ninth leading cause of death in the United States, with more than 37 million adults affected annually (Centers for Disease Control and Prevention Chronic Kidney Disease Initiative, 2020). Chronic Kidney Disease can lead to many complications such as the development of additional chronic diseases, weak bones, and nerve damage (National Kidney Foundation, 2021b). There are five stages of CKD (Figure 1), where stage five is classified as End-Stage Renal Disease (ESRD) (What are the Stages of Chronic Kidney Disease, 2017).

[1]For the purposes of this thesis, *Black* and *African American* will be used interchangeably.

Figure 1. Stages of Chronic Kidney Disease

Stage of CKD	GFR*	% of kidney function
Stage 1 *kidney damage with **normal** kidney function*	90 or higher	90-100%
Stage 2 *kidney damage with **mild loss** of kidney function*	89 to 60	89 to 60%
Stage 3a ***mild to moderate** loss of kidney function*	59 to 45	59 to 45%
Stage 3b ***moderate to severe** loss of kidney function*	44 to 30	44 to 30%
Stage 4 ***severe** loss of kidney function*	29 to 15	29 to 15%
Stage 5 *kidney **failure***	Less than 15	Less than 15%
*GFR tells how much kidney functioning is remaining		

(National Kidney Foundation, 2021a)

A number of studies have shown that African Americans are more likely to progress directly and quickly to ESRD than their White counterparts (Choi et al., 2009; Norris et al., 2008; Hounkpatin et al., 2020). African Americans have higher prevalence of ERSD at 5,671 per million as compared to 1,432 per million among Whites (McClellan et al., 2006; USRDS Annual Data Report, 2014; Saran et al., 2015). Many factors such as hypertension and diabetes impact the development of CKD (Iseki, 2005). However, differences in the physical risk factors are not the sole contributing factor and cannot entirely explain the discrepancies in CKD development between African Americans and Whites. Factors such as social stress, environmental stress, and other social determinants of health interact and have adverse effects on factors that enhance the progression of CKD (Bruce et al., 2015).

Racism

In trying to understand the vast disparities in the progression of disease between Black and White individuals, racism has become a research topic of interest. Racism can be defined in a multitude of ways. A highly accepted definition of racism is "a system of structuring opportunity and assigning value based on the social interpretation of how one looks, that unfairly disadvantages some individuals and communities, unfairly advantages other individuals and communities, and saps the strength of the whole society through the waste of human resources" (Jones, 2018, pp. 231). This definition encompasses the broad scope of racism and shows the magnitude at which racism can negatively impact health outcomes.

There are three levels of racism: institutionalized, personally mediated, and internalized as hypothesized by Jones (2018). Institutionalized racism is the differences in access to goods, services, and opportunities based on race. This difference in access manifests in many ways, including financial access, access to secure housing, and access to power (Jones, 2000). Personally mediated racism is the different assumptions about a person's character and resulting actions due to their race. Personally mediated racism may look like a lack of respect, such as poor service, or dehumanizing treatment, such as police brutality. Internalized racism is the acceptance by the stigmatized groups or individuals of the negative messages they are receiving about their own ability, which may manifest as hopelessness (Jones, 2000). This thesis will be focused on personally mediated racism in hopes to understand how experiences of chronic discrimination impact long term CKD progression.

Racism and CKD

There is a long history studying the link between race, racism, and hypertension (Krieger, 1990; Blascovich et al., 2001). Racial and ethnic minorities are almost twice as likely to be

diagnosed with hypertension than their white counterparts (Centers for Disease Control and Prevention, 2013). Additionally, one study found that those who internalized the racist events that happened to them rather than confronted the individual about it were 4.4 times more likely to experience hypertension when compared to individuals who did confront those about their racist actions (Peters, 2004). Hypertension subsequently accelerates the progression of CKD (Centers for Disease Control and Prevention Chronic Kidney Disease Initiative, 2020). Extensive studies have examined the link between cardiovascular disease, racism, and hypertension (Assari & Lankarani, 2016; Chae et al.; 2012 Lukachko et al., 2014). However, very few studies have examined the same association in terms of CKD.

Stress and Health Outcomes

While stress can be a good extrinsic source of motivation to complete tasks and drive change, prolonged stress can result in poor health (House, 1974; Lazarus & Folkman, 1984; McEwen, 2008; Schneiderman et al., 2005). Additionally, stress can accumulate and span across generations, often adding to the existing harm done to those who experience adverse life experiences such as racism (Thoits, 2010). There are clear biological responses, such as hypertension, that may be the result of exposure to racism. These health implications may be less present when individuals are exposed stressors that are non-racial (Armstead et al., 1989).

Linking Stress and Depression

Depression may explain the relationship between race-related stress and negative health outcomes. Many studies associate stress and depression with other adverse health outcomes (Maddock & Pariante, 2001; Bartolomucci & Leopardi, 2009; Tafet & Nemeroff, 2016). In general, individuals who encounter high levels of prolonged stress are more likely to develop

mental health issues such as depression and have a more difficult time fighting chronic illnesses compared to those who do not experience prolonged stress (Maddock & Pariante, 2001).

Consistent with findings for other chronic diseases, CKD patients are more likely to have a depression diagnosis or depressive symptomology than those without a CKD diagnosis (Williams, 2018). In addition to an increased risk of depression among CKD patients, African Americans are at an increased risk of experiencing depressive symptomology due to racism and race-driven actions (Williams, 2018). Tsai et al, 2012 found that depression among CKD patients increase the risk of adverse outcomes such as ESRD, hospitalization, and death.

Problem Statement

Much of the research into the stark disparities in the rates of CKD between White and Black individuals focuses on conditions such as income, education level, and employment status (Norton et al., 2016; Crews et al., 2019). However, the cause of the disproportionate burden is much larger than these factors alone (Mays et al., 2007). The impact of race-related stress on depression and the subsequent development of disease has been studied more extensively among other chronic conditions (Assari & Lankarani, 2016; Chae et al., 2012; Moise et al., 2016). This study seeks to explore the association between depression, race-related stress and CKD status among African Americans.

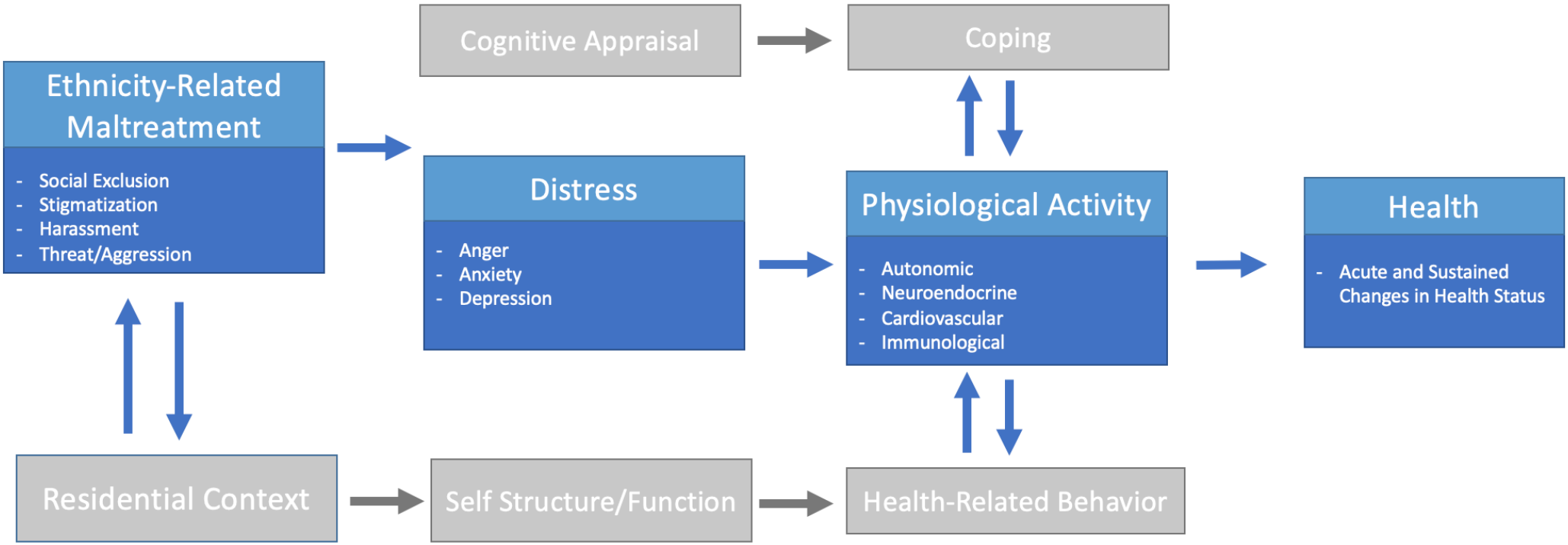
There is a large gap in the literature that this study seeks to address. Some studies assess the association between race and CKD while others examine the association between mental health and CKD. However, few studies directly examine the role of both depressive symptomology and race-related stress on CKD status among African Americans. The results of this study will provide the foundation for researchers to continue similar studies on a larger scale to understand racial disparities in CKD progression.

