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African American Maternal Mortality in the United States: A Quantitative Analysis of Chronic Disease and Maternal Deaths

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Abstract

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Abstract

African American women have higher rates of chronic disease including diabetes and cardiovascular related disease compared to White women and are 3 to 4 times more likely to die during childbirth, more than any other ethnic group in the United States. . When African American women become pregnant these conditions may influence their maternal health outcomes. This study aimed to determine difference in pregnancy related death associated with chronic conditions between African American women and White women. Based on secondary/archival data from the Center for Disease Control and Preventions' 2017 National Center for Health Statistics Mortality Multiple Cause Files a binary logistic regression was conducted to assess if diabetes and cardiovascular related disease predicted maternal mortality outcomes. Statistical analysis revealed that a diagnosis of diabetes or cardiovascular related disease was associated with a decreased maternal death outcome. The binary logistic regression revealed that that chronic disease does have an impact on maternal mortality. Overall, a 46% decrease and a 64% decrease in a maternal death outcome were associated with diabetes and cardiovascular related disease diagnosis, respectively. The knowledge of one's chronic disease status was associated with a decreased maternal death outcome. On this basis it is recommended that healthcare providers and public health practitioners make efforts to educate African American women on the importance of health knowledge, pre-pregnancy health, and knowing one's disease status leading to positive social change.

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Section 1: Foundation of the Study and Literature Review

Introduction

Maternal mortality is one of the measures of the quality of a health care system. More women die in the United States from complications related to childbirth than in any other developed country (Creanga, Syverson, Seed, & Callaghan, 2017; Peterson et al., 2019; Wilson, 2018). Presently, the United States ranks 60th in maternal mortality, with a rate of 28 deaths for every 100,000 live births (GBD 2015 Maternal Mortality Collaborators, 2017). An estimated 700 to 900 women die annually in the United States from pregnancy-related problems, and 50,000 nearly die (GBD 2015 Maternal Mortality Collaborators, 2017; Petersen et al., 2019). Between the 1980s and 2010, the maternal mortality rate doubled in the United States (Borrell, Rodriguez-Alvarez, Savitz, & Baquero, 2016). These deaths occur both during childbirth and for the duration of pregnancy for up to one year postpartum. Some of the difficulties that contribute to maternal mortality include severe bleeding, high blood pressure, infections, and complications from delivery. Emerging data from state-based maternal mortality review committees are showing that 70% of maternal deaths may be preventable (McCaw-Binns et al., 2018).

Furthermore, substantial racial/ethnic inequalities in pregnancy-related mortality persist. While some progress has been made in primary care, recent studies suggest that little progress has been made in addressing maternal mortality among African American women (Hameed et al., 2015; King, 2012; Wilson, 2018). For more than three decades, there has been a disproportionate burden of maternal death among African American

women (Petersen et al., 2019). Today, African American women are four times as likely to die from pregnancy-related complications compared to White women (Petersen et al., 2019; Tucker, Berg, Callaghan, & Hsia, 2017; Wilson, 2018). Review committees have found that underlying chronic disease conditions are disparate and contribute to mortality rates for African-American women when compared to White women. However, data also depicts the presence and effects of unconscious bias as well as structural racism that may be contributing to the maternal mortality of African American women (Rosenthal & Lobel, 2018).

Problem Statement

Substantial racial inequalities in maternal mortality exist in the U.S. African American women are four times as likely as white women to die around the time of childbirth (Wilson, 2018). In cities like Washington D.C., New York City and Pittsburgh, the figures are even more staggering. Washington D.C.'s maternal death rate among African American women stands at 70.9 deaths per 100,000 live births (United Health Foundation, 2018). The African American maternal death rate in D.C. is more than 50% higher than the national average (United Health Foundation, 2018). Data from the Centers for Disease Control and Prevention (CDC) (2019) showed that between 2011-2015, nationally, White women had a maternal mortality rate of 13.0 deaths per 100,000 live births while African American women had a rate of 42.8 deaths per 100,000 live births. Studies showed that these racial inequities are not exclusively explained by differences in education or income. For example, a 2016 study led in New York City showed that a college educated African American woman had a higher risk of severe

maternal morbidity than a White woman without a high school diploma (Borrell et al., 2016). Additionally, African American women in Pittsburgh are more likely to die during pregnancy than their peers in 97% of U.S. cities (Howell et al., 2019). Critically, one study stated that the maternal mortality crisis is rooted in the marginalization of African American women.