Theoretical Framework

The Brondolo, et al (2011b) conceptual framework links socioecological and racial contexts with health outcomes. This study will use this framework to explore how race-related stress leads to health changes. Race-related stress presents itself as one form of ethnicity-related maltreatment, distress, and psychological change. This framework suggests that repeated exposure to racial discrimination may lead to greater sensitivity to racial discrimination in the future. Therefore, long-term exposure to racism can subsequently impact the distress response. Individuals who report higher levels of exposure to racism are at an increased likelihood to report higher levels of negative moods. Negative moods can include increased daily levels of sadness, anger, and nervousness as well as depression symptoms. The extended exposure to race-related maltreatment combined with the distress response feeds into the physiological response of the individuals. Physiological response, such as autonomic, immunological, and neuroendocrine responses, will ultimately impact health and health status.

This framework is useful for understanding the complexities of African American individuals' experiences with racism and race-related stress. This study will explore the pathway from ethnicity-related maltreatment to the outcome on health via distress and physiological responses. This pathway will be used to describe how the effect of race-related stress on depression relates to the development of CKD among African Americans.

Figure 2: Theoretical Framework "Potential Pathways leading from acute ethnicity-related maltreatment to health status" (Developed by Brondolo et al. 2011b)



(Brondolo et al., 2011b)

Purpose of the Study

This study is based on data collected as part of a randomized trial of race-related stress among African Americans with CKD. The original study that these data were collected for examined how the recollection of racial stressors impacted certain factors that increase CKD progressions such as inflammatory processes and systolic and diastolic reactivity. This study specifically examines the relationship between depression, race-related stress, and the concurrent stage of CKD among African Americans. The findings of this study will help broaden public health and medical understandings of the impact that race-related stress has on CKD status. The findings of this study may help drive future research, which will expand the understanding of the differences in CKD progression between African Americans and Whites.

This study was designed to address the following research aims:

1. To understand the association between depressive symptomology and chronic kidney disease status among African Americans.
2. To understand the association between perceived race-related stress and chronic kidney disease status among African Americans.
3. To understand the independent association between depressive symptomatology and perceived race-related stress in chronic kidney disease status among African Americans.

Research Question

The goal of this study is to understand the association between race-related stress, depressive symptomology, and chronic kidney disease status among African Americans. The following hypothesis is proposed: African Americas who experience frequent racial discrimination and depressive symptomology are more likely to be in the later stages of CKD when looking at a population of individuals who already have CKD or are at an increased risk

for developing CKD. To test the hypothesis, the following research question was developed: in what ways are depressive symptomology and experiences of race-related stress associated with CKD status among African Americans?

Significance Statement

Currently there is no known research that looks at depression and race-related stress on CKD status among African Americans. There is existing research that assesses the biological impacts of stress and depression on CKD progression. However, no known research considers how race-related stress as a social determinant of health may impact CKD status among African Americans. This is exceedingly important to consider seeing as African Americans progress through the stages of CKD at a more accelerated pace and no known explanations have been clearly identified. Considering the discrepancy in acceleration between African American and White CKD patients and how biological factors alone cannot explain the accelerated pace of progression experienced by African Americans this study may be able to compliment the previous studies conducted. These findings may help explain this discrepancy by explaining social reasons as to why African Americans progress more quickly through CKD stages. Understanding this relationship may provide a foundation for future researchers to understand the implications of depression and race-related stress in African American's progression through CKD.

Definitions

Chronic kidney disease (CKD)- "a condition in which the kidneys are damaged and cannot filter blood as well as they should. Because of this, excess fluid and waste from blood remain in the body and may cause other health problems, such as heart disease and stroke" (Centers for Disease Control and Prevention Chronic Kidney Disease Initiative, 2020).

Blood Pressure - “Blood pressure is the pressure of blood pushing against the walls of your arteries. Arteries carry blood from your heart to other parts of your body” (Centers for Disease Control and Prevention Blood Pressure Symptoms and Causes, 2021).

Depression- “feelings of sadness and/or a loss of interest in activities you once enjoyed. It can lead to a variety of emotional and physical problems and can decrease your ability to function at work and at home” (American Psychiatric Association, 2020).

Racism- “a system of structuring opportunity and assigning value based on the social interpretation of how one looks, that unfairly disadvantages some individuals and communities, unfairly advantages other individuals and communities, and saps the strength of the whole society through the waste of human resources” (Jones, 2018, pp 231).

Chapter 2: Literature Review

Introduction

The following chapter is an overview of the current research on racism, race-related stress, and CKD, including the links between stress, depression, and health outcomes. A review of the theoretical framework is provided, along with an overview of the problem of racial inequities in health and the need for more research on depression and racism, and the subsequent impact on health outcomes such as CKD.

Review of the Literature

Racism and Health

A variety of studies highlight the disparities in both physical and mental health outcomes between African American and White individuals (Banks et al., 2006; Geronimus et al., 2006; Williams & Mohammed, 2008; Cunningham et al., 2017). Differences in life expectancy across racial and ethnic populations can be somewhat attributed to the life-long experience of coping with toxic stress from racism and bias (Healthy People 2020, 2021; Geronimus et al., 2006; Williams & Mohammed, 2008). As disparities exist in multiple contexts, it cannot be assumed that socioeconomic factors are solely responsible for racial/ethnic inequalities in health. Racism is one of the primary causes of poor health outcomes among racial/ethnic minorities (Williams et al., 2019). However, very little research explicitly addresses the impact of racism and bias on health.

A direct link has been found between those who experience everyday discrimination and both depression and anxiety symptoms (Banks et al., 2006). Studies have found that ethnic minorities who reported exposure to racial discrimination once in their life have worse mental health or depression than those who reported no exposure (Banks et al., 2006; Tobler et al., 2013;

Wallace et al., 2016). Additionally, when comparing experiences of discrimination by race, lower mental health scores associated with discrimination were strongest among African Americans (Gee et al., 2006).

In addition to poorer mental health, worse physical health outcomes can be linked to perceived discrimination and racism (Banks et al., 2006; Paradies, 2006; Priest et al., 2013). Discrimination can result in significantly more adverse effects. In a study examining mortality results as an effect of discrimination, participants who reported more perceived discrimination had a higher risk of death (Barnes et al., 2008). Racism contributes to poorer health and higher mortality rates. One study indicated that areas experiencing higher levels of racism experienced an 8.2% increase in all-cause Black mortality, equaling 30,000 excess deaths annually (Chae et al., 2015). Perceived racism has been found to be a key indicator of health outcomes such as increased heart rate and hypertension. Heart rate variability, or inconsistency in heart rate, and increased heart rate have been linked to the prolonged impact of racial discrimination (Hoggard et al., 2015). A number of studies have linked experiences of discrimination and racial stressors to increased blood pressure and on occasion, hypertension (Lepore et al., 2006; Brondolo et al., 2011a; Brewer et al., 2013). Additionally, several studies indicate links between the experience of perceived discrimination due to race as a cause of hypertension (Brondolo et al., 2011a).

Stress and Health Outcomes

Long-term exposure to stress can lead to damaged health and poorer health outcomes (House, 1974; Lazarus & Folkman, 1984; Schneiderman et al., 2005). Some levels of stress can be beneficial as they act as motivators for change or action. Prolonged exposure to stress causes irreversible changes to the body (McEwen, 2008). Overall, perceived stress is associated with poorer quality of health and life; individuals with increased levels of stress are at a higher risk for

poorer cardiovascular disease health outcomes (Gemmell et al., 2016; House, 1974). Stressors can act on individuals throughout a lifetime and across generations which further widens the gap between the disadvantaged and the advantaged (Thoits, 2010). Those who have exposure to more stress are more likely to have worse health outcomes and those with more health issues are more likely to experience high levels of stress. This is a perpetual cycle that is continuously impacted by systemic structures such as lack of access to care, unjust experiences of violence, police brutality, unequal environmental exposures, bias hiring processes, and housing discrimination.

When all stressors are considered, the negative impacts on both physical and mental health are substantial. Different exposures to stressful experiences are the primary way gender, race, marital status, and class inequalities in both physical and mental health exist. Minority groups are more severely harmed by discriminatory stress. Stressors expand over life and across generations increasing the gaps in health disparities. Exposure to racist stressors results in adverse biological responses. When exposed to racist situations individuals responded with elevated blood pressure, however, the same biological response was not present when exposed to non-race-related situations (Armstead et al., 1989). Being subjected to bias and prejudiced attitudes results in an emotional response, stress response, and subsequently increased heart rate (Sawyer et al., 2012). When comparing anticipatory stress, or racism-related vigilance, and blood pressure between different racial and ethnic groups, African American respondents reported the highest vigilance levels, and for each unit increase in vigilance there was a 4% increase in the odds of blood pressure. There was a similar but nonsignificant association for Hispanics and no association for Whites (Hicken et al., 2014).

Race-Related Stress and Health

The exposure of racial discrimination is a specific type of stress that has severe adverse effects on mental health, psychological well-being, and related health behaviors such as sleep, eating patterns, and use of psychoactive substances (i.e., drugs, alcohol, and cigarettes) (Bailey et al., 2017). Additionally, increases in self-reported racism were positively associated with increased levels of negative mental health (Bailey et al., 2017). This allows one to make the connection between experiences of race-related stress and health. Several studies highlighted the idea of stress-proliferation processes as a result of racism and determined that racism can affect health through institutional mechanisms (Williams, 2018; Duru et al., 2012).

Race-related stressors increase the physiological activity in the body, which in turn contributes to negative health outcomes (Harrell et al., 2003; Sternthal et al., 2011). One study found that while socioeconomic factors explained the difference in chronic stress between Hispanic and White participants, socioeconomic factors were not fully able to explain the difference in chronic stress levels between Black and White participants (Brown et al., 2018). Furthermore, African American's who live in areas where high levels of structural racism are reported are at an increased risk for myocardial infarction, one of the cardiovascular diseases, when compared to their counterparts in areas with lower levels of reported structural racism (Lukachko et al., 2014). African American's have worse health outcomes when it comes to allostatic load, or how the body handles situations of stress. This proliferation of large allostatic load can lead to health impacts such as poorer diets and increased levels of cardiovascular disease (Duru et al., 2012). Chronic exposure to stress because of racism can have negative impacts on the physical and mental health of people.

Stress and Depression

While there are a number of factors that impact depression development, such as genetics, biological factors, and lack of social support, major stressors often trigger depressive episodes to occur (Hosseini & Jalali, 2018). Frequently, the first time an individual experiences depression the event is associated with a major life stressor (Monroe & Harkness, 2005). Those who experience more stressors are more likely to report experiences of depression, especially if those stressors are related to personal characteristics or behaviors (Hammen, 2006). Certain social determinants of health such as employment, access to insurance, socioeconomic status, and experiences of racism are determinants of mental health (Alegría et al., 2018). Perceived experiences of racism act as a strong stressor. Walker et al. 2014 found that perceived racism was both directly and indirectly associated with suicidal thoughts. Experiences of prolonged rumination on past events can lead to higher levels of hopelessness and lower self-concept as well as more adverse effects (Nyborg & Curry, 2003; Brosschot et al., 2006).

Race-Related Stress and Chronic Kidney Disease

Perceived racial discrimination has been linked with decreased kidney functioning, which can explain the differences in kidney function decline among African American and White individuals who do not have CKD (Beydoun et al., 2017; Peralta et al., 2011). Individuals who reported more everyday discrimination had a lower glomerular filtration rate (Cobb et al., 2019). Glomerular filtration rate indicates kidney function; therefore, a lower glomerular filtration rate indicates lower kidney functioning (National Kidney Foundation, 2021a). Additional studies show that there may be an association between race-related stress and processes related to CKD progression, such as inflammatory processes (Arriola et al., 2021). However, there is a large gap in the literature surrounding race-related stressors and CKD. There is a need to focus on racial

discrimination as an important factor when researching and treating patients, especially African American patients with CKD (Norton et al., 2016). Several studies have examined the association between racism, race-related stress, depression, and kidney functioning, but no known studies examine these associations with CKD stage (Beydoun et al., 2017; Cobb et al., 2019; Peralta et al., 2011)

Perceived racial discrimination is also associated with hypertensive status, which is both a cause and effect of CKD (Dolezsar et al., 2014). Individuals who have better blood pressure control are less likely to develop and progress through CKD stages (Pugh et al., 2019). The findings that link race-related stress and CKD specific symptoms are substantial yet there is limited research that looks at the direct link between race-related stress and CKD status.

Theoretical Framework

Background

There are many areas of racism and race-related stress that need additional research in order to understand the implications on health outcomes. Attention to stress-proliferation as a result of racism, and the assessment of stressful experiences are areas that need more work in order to understand the implications of racism and race-related stress on health, particularly CKD. The perpetuation of stress leads to long-term health issues and worse outcomes. The Brondolo et al. (2011b) framework describes the relationship between ethnicity-related maltreatment, distress, psychological activity, and the resulting health outcomes. Based on this framework, depression becomes a mechanism linking race-related stress and CKD.

Long term Impact of Ethnicity-Related Maltreatment

Ethnicity-related maltreatment can manifest as social exclusion, stigmatization, harassment, threat, or aggression (Brondolo et al., 2011b). Experiences of ethnicity-related

maltreatment can become internalized in which the individual believes the characteristics others perceive to be true (Jones, 2000). This internalization of the maltreatment in turn influences health-related behaviors and outcomes (Sinclair et al., 2005). The experience of maltreatment feeds into distress, which can manifest as anger, anxiety, and depression (Brondolo et al., 2011b). There are direct links between social situations in which individuals experience maltreatment and experiences of distress. These pathways need to be addressed to improve mental health, and therefore health outcomes (Alegría et al., 2018). Experiences of extended distress can impact physiological activity such as the immunological, neuroendocrine, cardiovascular, and autonomic response (Brondolo et al., 2011b). Physiological activity such as increased inflammation markers and hypertension are indicators in the development and progression of CKD (Dai et al., 2011, Armstead et al., 1989). The long-term exposure of stress on a body can result in decreased health outcomes (Schneiderman et al., 2005; Sawyer et al., 2012). The independent components of the Brondolo et al. (2011b) framework, ethnicity-related maltreatment, distress, and physiological activity, result in a culminating final outcome, health. These changes can appear as both short-term health changes and long-term sustained changes (Brondolo et al., 2011b). This framework is used to explain how depression acts as a mechanism to link racism and CKD.

Summary of the Problem

Given the prevalence of CKD among African Americans coupled with the poor health outcomes and mortality rates of CKD, the lack of research regarding the impact of perceived experiences of race-related stress and perceptions of depression is concerning. There are studies that examine the association between depression and the impact of race-related stress on health. There are also many studies that examine how depression, racism, and race-related stress impact

cardiovascular disease among African American patients. However, there are no known studies that seek to understand how perceptions of depression and race-related stress interact to impact CKD status among African Americans. This study seeks to fill this gap and explore the association between perceptions of depression, perceptions of racial discrimination, and CKD status among African Americans.

Chapter 3: Methods

Introduction

Study Purpose

The purpose of this study is to investigate the relationship between race-related stress and depressive symptomology among African Americans with CKD. This study aimed to fill a gap in the literature by addressing the association of experiences of race-related stress and depression to understand the way these experiences impact CKD status. Additionally, this study considered the effects of known factors that increase the status of CKD such as blood pressure. This study was a secondary analysis of data collected in "A Randomized Trial of Race-Related Stress among African Americans with Chronic Kidney Disease", clinical trial identifier NCT03387319

By performing secondary data analysis on the results of a National Institutes of Health study, exploratory research grant, the results of this study may provide the foundation for researchers to continue similar studies on a larger scale.

Research Aims

This study was designed to address the following research aims:

1. To understand the association between depressive symptomology and chronic kidney disease status among African Americans.
2. To understand the association between perceived race-related stress and chronic kidney disease status among African Americans.
3. To understand the independent association between depressive symptomatology and perceived race-related stress in chronic kidney disease status among African Americans.

Human Subjects Approval

This thesis is a secondary analysis of an R21 exploratory research grant study funded by the National Institutes of Health. Data for this study resulted from a multiple-day data collection effort in which participants completed a survey and underwent testing in a laboratory setting. The parent study was previously approved by the Emory University Institutional Review Board. This study protocol is considered non-human subjects research based on the results of the Non-Human Subjects Research Determination form made by Emory University's Institutional Review Board. Therefore, no additional IRB approval was required for this study.

Study Population and Sample

Target Population and Sample

The target population for this study was African American individuals with CKD or at risk of developing CKD. The initial sample included 68 participants. However, individuals who were at risk for developing CKD, but were not currently diagnosed with CKD, were included. Most participants were in stage 3 (n=26) or stage 4 (n=13) and about 20% (n=12) did not have CKD.