Prather et al. (2018) asserted that the reproductive health of African American women may have been compromised as a result of racism, spanning discriminatory healthcare practices from as far back as slavery through the post-Civil Rights period. Prather et al. conducted a study investigating present day epidemiology of reproductive health inequities of African American women. The study found that the historical medical experimentation and poor healthcare combined with social determinants has worsened African American women's complex relationship with the medical community (Prather et al., 2018). The social determinants of health correlated with institutionalized and interpersonal racism potentially make African American women more susceptible to adverse reproductive health outcomes (Prather et al., 2018). Such studies highlight implied discrimination in the healthcare system that result in inadequate services for African American women when they are in imperative need of good medical care.

The causes of maternal mortality and racial disparities in maternal mortality are myriad and complex and they can be grouped based on timing and include: (a) maternal health before pregnancy; (b) access to care and quality of care during pregnancy and childbirth; and (c) recovery, support, and access to care after childbirth. Presently, researchers investigating the maternal mortality crisis in cities like Washington D.C, New

York and Pittsburgh have primarily focused on the implicit bias and racism in the medical system, but there has been little work exploring the correlation between the high rates of chronic disease among African American women and pregnancy outcomes (Wilson, 2018).

Purpose of Study

In this study, I am aiming to investigate and gain a greater understanding of specific contributors among the leading causes of pregnancy-related deaths among African American women living in the United States. For this study, I will employ a quantitative research method to analyze maternal health conditions for trends and disparities among women's reproductive health. This can provide unique perceptions into the problems, pressures, and underserved reproductive and maternal health needs of African American women. This data will be contextualized with a review of recent literature on African American maternal mortality rates in the United States. and statistical analysis of demographic changes.

Research Questions and Hypothesis

The chronic conditions that will serve as independent variables for this study will include cardiovascular related diseases and diabetes. Ethnicity of the pregnancy related death will serve as the dependent variable.

Research Question 1: What is the difference in pregnancy related death associated with chronic conditions between African American women and White women?

$H_0$1 :There is no significant difference in pregnancy related death associated with chronic conditions between African American women and White women.

$H_1$1- There is a significant difference in pregnancy related death associated with chronic conditions between African American women and White women.

Theoretical Foundation of Study

The framework I will use for this study is the McCarthy-Maine Model. As previously mentioned, several determinants contribute to maternal mortality. When conceptualizing the possible relationships between social determinants of health and maternal mortality, it is useful to consider the potential pathways. McCarthy and Maine (1992) developed the McCarthy-Maine Model for examining these determinants of maternal mortality by categorizing them into biological, social, economic, cultural, behavioral, and environmental groups. The framework suggests a pathway through which these determinants lend to maternal mortality. The conjugation of these determinants implicitly or explicitly contributes maternal mortality, pregnancy complications, and morbidity, therefore underscoring different mechanisms for interventions to mitigate adverse outcomes (Borrell et al., 2016; Prather et al., 2018; Wilson, 2018). The proximity of these determinants accentuates the gravity of their impact on the outcome, with distant determinants underpinning the intermediate and proximal determinants (McCarthy & Maine, 1992). Organizing determinants into multiple dimensions and levels allows us to consider the context in which a woman lived and to understand the potential effects of determinants on her death.