Sampling and Recruitment

Participants were recruited from a medical practice via active and passive recruitment methods. As a means of active recruitment, the project coordinator identified potential participants through medical records and the appointment system based on the inclusion criteria and those with upcoming appointments. Then she mailed a letter that gave more information about the study and encouraged those who were interested in participating to contact her by telephone. As a means of passive recruitment, flyers were posted in the clinic informing patients of the study, and a postcard describing the study was placed in patients' exit materials as they left

their appointments. Additionally, patients were informed of the study at the clinic while they were waiting to be seen by a health care provider. All participants underwent a screening process to determine eligibility. Participants who completed both day 1 and day 2 were compensated $200. However, this study only uses data collected in the day 1 survey.

Survey Administration and Procedures

On the day of the study recruitment participants gave informed consent and completed the survey. The survey collected general demographic information as well as information on perceptions of experiences of discrimination and perceptions of depression. General health information and CKD status were abstracted from patient charts. The second day of the study was scheduled within one week of the initial data collection.

Eligibility Requirements

The eligibility criteria were individuals who self-identify as African American, were between 25 and 65 years of age, and at the time of the study were patients of the collaborating clinic and had seen a provider within 30 days of study enrollment. Participants in stages 1-4 of CKD were included. Study participants who did not have CKD (i.e., stage 0) were also included. Patients in stage 5 of CKD were not included because they cannot progress any further. Additional exclusion criteria included a diagnosis of lupus erythematosus, mental disorders that may prevent participation, currently on maintenance dialysis, or unwillingness to undergo intravenous catheterization.

Measures

Outcome Measures

The outcome variable addressed by this study was CKD stage. CKD stage was determined by abstracting the current CKD stage of the participant from their medical chart. For

this study CKD stage was dichotomized into stages 0/1/2 and stages 3/4 due to the small sample size of this study.

Personal Demographic Characteristics

In this study, the primary demographic variables of interest were general health status, gender, race, hypertension, diabetes, habits surrounding alcohol consumption, and age. General health status was measured by asking "In general, would you say your health is:" with response options (1) poor, (2) fair, (3) good, (4) very good, and (5) excellent. Gender was measured by asking "What is your gender?" with two response options, male and female. Alcohol consumption was assessed when the participants answered the question "During the past 30 days, how many days per week did you have at least one drink of any alcoholic beverage such as beer, wine, a malt beverage, or liquor?" Participants were able to answer with any number and then these responses were coded into those who consumed alcohol and those who did not consume alcohol. Age was measured by asking "When were you born?" respondents indicated their birthdate in mm/dd/yyyy format. Variables such as hypertension and diabetes were obtained though medical chart abstraction and treated as dichotomous variables, with responses of either yes or no.

Depressive Symptomology

Depressive symptomology was assessed using the Beck Depression Inventory, a 21-item scale used to measure depression and depressive symptoms (Beck et al., 1996). The response scale ranges from 0 to 3, with 0 indicating no depressive symptoms and 3 indicating higher levels of depressive symptomology. Sample topics participants were asked about include guilt, satisfaction, suicidal thoughts, and sleep. Scores for each respondent were summed and could range from 0 to 63. Higher scores indicate higher symptoms of depression. The Beck Depression

Inventory is scored and categorized into five categories: normal, a mild mood disturbance, borderline clinical depression, moderate depression, and severe depression (Beck et al., 1996). However, given the sample size, responses were coded into no depressive symptomology (score 1-9) and depressive symptomology (score 10-63) (Butcher et al., 1998). Cronbach's alpha reliability for this scale was 0.922 suggesting high internal consistency of scale items.

Chronic Discriminatory Stress

Chronic discriminatory stress was assessed using the Everyday Discrimination Scale, a 10-item scale with answer options ranging from never (1) to often (4). Sample items included "You are treated with less courtesy than other people" and "People act as if they are afraid of you." Total scale scores were computed by summing the responses to all 10 questions. Scores ranged from 10 to 40 with a higher score indicating higher experiences of discrimination. Given the sample size, responses were coded into infrequent experiences of everyday discrimination (score 10-17) and frequent experiences of everyday discrimination (score 18-40). Cronbach's alpha reliability for this scale was 0.890 suggesting high internal consistency of scale items.

Data Analysis Methodology

Preliminary Analyses

Statistical analyses were computed using Statistical Package for the Social Sciences (SPSS Version 27). The first step in the preliminary analysis of the data was to produce frequency tables that include counts for each study variable to assess for missing data. Given the small sample size, if missing data amounts are greater than 5% the missing data were imputed using mean substitution, rather than dropping any responses with missing data (Tabachnick & Fidell, 2013).

Second, the distribution of study variables in the overall sample was analyzed using univariate analysis. Frequency tables were produced to examine the weighted and frequency percentages of demographic variables, potential independent variables, and outcome variables. Any variables out of range were checked against the original data source. Frequencies were analyzed to ensure that plausible values were obtained for each variable (Tabachnick & Fidell, 2013).

Third, chi-square tests were performed to check for a relationship between the study variables, depressive symptomology, and experiences of discrimination, and in order to determine crude relationships between the primary variables of interest before including additional study variables. Statistical differences in perception of depression by differing levels of perceived race-related stress were examined using a chi-square test.

Assessment of Research Aims

This study was designed to assess three specific research aims: understanding the association of depressive symptomology in chronic kidney disease status among African Americans, understanding the association of perceived race-related stress in chronic kidney disease status among African Americans and understanding the association of perceived race-related stress and depressive symptomology in chronic kidney disease status among African Americans.

To answer aim one, understanding the association between depressive symptomology and CKD status among African Americans and aim two, understanding the association between perceived race-related stress and CKD status among African Americans, bivariate logistic regression was conducted. Variables deemed theoretically relevant and statistically significant were included in the final multivariable models (Aneshensel, 2013). For the bivariate

associations, odds ratios, 95% confidence intervals, and associated p-values were reported. Significance was assessed at a value of $\alpha=0.05$.

The third study aim, to understand the independent association between depressive symptomatology and perceived race-related stress in CKD status among African Americans was evaluated using multivariable logistic regression models. Demographics were included as the main effects; therefore, the independent effects of depressive symptomology and perceived race-related stress could be assessed on CKD stage. In the second step of the models, depressive symptomology and perceived race-related stress were added to the model to consider the impacts of both depressive symptomology and perceived race-related stress on chronic kidney disease. Age and gender were used as controls in the second step.

Chapter 4: Results

Data Analysis

Preliminary Analyses

The personal demographic characteristics of the study sample are presented in Table 1. The total sample consisted of 68 African American CKD patients and those at risk for developing CKD. The sample was 65.7% (n=44) female and 34.3% (n=23) male. The sample the majority of participants being above the age of 51 years old, 60.3% (n=41), and 39.7% (n=27) between the age of 30-50 years old. Most respondents (58.8%, n=40) indicated they were in poor/fair health, 23.5% (n=16) indicated they were in good health, and 17.6% (n=12) indicated they were in very good/excellent health. In regard to underlying conditions, 77.6% (n=52) of participants reported having hypertension, or high blood pressure. 44.8% (n=30) of participants had diabetes. 41.2% (n=28) of respondents reported that they do drink alcohol. Across the study sample, 35.3% (n=24) of participants were classified as being in stage 0, stage 1, or stage 2 CKD and 64.7% (n=44) were in stage 3 or stage 4 CKD. For depressive symptomology, most participants (70.6%, n=48) scored “reported no” for depressive symptomology on the Beck Depression Inventory, and 29.4% (n=20) scored “yes” for depressive symptomology. In terms of experiences of discrimination, 22.1% (n=15) of participants had scores that indicated infrequent experiences of discrimination while 77.9% (n=53) had scores indicating frequent experiences of discrimination.