The McCarthy-Maine Model consists of three broad phases of the processes that lead to maternal disability or mortality. Preceding maternal death is a series of circumstances or outcomes that result in disability or death (pregnancy or pregnancy-

related complications). A woman's death is defined as a maternal death if she is pregnant and has issues of pregnancy or childbirth or have a pre-existing health condition that is exacerbated by pregnancy (Filippi, Chou, Barreix, & Say, 2018). This series of adverse health outcomes are affected by five sets of intermediate factors: the health status of the women, her reproductive condition, access to medical care, health care behaviors, and some unknown factors. As applied to this study, health conditions include cardiovascular related diseases and diabetes.

A woman's health status before pregnancy has a significant impact on whether she develops complications and survives them. The threat of noncommunicable disease to maternal health can be viewed within a cycle of cardiovascular risk factors, including diabetes and obesity. They can complicate the woman's life span throughout the reproductive years as well as middle age and beyond. If women are entering pregnancy already at a stage of overweight or obesity, they are at higher risk for excessive weight gain during pregnancy, glucose intolerance, and hypertensive disorders that can occur. In the postpartum, they have a risk of postpartum weight retention, persistent glucose intolerance, and higher blood pressures that can often, unfortunately, go unrecognized or undiagnosed. This contributes over time to chronic obesity, cardiovascular disease risk factors, which can ultimately lead to cardiovascular events. This is significant to this study considering the high rates of cardiovascular disease, obesity, hypertension, and diabetes among African American women. Lastly, the framework delineates socioeconomic and cultural background determinants at the most considerable distance from a maternal death (McCarthy & Maine, 1992).

Nature of Study

National data sets from the Centers for Disease Control and Preventions' 2017 National Center for Health Statistics Mortality Multiple Cause Files will be used to conduct a quantitative cross-sectional secondary data analysis of the prevalence and case fatality rates of cardiovascular related disease and diabetes among pregnant African American women living in the United States. The rates of these chronic conditions will be compared to White women living in the United States in 2017. The chronic conditions and ethnicity will serve as the independent/predictor variables and pregnancy related death will serve as the dependent variable. This quantitative analysis should help discern if high rates of chronic conditions among African American women are associated with maternal death, potentially partially explaining the high rates of maternal death in the United States.

Literature Search Strategy

The current state of knowledge on African American maternal mortality and chronic disease is dynamic and evolving. I completed a comprehensive search for evidence-based research using databases and search tools available from Walden University Library, PubMed, ProQuest, MEDLINE, SAGE, American Journal Of Obstetrics & Gynecology, Pregnancy Hypertension: An International Journal Of Women's Cardiovascular Health, Maternal And Child Health Journal, Women's Health, and MMWR Surveillance Summaries. Additional resources included the CDC website, WHO website, Google, and Google Scholar.

To access an extensive and relevant scope of literature regarding my study, I used the following search terms and phrases separately and in combination: trends in maternal mortality in the United States, cause-specific proportionate pregnancy-related mortality, chronic diseases linked to maternal mortality, obesity/overweight among African American women of childbearing age, and African American maternal mortality. I categorized the articles I found by the following themes: chronic disease among African American women, cardiovascular related disease among African American women, obesity Among African American women, maternal mortality and chronic disease, and chronic disease and maternal mortality in the United States. I used Booleans operators "and" and "or" between the key words to access a larger volume of articles. Priority was given to articles and reports published from 2013–2019. However, to understand the historical context of cardiovascular related disease, obesity and overweight, and pregnancy outcomes, I used articles published more than 10 years ago because there is a shortage of studies on African American maternal death as a result of chronic disease prevalence.

Literature Review

In the following review of the literature, I explore high rates of chronic conditions among African American women, discuss the role of preexisting chronic conditions as a significant contributor to maternal death, evaluate the high rates of chronic disease and maternal death of African American women, and conclude that specific maternal mortality initiatives are needed to deter future deaths.

Chronic Disease Among African American Women

Globally, noncommunicable disease (NCDs) has been the leading cause of death for women for the past 30 years but is often underreported and undertreated (Bonita & Beaglehole, 2014). NCDs cause an estimated 73% of deaths or 19.4 million deaths among women, and by 2030, a 50% increase is expected (WHO, 2010). Women with diabetes, obesity, hypertensive pregnancy disorders, and several other NCDs are at a higher risk of developing childbirth-related complications. This is significant because there is an increased prevalence of multimorbidity among African American women, which is the likelihood of a person living with NCD having one or more chronic conditions concurrently (Beeson et al., 2018).

According to the CDC), African Americans experience a higher level of chronic disease than any other ethnic group (CDC, 2017). Across nearly every health indicator, African American women fare worse than their counterparts in other racial/ethnic groups (Dodgen & Spence-Almaguer, 2017). Cardiovascular disease, hypertension, overweight and obesity, and diabetes are documented risk factors for chronic conditions, and African American women encounter these conditions at a higher level than their White counterparts (Dodgen & Spence-Almaguer, 2017).

According to the American Heart Association (AHA) (n.d), cardiovascular disease is the preeminent cause of death among African American women. Cardiovascular disease kills nearly 50,000 African American women every year. Fifty-seven percent of African American women over age 20 years have some form of heart disease such as clogged arteries, stroke, or hypertension compared to 43% of White

women, 42% of Hispanic women, and 37% of Asian women. Additionally, African American women are 30% more likely to die from heart disease (AHA, n.d.).

The racial disparity in hypertension and hypertension-related outcomes has been recognized for decades, with African Americans having increased risks than Whites (Chen et al., 2019). High blood pressure is a risk factor for heart disease. One in three adults has high blood pressure, with the highest rates among African-Americans (Chen et al., 2019). Furthermore, hypertension develops earlier in life among African Americans compared to other racial-ethnic groups. According to the 2003–2014 National Health and Nutrition Examination Survey (NHANES) data, the current prevalence of hypertension in African-Americans is 44%, which is substantially higher than Whites at 28.5% (Brown et al., 2017). The Office of Minority Health reports 42.9% of African American women age 20 years and older have hypertension compared to 27% of White women (Office of Minority Health Resource Center, 2020).

The obesity epidemic has affected all Americans, but it has hit African-American women substantially. Approximately 80% of African American women age 20 years or older are overweight or obese compared to 64.8% of White women. Nearly 60% of African-American women are considered obese based on Body Mass Index (Office of Minority Health, 2020). These inequities are especially evident during adolescence and continue into adulthood. According to the most recent data on adolescent obesity, African-American adolescent girls have the highest prevalence of overweight (21.2%) compared to their white (14.6%) female peers (O'Brien-Richardson, 2019). Obesity is often correlated with poor physical activity and nutrition and carries with it an increased

risk of cardiovascular disease, diabetes, depression, cancer and other health conditions. Additionally, African American women are at increased risk for early onset of cardiovascular disease and its resulting complications (AHA, 2015). When disease begins at an early stage in life, it can lead to premature death.

Diabetes is the fourth leading cause of death among African Americans. According to the National Diabetes Statistics Report from the CDC (2020), African Americans are 70% more likely to be diagnosed with diabetes than Whites, 1.7 times as likely to be hospitalized, and 2.2 times likely to die from diabetic complications. Twelve percent of African American women, ages 20 years and older, are impacted by diabetes (CDC, 2020). It is estimated that diabetes can be attributed to abdominal obesity in 39.9% of African American women, compared with 24.0% of White American women (Beckles et al., 2019). African American women account for 12.7% of diagnosed diabetes cases compared to 7.5% among White women (Office of Minority Health, 2019). This is significant because African Americans only account for 13% of the total female population (Beckles et al., 2019). African American women are especially at risk because of high rates of overweight and obesity, high rates of hypertension, lack of exercise, and high cholesterol. African American women are 1.9 times as likely to develop diabetes and 2.4 times as likely to die from complications of diabetes (Office of Minority Health, 2019).