Table 1

Univariate Analysis of Demographic Variables & Study Variables (n=68)

Variables	Count *n*	Percent %
Sex		
Male	23	34.3
Female	44	65.7
Age		
30-50 years	27	39.7
51+ years	41	60.3
General Health Status		
Poor/Fair	40	58.8
Good	16	23.5
Very good/Excellent	12	17.6
Hypertension Status		
Yes	52	77.6
No	15	22.4
Diabetes Status		
Yes	30	44.8
No	37	55.2
Alcohol Consumption		
Yes	28	41.2
No	40	58.8
CKD Stage		
0/1/2	24	35.3
3/4	44	64.7
Depressive symptomology		
Yes	22	32.4
No	46	67.6
Chronic Experiences of Discriminatory Stress		
More frequent	38	55.9
Less frequent	30	44.1
Total	68	--

n varies due to missing data

The purpose of aim three of this study to understand the independent association between depressive symptomatology and perceived race-related stress in CKD status among African Americans. To address aim three, chronic experiences of discriminatory stress and depressive symptomology were cross tabulated to determine if there were significance differences in level of depression by experiences of discrimination. A Chi Square test was performed to examine the association between depression and experiences of discrimination. Results suggest that there is a statistically significant association (x^2=8.873; df=1; p=0.003), between experience of depression symptomology and experiences of chronic discriminatory stress. As seen in Table 2, a larger percentage (81.8%) of those who experienced more frequent experiences of chronic discriminatory stress received scores that indicated yes for depressive symptomology than those who experienced less frequent chronic experiences of discriminatory stress and also received scores that indicated yes for depressive symptomology (18.2%). Additionally, those who experienced more frequent experiences of discriminatory stress were less likely to receive a score of no for depressive symptomology (43.5%) than those who experienced less frequent experiences of discriminatory stress and received a score of no for depressive symptomology (56.5%).

Table 2
Associations in perceptions of depressive symptomology by differing levels of perceived levels of chronic experiences of discriminatory stress

	Depressive Symptomology			
Chronic Experiences of Discriminatory Stress	Yes *n* (%)	No *n* (%)	*Total*	Significance
More frequent	18 (81.8)	20 (43.5)	38	x^2=8.873; df=1; p=0.003
Less frequent	4 (18.2)	26 (56.5)	30	
Total	22	46		

n varies due to missing data

Additionally, the frequencies of CKD and each of the additional variables of interest were cross tabulated, as shown in Table 3. Chi-square tests were performed to examine the association between the demographic variables of interest and CKD stage. There was no significance found in the association between sex (p=0.117), age (p=0.200), general health status (p=0.248), hypertension status (p=0.078), diabetes status (p=0.234), or alcohol consumption (p= p=0.332) and CKD stage.

Table 3
Frequency of CKD Stage by sex, health status, age, hypertension status, and diabetes status

	CKD Stage			
Variables	Stage 0/1/2 *n* (%)	Stage 3/4 *n* (%)	*Total*	Significance
Sex				
Male	5 (21.7)	18 (40.9)	23	x^2=2.46; df=1;
Female	18 (78.3)	26 (59.1)	44	p=0.117
Age				
30-50 years	12 (50.0)	15 (34.1)	27	
51+ years	12 (50.0)	29 (65.9)	41	x^2=1.64; df=1; p=0.200
General Health Status				
Poor/Fair	11 (45.8)	29 (65.9)	40	
Good	8 (33.3)	8 (18.2)	16	x^2=2.79; df=2;
Very good/Excellent	5 (20.8)	7 (15.9)	12	p=0.248
Hypertension Status				
Yes	15 (65.2)	37 (84.1)	52	x^2=3.10; df=1;
No	8 (34.8)	7 (15.9)	15	p=0.078
Diabetes Status				
Yes	8 (34.8)	22 (50.0)	30	x^2=1.42; df=1;
No	15 (65.2)	22 (50.0)	37	p=0.234
Alcohol Consumption				
Yes	8 (33.3)	20 (45.5)	28	x^2=0.94; df=1;
No	16 (66.7)	24 (54.5)	40	p=0.332
Total	24	44		

n varies due to missing data

To address aims one and two, Table 4 shows the frequency of CKD status by chronic experiences of discriminatory stress and depressive symptomology. To address aim one, a chi-square test was conducted between depressive symptomology and CKD Stage. The findings were nonsignificant (x^2=0.442; df=1; p=0.506). Aim two was addressed by conducting a chi-square test to assess the association between chronic experiences of discriminatory stress and CKD stage. The findings were nonsignificant (x^2=0.659; df=1; p=0.417).

Table 4
Frequency of CKD Status by Depressive Symptomology and Experiences of Discriminatory Stress

	CKD Stage			
Variables	Stage 0/1/2 *n* (%)	Stage 3/4 *n* (%)	*Total*	Significance
Depressive symptomology				
Yes	9 (37.5)	13 (29.5)	22	x^2=0.45;
No	15 (62.5)	31 (70.5)	46	df=1; p=0.503
Chronic experiences of discriminatory stress				
More frequent	15 (62.5)	23 (52.3)	30	x^2=0.66;
Less frequent	9 (37.5)	21 (47.7)	38	df=1; p=0.417
Total	24	44		

n varies due to missing data

Bivariate analysis was run to answer aim one, the association between depressive symptomology and CKD status among African Americans. Aim one was answered by analyzing depressive symptomology with CKD stage, the findings were not statistically significant (p=0.601). The Nagelkerke R^2 for this model was 0.005, indicating that approximately 0.5% of the variance in CKD stage in this sample could be explained by this model. Bivariate analysis was run to answer aim two, the association between perceived race-related stress and CKD status among African Americans. Aim two was answered by analyzing the impact of perceived race-related stress on CKD stage, the findings were not statistically significant (p=0.354). The Nagelkerke R^2 for this model was 0.019, indicating that approximately 1.9% of the variance in CKD stage in this sample could be explained by this model.

Table 5
Bivariate logistic regression with depressive symptomology and bivariate logistic regression with chronic experiences of discriminatory stress

Variables (Reference)	Stage 3/4 OR (95% CI)
Depressive symptomology (Yes)	
No	0.750 (0.255-2.202)
Nagelkerke R^2	*0.005*
Chronic experiences of discriminatory stress (More frequent)	
Less frequent	0.657 (0.238-1.816)
Nagelkerke R^2	*0.019*

OR=Odds Ratio, 95% CI=Confidence Interval
*p<0.05

The multivariable models were used to answer aim three, to understand the association between perceived race-related stress and CKD status among African Americans. The results of the first step of the final models, the demographic variables, can be found in Table 6. The variables sex (p=0.091), poor/fair general health status (p=0.188), good general health status (p=0.803), age 30-50 (p=0.405), hypertension (p=0.149), diabetes (p=0.528), and alcohol consumption (p=0.098) were not statistically significant. The Nagelkerke R^2 for this model was 0.241, indicating that approximately 24.1% of the variance in CKD stage in this sample could be explained by this model.

Table 6
Multivariable model step 1: logistic regression with demographic variables

Variables (Reference)	Stage 3/4 OR (95% CI)
Sex (Female)	
Male	0.292 (0.070-1.215)
General Health Status (Very good/Excellent)	
Poor/fair	2.984 (0.587-15.168)
Good	1.259 (0.206-7.702)
Age (51+ years)	
30-50 years	1.663 (0.503-5.501)
Hypertension (Yes)	
No	3.059 (0.671-13.953)
Diabetes (Yes)	
No	1.493 (0.431-5.175)
Alcohol Consumption (Yes)	
No	2.978 (0.819-10.826)
Nagelkerke R^2	*0.241*

OR=Odds Ratio, 95% CI=Confidence Interval
*p<0.05

Step two assessed the individual relationship between chronic experiences of discriminatory stress and depression with CKD stage when controlling for age (p=0.351) and gender (p=0.144). The results of the multivariable model that looks at chronic disease and experiences of discriminatory stress to answer aims three can be found in Table 7. When controlling for age, gender, and depressive symptomology, results indicate that when compared to those who report more frequent experiences of discriminatory stress, those who report less frequent experiences of discriminatory stress are less likely to be in higher stages of CKD (p=0.726). When controlling for age, gender, and chronic experiences of discriminatory stress, that when compared to those who experience depressive symptomology, those who report no depressive symptomology are more likely to be in higher stages of CKD (p=0.959). The Nagelkerke R^2 for this model was 0.075, indicating that approximately 7.5% of the variance in CKD stage in this sample could be explained by this model.

Table 7
Multivariable model step 2: logistic regression with chronic experiences of discriminatory stress and depressive symptomology

Variables (Reference)	Stage 3/4 OR (95% CI)
Age (51+ years)	
30-50 years	1.677 (0.565-4.979)
Gender (Female)	
Male	2.397 (0.742-7.844)
Chronic experiences of discriminatory stress (More frequent)	
Less frequent	0.819 (0.268-2.505)
Depressive symptomology (Yes)	
No	1.031(0.312-3.411)
Nagelkerke R^2	*0.075*

OR=Odds Ratio, 95% CI=Confidence Interval
*p<0.05

Summary of Results

In summary, chronic discriminatory stress and depressive symptomology were not found to be significantly associated with increased CKD Stage. The findings that answer aim one and analyzed the association between depressive symptomology and CKD status were nonsignificant. The analysis that was conducted to answer aim two and analyze the association between perceived race-related stress and CKD also produced results that were nonsignificant. Aim three, to understand the independent association between depressive symptomatology and perceived race-related stress in CKD status among African Americans produced results that were nonsignificant. The results of the association between racial discrimination and CKD stage were in the expected direction. However, the results of the association between depressive symptomology and CKD stage were not in the expected direction.