These health conditions have been associated with disparities in economic status, social status, reduced access to care, and cumulative stress that African American women experience throughout their lives (CDC, 2017; Opichka et al., 2019; Scott et al., 2019;

Warren-Findlow, 2006). Decreased life span and increased mortality lead to poor quality of life, with harmful effects on work performance, family, and social engagement.

It is now widely recognized that health outcomes are deeply influenced by various social factors outside of health care. The health behaviors of African American women contributing to high levels of chronic disease have been well documented. Perceived risk is an essential concept in health behavior theories and is an individual's belief about the likelihood of developing a disease in the future. For example, approximately 34% of African American women meet the American Heart Association's physical activity recommendations. This may be related to perceived barriers and few perceived physical activity benefits. Research shows African American women are at higher risk for nonadherence to recommendations for modifiable behaviors that have been shown to prevent obesity and subsequent chronic diseases (Kong, Tussing-Humphreys, Odoms-Young, Stolley, & Fitzgibbon, 2014). Brown et al. (2017) explained irrespective of increased risk for cardiovascular and related conditions, African American women are less likely to participate in behaviors that decrease the risk of cardiovascular disease, hypertension, and obesity. Few African-American women meet the U.S. standard of dietary guidelines, and according to the AHA, 46% of African American women have hypertension, and 48% have cardiovascular disease (Brown et al., 2017; O'Brien-Richardson, 2019).

Along with unhealthy behaviors among African American women and deficiencies in the health care system, a significant contributor is health knowledge. Researchers have prominently pointed to health education as an essential determinant of

health. Research-based on decades of experience in the developing world has identified health educational status (especially of the mother) as a significant predictor of health outcomes and economic trends in the industrialized world. In theory, knowledge of one's health status should lead to better health outcomes. African American women have higher percentages of low attendance to health education programs, medical appointments, and prenatal education classes. According to the American Academy of Pediatrics, education is an essential component of prenatal care, particularly for pregnant women for the first time (American Academy of Pediatrics, 2017). This is significant because informed decision-making is the process that patients go through to decide to participate in a health-related activity (Bowen et al., 2013). Because African American women do not take full advantage of health resources from various health organizations and programs, their health outcomes have been significantly impacted. According to Mottl-Santiago et al. (2013), the issue is not a lack of health resources but barriers to accessing those resources, including lack of awareness and lack of time (Mottl-Santiago et al., 2013).

It is important to identify unique patterns of health inequities, especially among African American women, and how they impact the cycle of comorbidities (the presence of two chronic diseases at the same time) and the exacerbation of maternal mortality rates. Of particular concern is cardiovascular disease and obesity, which this research will focus on.

Prevalence of Maternal Mortality Among African American Women

In the United States, many mothers die around the time of childbirth, with more than 50,000 women being affected annually by severe maternal morbidity (March of Dimes, 2018). Every year more than 700 mothers die from complications related to pregnancy and delivery, leaving behind grieving families as well as urgent policy questions about how the United States can do better (CDC, 2019). Compared to other high-income countries, the United States has the highest number of maternal mortalities (Creanga, Syverson, Seed & Callaghan, 2017; Peterson et al., 2019; Wilson, 2018; WHO, 2019;). Between the 1980s and 2010, the maternal mortality rate doubled in the United States (Borrell et al., 2016). The United States spends nearly 17.8% of its gross domestic product (GDP) on health care, more than any other high-income country (Parente, 2018). However, women are dying from pregnancy-related causes that are largely preventable. One study found that 70% of pregnancy-related deaths could have been prevented (WHO, 2019). Preventable causes of death include cardiovascular conditions and overweight and obesity, both of interest to this study (Mocumbi et al., 2016). Childbirths should be safer for mothers in the United States, but some mothers are at greater risk than others.