Chapter 5: Discussion

Introduction

This study was informed by the Brondolo et al. (2011b) framework to consider the relationship between race-related stress, depression, and CKD (Figure 2). This framework situates the relationship between ethnicity-related maltreatment, distress, and psychological activity as a possible cause for the resulting health outcomes. For the purposes of this paper, based on this framework, the association between depression and race-related stress work to possibly explain the variance in CKD. This framework serves as a way to understand why African American CKD patients have worse CKD outcomes than their White counterparts. This was done by examining the possible connection between chronic ethnicity-related maltreatment that leads to stress, depression, and subsequent worse CKD outcomes.

Summary of Study

The purpose of this study was to investigate the variation in CKD stage depending on a combination of depressive symptoms and experiences of chronic discriminatory stress. To the knowledge of the author, this study was the first of its kind to investigate the relationship between experiences of chronic discriminatory stress and depression on CKD. This study was a secondary analysis of data from African American with CKD or at risk for developing it. It also considered the relationship of diabetes and hypertension diagnoses, age, sex, health status, and alcohol consumption. This research was designed to answer the following research question: in what ways are depressive symptomology and experiences of race-related stress associated with CKD status among African Americans? While the findings of this study were generally nonsignificant, the findings that resulted from this study have implications that can be used to inform future research.

Discussion of Key Results

The discussion of the key findings of this thesis the focus will be reporting how the trends found align with previous studies and rely on significance coming from the soundness of the study and effect size rather than reporting solely on statistical values (Amrhein et al., 2019; Ioannidis, 2019).

There was a significant association between depressive symptomology and chronic experiences of racial discrimination. The results do align with the expected results and the results of similar studies (Banks et al., 2006; Tobler et al., 2013, Wallace et al., 2016). The findings indicate those who report experiences of depression also indicate frequent experiences of discrimination aligns with the findings of Tobler et al. (2013). In the Tobler et al. (2013) study, participants reported frequent experiences of discrimination were at an increased risk for depression. However, this study was conducted using cross-sectional data, therefore, in order to determine if a similar causal relationship exists, longitudinal studies will need to be conducted.

The demographic variables of this data align similarly to those of other studies done with similar populations of CKD patients (Tsai et al., 2012; Hicken et al., 2014; Cobb et al., 2019). Men are more likely to be in later stages of kidney disease CKD (Iseki, 2005; Norton et al., 2016). In a study conducted by Iseki (2005), while women were more likely to have CKD, men were more likely to be in later stages of CKD. The participants of this study were comprised mostly of women, and while by numerical value there are more women in the later stages of CKD, the proportion of men in earlier stages of CKD to alter stages of CKD is higher. This slight discrepancy in numerical value may be a result of the cross-sectional design of this study, the location from which participates were recruited, or the limited sample size due to the exploratory nature of the grant used to fund this study. Participants were recruited from a clinic that

specializes in treating patients with CKD, because more women have CKD the sampling pool may have been skewed towards female participants.

The results of this study reflect the trends of CKD by age. The majority of participants are in the 51+ category years old. These findings correspond with typical trends of the two most common age groups of CKD patients being above 65 and between 45 and 65 (U.S. Department of Health and Human Services, 2021).

Additionally, the prevalence of depressive symptomology and experiences of chronic discriminatory stress found in this study population align with trends found in previous research. Previous studies indicate that there is an association between individuals who are exhibiting depressive symptomology and chronic stress with later stages of CKD development (Chiang, 2015; Beydoun et al., 2017; Cobb et al., 2019; Shirazian, 2019). These consistent demographic trends indicate that this data set follows the patterns already understood about CKD. Therefore, since this data resembles existing data sets, the results used to answer the research question are likely to also follow existing trends.

Research Aim 1

The first aim of this study:

1. To understand the association between depressive symptomology and chronic kidney disease status among African Americans.

Prior studies considering the association between depressive symptomology and CKD status among African Americans have been limited. They typically examine specific health impacts of depression rather than CKD status. Others have primarily examined depression development in later stages of CKD. Additionally, these studies typically examine CKD patients in general rather than by race. Research has shown that while African Americans make up 13% of the population

in the United States, they only account for 5% of study participants. Whereas Whites make up 67% of the population in the United States and 83% of study participants (Yates et al., 2020). Regardless of these discrepancies of race, all of these findings have been relatively consistent in linking depression with CKD. Prior studies have considered the association between depression and CKD health indictors such as eGFR and hypertension (Forsyth et al., 2014; Assari & Lankarani, 2016; Tsai et al, 2012). Additional studies have examined the impact of CKD on the development of depression (Chan et al., 2011; Shirazian, 2019; Muthukumaran et al., 2021). A study conducted by Muthukumaran et al., (2021) found that CKD patients were at an increased risk for a lifetime prevalence of depression. The results of the Tsai et al. (2012) study indicate that those who experience depression are more likely to progress to late stages of CKD and die from CKD. Those who had depressive symptomology were three times more likely to end up in later stages of CKD or die than those without depressive symptomology (Tsai et al, 2012).

The goal of aim one was to understand the association between depressive symptomology and CKD status among African Americas. When examining the depressive symptomology of this population, the participants of this study have slightly higher levels of depressive symptomology than in some previous research, 32% compared to 25% (Shirazian, 2019). However, the study conducted by Tsai et al. (2012) had a similar indication of depressive symptomology with 37% of their participants exhibiting depressive symptomology compared to 32% in this study. This may be due to a number of reasons such as the composition of this cohort or the dichotomization of the Beck Depression Inventory. Some studies indicate that African Americans have more experiences of lifetime depression, this may explain differences in depression prevalence between studies seeing as this study only recruited African American participants (Dunlop et al., 2003).

The results of the analysis conducted to answer the question posed in aim one indicated a nonsignificant association with a weak effect size between depressive symptomology and CKD. However, the direction of these results indicates that when compared to those who exhibit depressive symptomology, those who exhibit no depressive symptomology are less likely to be in higher stages of CKD. Taken into consideration within the context of the existing literature there may be reason to further explore the relationship between depression and CKD status among African Americans.

Research Aim 2

The second aim of this study:

2. To understand the association between perceived race-related stress and chronic kidney disease status among African Americans.

There are a number of studies that examine the biological impact of stress on disease (Williams & Mohammed, 2008; Dolezsar et al., 2014; Hicken et al., 2014). As well as studies that examine the impact of stress on factors that exacerbate development and progression of CKD (Beydoun et al., 2017; Cobb et al., 2019; Arriola et al., 2021). Hicken et al. (2014) found that hypertension was associated both with race and stress. Those who experienced higher levels of race-related stress were four times more likely to have hypertension. While the findings of the Hicken et al. (2014) study are not directly in line with this study, hypertension is a risk for the development of CKD. The findings of this study indicated that the majority of the participants, 78% were hypertensive and more of those who were in the later stages of CKD were hypertensive, 84%. The findings of the Cobb et al. (2019) study indicate that those who experience more everyday discrimination had lower eGFR rates and were therefore in later stages of CKD. This is consistent with this study, with 52% of those in later stages of CKD

experiencing more frequent discriminatory stress. However, the Cobb et al. (2019) study was comprised mostly of White individuals who made up 83% of study participants. Therefore, the experiences of everyday discrimination may have been related to ageism or gender and cannot solely be contributed to race. It is important to consider the possible impactions race has on these findings.

The results of the analysis conducted to answer the question posed in aim two indicated a nonsignificant association and weak effect size between chronic experiences of perceived race-related stress and CKD. Regardless, the direction of these results indicates that when compared to those who exhibit more frequent experiences of discriminatory stress, those who exhibit less frequent experiences of discriminatory stress are less likely to be in higher stages of CKD. Given the direction of the results in conjunction with the existing research that indicates similar trends, the results of the analysis conducted may indicate a meaningful relationship between CKD stage and race-related stress among African American CKD patients.

Research Aim 3

The third aim of this study:

3. To understand the independent association between depressive symptomatology and perceived race-related stress in chronic kidney disease status among African Americans.

As discussed above in aim one and aim two, there are a number of studies that examine the association between stress, depression, and discrimination with CKD status and CKD risk factors. A number of studies examined the association between stress and depression (Maddock & Pariante, 2001; Bartolomucci & Leopardi, 2009; Tafet & Nemeroff, 2016; Hosseini & Jalali, 2018). However, no known studies have examined the association of the independent effects of both depression and racial discrimination and CKD among African Americans.