African American women are more than four times as likely as White women to die around the time of childbirth (Petersen et al., 2019; Tucker, Berg, Callaghan, & Hsia, 2007; Wilson, 2018). Data from the CDC (2019) showed that between 2011-2015, nationally, White women had a maternal rate of 13 deaths per 100,000 live births, while African American women had a rate of 42.8 deaths per 100,000 live births. Differences in

education or income do not explain these racial disparities. For example, a 2016 study from New York City showed that college-educated African American women had a higher risk of severe maternal morbidity than a White woman without a high school diploma (Borrell et al., 2016).

The causes of maternal mortality and racial disparities are myriad and complex. Many research studies documents that the risks for maternal mortality are more significant for African American women. For example, a 2013 study in the Maternal Child Health Journal, looked at 5 of the most common and potentially fatal pregnancy-related complications and found that African American women were 2 to 3 times as likely to die as White women with this same diagnosis (Mitchell et al., 2013). The study also found that African American women are twice as likely as White women to initiate prenatal care late in pregnancy, which may derive from access barriers that relate to geography and health insurance (Mitchell et al., 2013). Furthermore, hypertension, cardiovascular disease, overweight, and obesity are of considerable concern among African American women because of high prevalence, as stated by the National Partnership for Maternal Safety (National Partnership for Maternal Safety, 2018).

Although research and studies have confirmed that women who identify as minority races, ethnic, live in rural areas, or have a lower social advantage are at higher risk of maternal mortality, little is understood about why and ways to advance care for these women potentially (Chan et al., 2019; Howell & Zeitlin, 2017; Jain et al., 2018).

Maternal Mortality and Chronic Disease

There are two critical drivers of death rates changing: (a) changes in risk factors that people have like obesity or cardiovascular disease getting better or worse and (b) access to medical care, whether prevention or cure (Chen et al., 2017). Maternal mortality and morbidity are intensified by the rise of chronic disease among women in the United States. Given the prevalence of chronic conditions like cardiovascular disease and obesity among African American women, clarifying the relationship between maternal chronic disease and pregnancy outcomes for both African American women and White women could prove highly valuable for maternal health initiatives and policy development. As previously stated, cardiovascular disease and obesity are risk factors for poor health outcomes, and these risk factors can be magnified during pregnancy if they are not adequately controlled (Joszt, 2018). The high prevalence of the preexisting chronic disease in the obstetric population is especially problematic because preexisting chronic conditions have been independently linked with a higher risk of maternal mortality, even after adjusting for demographic changes (Admon et al., 2017; Davis et al., 2017; Goldfarb et al., 2016).

Cardiovascular Disease

Indeed, African American women experience higher rates of preventable diseases as previously outlined, and when or if African American women choose to become pregnant, these health conditions influence maternal health outcomes.

It has been documented that cardiovascular disease is the leading cause of death in pregnancy and in postpartum. Thirty-three percent of maternal deaths are due to

cardiovascular disease or cardiomyopathy (Elkayam, Goland, Pieper & Silversides, 2016; Theilen et al., 2016). U.S. surveillance data demonstrate an increase in cardiovascular pregnancy-related mortalities with 3.48 deaths per 100,000 live births from 1998 to 2005 to 4.23 cardiovascular deaths from 2006 to 2010 (Hameed et al., 2015; Main et al., 2015). Cardiovascular disease in the context of maternal deaths includes conditions such as ischemic heart disease, stroke, hypertension, and coronary artery disease. Myocardial infarction, postpartum cardiomyopathy, arrhythmia, and heart disease are common conditions that are seen in reproductive-age women. Cardiomyopathy contributed to an estimated 12% of maternal mortalities from 2006 to 2009, and obese African American women are especially at risk for cardiomyopathy (Hameed et al., 2015).

Additionally, African American race, obesity, and high blood pressure are risk factors for maternal mortality related to cardiovascular disease deaths. In 2017, the rate of chronic hypertension for African American mothers (667.4 per 10,000 live births) was over three times higher than the rate for white mothers (198.4) (Singh et al., 2018). One study conducted in California found that despite only accounting for 5.5% of births, African American women encompassed more than 20% of all maternal mortality cases and almost 40% of cardiovascular deaths (Main et al., 2015).

Furthermore, in the context of the woman's life span, if they have completed childbearing, they still have all these risk factors that can culminate in a cardiovascular disease event in middle age or beyond. If they have not completed childbearing, then the woman will potentially enter the next cycle of pregnancy with likely a worse cardiometabolic profile than she did in the previous pregnancy. In many cases, this has

gone unrecognized and undiagnosed, leading to further maternal mortality (Mocumbi, Sliwa, & Soma-Pillay, 2016; Zöllner, Curry, and Johnson, 2013).

Medical researchers have found that there are health inequities in access and treatment that often preclude the identification of cardiovascular risk factors through a medical assessment or identification of at-risk women before pregnancy. There are often missed opportunities to identify cardiovascular risk factors during the long prenatal course (Zöllner, Curry, & Johnson, 2013). Also, in the postpartum period, there can be symptoms of extreme fatigue or shortness of breath that are cardiac but are also symptoms that can be routinely attributed to being postpartum (Lo, Mission, & Caughey, 2013). Researchers have also documented that African American women have a three times higher risk of death from cardiovascular disease mortality compared to white women (Howell, 2018; Lo, Mission, and Caughey, 2013). In addition to the barriers mentioned above, other barriers include institutional and systemic barriers, as well as racial biases and gender inequities.

Overweight and Obesity

The growing epidemic of chronic conditions like overweight and obesity are determinants that can aid in decreasing maternal mortality, according to several studies employing state-level maternal mortality data and the link with potential risk factors connected to maternal mortality. Coexisting medical conditions contribute substantially to maternal mortality among African American women. African American women are more likely to have a comorbidity or preexisting medical condition such as hypertension, diabetes, or obesity, which can jeopardize the path of their pregnancy (Britton et al.,

2018; Metcalfe et al., 2017). According to one study, approximately 30% of women are obese or have been diagnosed with at least one chronic disease. Analyzed state-level maternal mortality rates from 1997 to 2012 and their connection with several risk factors revealed that obesity and diabetes are linked with increased maternal mortality (Nelson, Moniz, & Davis, 2018). According to a United Nations study, maternal death rates are down globally, but rates for preexisting medical conditions that increase risks for maternal mortality remain high (UN Maternal Mortality Estimation Inter-agency Group, 2015).

Maternal obesity has been repeatedly documented to exacerbate the risk of pregnancy complications, including thromboembolic disease, gestational diabetes mellitus, and hypertensive disorders of pregnancy. An estimated 31% of the maternal mortality increase is attributable to the proportion of obese women of childbearing age, followed by births to women with diabetes (17%). Nelson, Moniz, and Davis (2018) suggest there is a need to focus on and promote the general pre-conception health of women of childbearing age.

Increasingly more pregnant women in the U.S. have chronic diseases and are overweight or obese. These health statuses expose pregnant women to have a higher risk of adverse outcomes. Creanga et al. (2017) conducted a study using national population-level data to study 2011 to 2013 pregnancy-related deaths in the U.S. The analysis found that 16.9% of deaths occurred among women for which pre-pregnancy obesity was documented on vital statistics. Additionally, it was revealed that the contribution of traditional causes of maternal mortality (hemorrhage, hypertensive disorders of

pregnancy, thromboembolism) declined while cardiovascular disease increased. The authors found that cardiovascular disease accounted for 26% of all pregnancy-related deaths. Individual-level factors such as chronic health conditions can partly explain why the United States is seeing worsening maternal outcomes (Creanga, Syverson, Seed & Callaghan, 2017).