Aim three of this research study was to understand the independent association between depressive symptomology and perceived race-related stress in CKD status among African Americans. Chronic experiences of discriminatory stress follow the trends predicted in the hypothesis, when compared to those who experienced frequent chronic discriminatory stress, those who experience less frequent chronic discriminatory stress were less likely to be in later stages of CKD. However, when controlling for age, gender, and experiences of discriminatory stress, those who had depressive symptomology, when compared to those without depressive symptomology were more likely to be in later stages of CKD. While these findings do not support the hypothesis, they provide valuable insight that could be used for further research. Because depression acted in the predicted way and indicated that when compared to those who experience depressive symptomology, those who report no depressive symptomology are less likely to be in higher stages of CKD, they may be other outlying factors that explain the difference in results when controlling for race. This could indicate that protective factors are not being accounted for among the group who experiences more frequent discrimination.

Considering that both depressive symptomology and perceived race-related stress were significantly associated with one another but not statistically significantly associated with an increase in CKD status, there may be merit in the two interacting with one another to result in increased instances of higher CKD stage. Due to the small sample size of this study, there may not have been enough power to test interaction effects. Future studies, with more power would be better situated to answer a question about the interaction between depressive symptomology and perceived race-related stress in CKD status.

While the analysis run to answer aim three was nonsignificant, the effect size was rather large. 7.5% of the variance in CKD stage could be explained by the model. Considering all of the

known risk factors for CKD, this model accounting for 7.5% of the variance may prove to be a substantial explanation for variance in CKD stage. Future studies will need to be performed to further understand and explain these findings.

Overall Findings

This study was the first known of its kind to examine the independent association of perceived race-related stress, depressive symptomology, and CKD status. The results of this study indicate a need for more research in this topic to further explain any discrepancies and understand why CKD is more prevalent among African Americans and why African Americans progress through CKD stages more rapidly.

The only statistically significant results of this study showed a significant relationship between increased experiences of discrimination and increased depressive symptomology. The results of this study that follow the framework laid out by Brondolo et al. (2011b) indicate similar results to existing studies showing the link between patterns of experiences of discrimination and depressive symptomology. Existing studies show similar patterns of significant results indicating an association between increased experiences of discrimination and depressive symptomology (Harris et al., 2006; Tobler et al., 2013; Forsyth et al., 2014; Kairuz et al., 2021). Individuals who report chronic exposure to stress are more likely to develop health complications such as depressive symptomology, hypertension, and diabetes that put them at a higher risk for developing CKD (Lazarus & Folkman, 1984; Schneiderman et al., 2005; Dolezsar et al., 2014; Shirazian, 2019). The consistency of the findings of this study with other studies assessing health topics that behave in a similar manner to CKD indicates that there may be some significant relationship between depressive symptomology, perceived race-related stress and CKD.

The findings of this research align with prior knowledge and understanding of how CKD and other chronic diseases progress. Therefore, they may be some legitimacy in the trends that the results that were used answer the research question follow even though they were nonsignificant. These trends could be beneficial for future studies to base the development of their research questions from. Furthermore, these findings indicate that the framework developed by Brondolo et al. (2011b) may be one explanation for the discrepancy in CKD status among African Americans and Whites. However, further studies would need to be conducted in order to solidify the understanding of the pathway between race-related stress, depression, and CKD status.

Strengths and Limitations

While the findings of this study are not statistically significant, they are still important. They make important contributions to understanding the impact of race-related stress and depressive symptomology on health and possibly understanding why Black individuals progress through the stages of CKD at a more rapid pace than their White counterparts. However, there are a few limitations that need to be considered while interpreting these findings and for future iterations of similar research. First, due to the exploratory nature of this grant, the sample size was small. The small sample size may have been a contributor to the findings not being statistically significant. There were many variables that could not be used, such as race, because the sample size was not large enough to meet the requirements of number of variables in each category. Additionally, the sample size made it so many groups had to be collapsed into yes/no categories rather than giving the full range of answers that participants responded to. Thus, limiting the ability to assess how different levels of chronic discriminatory stress and different levels of depressive symptomology interact at each of the levels of CKD.

An additional limitation is that analyses were performed using participants perceptions experiences of discrimination. Participants were asked to recall past experiences of discrimination. Relying on participant memory increases the risk of recall bias which could result in inaccurate recounts of events and therefore inaccurate results. Basing these findings in perceptions rather than experiences changes the narrative of the results.

A final limitation of this study is the study design. This study deployed a cross-sectional methodology. With cross-sectional designs, causality cannot be assumed. Since CKD stage, depressive symptomology, and experiences of discrimination were all assessed at the same time in one survey it is impossible to determine that whether experiences of depressive symptomology and experiences of discrimination cause CKD status or the inverse.

However, this study did utilize preexisting and validated scales to assess experiences of discrimination and depressive symptomology. Using preexisting scales provides a level of validity and allows for more readily accepted results. An additional strength of this study is the use of a robust data collection tool. Respondents answered a variety of questions such as those about health status, gender, and age that allow the results of this study to be compared to already existing trends. This allows the results to be grounded in existing trends even when not statistically significant. Furthermore, this study recruited almost 70 participants from an often hard to reach population. This allowed researchers to work with rich data to help possibly explain the existing discrepancies in CKD status.

Implications for Anti-Racist Sentiment

The findings of this study have a number of implications for future public health policy, promotion, and programming across the United States. First, anti-racist practices must be implemented in each workplace, school, religious setting, and community. A primary step to

change is education. By integrating cultural humility and anti-racist practice into community spaces people will begin to learn and develop cultural humility. As described in the theoretical model by Brondolo et al. (2011b), social exclusion, stigmatization, harassment, threat, and aggression all have the capacity to directly influence health outcomes. By striving for a nationwide anti-racist sentiment and integrating cultural humility throughout everyone's lives the health of everyone would improve.

Secondly, the integration of education must be a lifelong pursuit, this means policy level change must happen in order to ensure the safety of the public. It is not enough to simply state that one is anti-racist. Being anti-racist is a lifelong practice, self-acknowledgment, and continual education. Starting anti-racist education at a young age would ensure that individuals grow up competent and aware that their actions have lifelong effects on the health of others.

Future Directions

Some of the results of this study, indicate that the Brondolo et al. (2011b) framework may be used to accurately explain some of the disparities in CKD status between Black and White CKD patients. There does appear to be a strong relationship between depression and frequent experiences of discrimination. However, not all of the trends found in the data do not support the hypotheses that were tested seeing as when controlling for age, gender, and experiences of discrimination, depression no longer indicates the expected results. Therefore, these results cannot entirely explain why African American CKD patients are more likely to develop CKD and progress to ESRD more quickly than their white counterparts. In order to understand the reason why depression did not act in the manner expected further studies would need to be conducted that consider protective factors among those who experience frequent

discrimination and depression such as social support and coping mechanisms. If this is the case the results of this study, or similar studies may indicate an even more pressing need for reform.

However, these findings that indicate that more research may further explain the possible impact that perceived racial discrimination may impact CKD stage. Researchers may be able to use these findings as a channel to drive more specific data analysis in the future. These findings may also be used as evidence that further testing needs to be done to answer a similar hypothesis. Conducting further studies would provide support for the implementation policies, interventions, and education to decrease chronic discriminatory stress. If these findings hold true in future iterations, they will provide support for community-based interventions that focus on cultural humility training and other educational programs to aid in the dismantling of persistent discriminatory stress.

Recommendations

The primary recommendation for further studies to understand the relationship between depressive symptomology and racial discrimination is to conduct a study of depressive symptomology, racial discrimination, and CKD status among African Americans with a larger sample size. Additional risk and protective factors for depressive symptomology such as social support, economic hardship, past abuse, and access to healthcare should be included in the models. The increased sample size would allow other, more complex, tests to be run such as running interactions or mediation analysis. Running interaction effects would allow further understanding of the relationship between depressive symptomology and racial discrimination on CKD stage rather than their independent relationships. Adding in possible risk or protective factors for depression may be able to provide further explication as to the unexpected direction the multivariable analysis of depression took.

In addition, mix methodology should be applied to future studies of depressive symptomology and racial discrimination. Relying solely on quantitative data does not adequately capture the experiences of participants nor does it allow for certain nuances to be examined. Introducing a mixed methods approach would provide space to understand the duration of racial discrimination, the severity of racial discrimination, and the onset of depressive symptomology. This may allow for additional understanding of a way to contextualize racism seeing as it is a very complex topic that cannot easily be quantified. By including mixed methodology into a cross-sectional study design the details collected would be able to provide rich data to help further understand the relationship between depressive symptomology, racial discrimination, and CKD stage.

Finally, based on the findings of this study an additional recommendation would be to conduct a longitudinal study in a similar manner. One possible method that could be used for a longitudinal study would be to collect weekly or monthly experiences of perceived racial discrimination. This would allow for results of experiences of perceived racism to be averaged which may prove to be a more accurate way to measure racism, rather than only capturing one snapshot in time. Additionally, depression symptomology and kidney functioning could be assessed on an organized, timely basis which would provide even more rich data. By conducting a longitudinal study causality could be assessed and the Brondolo et al. (2011b) model could be further applied and supported. If a longitudinal study was conducted then a similar hypothesis could be proven, or disproven. A longitudinal study would allow for researchers to not only test for causality but also allow for the assessment of depression and racial discrimination to possibly explain CKD progression disparities.

Conclusions

This study applied the framework developed by Brondolo et al. (2011b) to assess how chronic experiences of perceived race-related stress, depressive symptomology is related to subsequent CKD status among African Americans. Currently, there is no known research that looks at depression, race-related stress, and CKD status among African Americans. There is research that assesses the biological impacts of stress and depression on CKD progression, but no known research considers how these social determinants of health such as race-related stress may impact CKD status. This is exceedingly important to consider seeing as African Americans progress through the stages of CKD at a more accelerated pace. While this study did not derive any statistically significant results, the trends in the findings indicate the possibility of future studies finding an association between depression, racial discrimination, and CKD status. When compared to results of other similar studies, these trends follow expected patterns. The results of this study indicated similar levels of hypertension, depression, and experience of stress. These findings do hold a number of important considerations. Further research must be done in order to understand the interaction between depression and racial discrimination on CKD status in order to further understand the lasting impacts of racial discrimination. Finally, these findings stand on the work done before it to further emphasize the need for change. Racism has lasting impacts on health and without systems level change health disparities will continue to exist at such drastic levels.

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Appendix A

NON-HUMAN SUBJECTS RESEARCH DETERMINATION FORM

Emory does not require IRB review of studies that do not meet the definitions of "human subjects research" (DHHS) or "clinical investigation" (FDA). This tool is to help you define your project and to ensure proper review and regulatory requirements are met.

If the tool results in an outcome of "no IRB review required," this form will serve as your documentation of that determination. Please keep the completed copy in your records.

AUDIT: The IRB will periodically audit completed forms and your written proposal to ensure that the tool is providing accurate results.

NOTE: this tool should only be used for projects completed by Emory/EHC affiliates doing work for Emory purposes. When answering the questions in this determination tool, consider only the project activities performed by Emory/EHC affiliates in the current proposed project (e.g. if your study is a secondary data analysis, do not include the primary data collection activities when considering your responses.) Emory/EHC affiliates who are completing a project for academic credit at a different institution should seek a determination from that institution's IRB.

...

1

Project Title *

Understanding the role of perceived depression and perceived experiences of discrimination on Chrc

2

PROJECT LEADER (not necessarily the person filling in this form) *

Maggie Pustinger

3

FUNDING *

Will these activities be supported by a DHHS award (e.g., NIH, NSF, DoE, DoD) through a grant, contract, subaward/subcontract, or cooperative agreement?

NOTE: If Emory is the prime recipient of a DHHS award and the funding application indicates that human subjects will be involved, IRB submission is required.

Also, if Emory is the prime recipient of a DHHS award, but contracting with another site to carry out all non-exempt human subjects research activities for that award, please contact the Emory IRB for guidance instead of using this form.
If Emory is the subrecipient, only the activities done by Emory should be considered for this form, even if other sites are performing human subjects research.

- ○ Yes
- ◉ No

4

SHARING DATA OUTSIDE OF EMORY *

Will you be sharing data (identified or de-identified) outside of Emory? If yes, you need to contact OTT (ott@emory.edu (mailto:ott@emory.edu)) to determine if a Data Use Agreement is needed.

- ○ Yes
- ◉ No

5

Does the project involve Veterans Affairs?
(e.g. study site, data source, researcher's affiliation) *

- ○ Yes
- ◉ No

6

RESEARCH DETERMINATION- Systematic Investigation *

Is the proposed project a "systematic investigation?" For example: are you conducting online or in-person surveys, focus group discussions, or data analysis?

A. RESEARCH DETERMINATION – Systematic Investigation

- The "Common Rule," generally used by the Emory IRB to evaluate all human subjects research, defines "**research**" as *a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.* (45 CFR 46.102(l))
- A *systematic investigation* involves a prospective plan that incorporates data collection (either quantitative or qualitative), and data analysis to answer a question. It may include: surveys, interviews, cognitive experiments, behavioral or biomedical interventions or procedures, or medical chart reviews. It may also include observation of public behavior (e.g. ethnography).

- ◉ Yes
- ○ No

7

RESEARCH DETERMINATION- Generalizable Knowledge
Is the proposed project "designed to develop or contribute to generalizable knowledge?" *

Review these links if your project falls into one of the following categories:
Case Studies/Series (http://irb.emory.edu/forms/review/casestudy.html (http://irb.emory.edu/forms/review/casestudy.html))
Classroom Activities (http://irb.emory.edu/forms/review/classroom.html (http://irb.emory.edu/forms/review/classroom.html))
Public Health Practice (http://irb.emory.edu/forms/review/PH.html (http://irb.emory.edu/forms/review/PH.html))
Program Evaluations (http://irb.emory.edu/forms/review/programeval.html

(http://irb.emory.edu/forms/review/programeval.html))
Quality Improvement (http://irb.emory.edu/forms/review/QI.html (http://irb.emory.edu/forms/review/QI.html))
Sociobehavioral research: Oral History/Journalism and Ethnography/Anthropology (http://irb.emory.edu/forms/socio.html (http://irb.emory.edu/forms/socio.html))

If you still have questions, you can call our office for clarification at (404) 712-0720.

B. RESEARCH DETERMINATION – Generalizable Knowledge

Is your project *designed to develop or contribute to generalizable knowledge*? (45 CFR 46.102(l))

Your project may have results that could be useful or interesting to others. But we ask if your project is *DESIGNED* to contribute to generalizable knowledge. Your project's results may be presented without being generalizable (for example, as a case study).

Hallmarks of generalizable projects:

- Can the knowledge be applied to populations/contexts outside of the specific scope of the project?
- Is the work designed to contribute to a theoretical framework, even if the details of the population studied are unique to that population?
- Are the primary beneficiaries of the research: other researchers, scholars, and practitioners in the field of study?
- Are the results intended to be replicated in other settings?

- (•) Yes
- ( ) No

8

HUMAN SUBJECTS DETERMINATION *

Does this study involve obtaining information about living individuals? Answer "yes" if you're obtaining de-identified data or anonymous survey results if the results contain information about living people.

- (•) Yes
- ( ) No

9

If yes, does the study involve intervention or interaction with the individuals (e.g., online or in-person surveys [even if generating anonymous results], prospective collection of specimens, scans, etc.)?

- ( ) Yes

- ( ) No

10

Do the activities involve accessing or generating individually identifiable and private information about living individuals?

Please review the list of identifiers for more information (http://www.irb.emory.edu/documents/phi_identifiers.pdf (http://www.irb.emory.edu/documents/phi_identifiers.pdf))

- ( ) Yes
- ( ) No

11

Does the study involve analysis of existing data/specimens, where ALL data and/or specimens already exist prior to the start of the study? (Important: all parts of this question must apply if answering Yes.)

- ( ) Yes
- ( ) No

12

If yes, would ANY member of the research team be able to reidentify the data/specimens, either directly, or via a code and key?
* If anyone on the newly-proposed study team took part in the original collection of the existing specimens or data, your should answer Yes.
* If there are codes on the data, but no one on the study team has access to a link: you may answer "No" to this question only if you have a documented agreement with the data/specimen providers that prohibits your team from having access to the link.

- ( ) Yes

No

13

HUMAN SUBJECTS RESEARCH DETERMINATION - FDA

Will any individual be a recipient of any test article (i.e., drug, medical device) or be used as a control?

FDA 21 CFR 56.102 (23c&e)

Human Subject- an individual who is or becomes a participant in research, either as a recipient of the test article or as a control.
Clinical Investigation- any experiment that involves a test article and one or more human subjects.

Yes

No

14

Will any device be tested (including software, apps, in-vitro assays) using any individual's specimens or data, even if completely deidentified?

Yes

No

15

This project does not require IRB review because it is not research with "human subjects", nor is it a "clinical investigation" as defined in the federal regulations. Please use the Microsoft Print to PDF or Microsoft XPS Document Writer option to save a copy of your responses to this form. *

There is no eIRB submission necessary. I will protect the confidentiality of information accessed or obtained in this project. I will keep a copy of my responses to this form for my records.