Several hypotheses have been suggested to delineate greater case maternal mortality rates in African American women concerning both patient and health system attributes. Nevertheless, the part of chronic conditions in describing the greater death rates among African American women in has not been systematically explored. According to one study, the rate of chronic comorbidities and pregnancy-associated disease is rising among women in the U.S. and differs considerably by race (Tucker et al., 2007). The high rates of preexisting chronic conditions in the obstetric population are especially worrying as preexisting chronic disease has been independently linked with magnified risk of maternal death, even after controlling for other demographic shifts (Metcalfe, Wick, & Ronksley, 2018). Further research is needed to more clearly make an association between the high rates of chronic disease and maternal mortality among African American women.

Definitions

Maternal mortality is the death of a woman while pregnant or within 42 days of the termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (ICD-10, 1993)

Pregnancy related death is A maternal death occurring during pregnancy or within 42 days of termination of pregnancy, irrespective of cause.

Maternal Mortality Ratio

Maternal mortality ratio (MMR) is the number of maternal deaths per 100,000 live births in a given time period. The MMR expresses obstetric risk, or a woman's chances of dying from a given pregnancy. This is the most commonly used indicator of maternal health.

Maternal mortality rate is the number of maternal deaths per 1000 women of reproductive age (typically 15-49). This is an indicator of the risk of maternal death among women of reproductive age and provides an indication of the burden of maternal death in the adult female population.

Assumptions

While conducting the research for this study, it was assumed that:

1. The sample that was drawn for Washington D.C., was representative of African American women and White women of the population.
2. The data that was collected from the Centers for Disease Control and Prevention National Center for Vital Statistics based on Mortality Multiple Cause-of-Death Public Use Record were accurate. The data that were inaccurate was included in this research study.

Limitations

Everyone who dies is assigned a death certificate, so identifying a maternal death should be straightforward. However, because of how the National Center for Health

Statistics approach for counting deaths is carried out on a state by state basis, there is the possibility of both over and undercounting of maternal deaths. It has been documented that there are significant flaws in the way in which the U.S. identifies, and studies analyzes maternal mortality. It has lacked funding and scientific attention. Filippi et al. (2018) stated existing data sets are incomplete and untrustworthy. Over the past decade there has not been an official documented count of pregnancy-related fatalities, or an official maternal mortality rate (Filippi et al., 2018). The methods in which mortality data is collected has changed. Most recently, states have added a checkbox to death certificates inquiring if the individual was pregnant or had been within the last 12 months prior to death. While the addition has helped in distinguishing maternal death that originally would have been overlooked, it has led to the collection of cases not correlated with pregnancies. There are challenges that only using a vital statistics approach to measuring maternal mortality, results in an incomplete picture.

Significance

The findings of this study can redound to the benefit of society considering the dismal state of maternal health in the United States and the ways in which the government and its institutions at all levels are failing women, particularly African American women, at several stages of pregnancy and childbirth. Given the prevalence of chronic conditions like cardiovascular disease and obesity among African American women, clarifying the relationship between maternal chronic disease and pregnancy outcomes for both African American women and White women could prove highly valuable for maternal health initiatives and policy development. Although some research

has been undertaken and data compiled—demonstrating an unacceptable trend—research is neither comprehensive nor exclusive to Washington D.C. as it relates to the association between chronic disease prevalence and maternal mortality among African-American women. This is significant considering the maternal death rate among African American women living in Washington D.C. is triple the national average (Wilson, 2018; United Health Foundation, n.d.). Maternal death is linked to child death. It has been documented that nearly half all motherless children under the age of five will die (Black et al., 2016). Health conditions such as overweight, obesity, cardiovascular and coronary conditions, and diabetes are the same factors leading to neonatal morbidity and mortality (El-Assaad, Al-Kindi & Aziz, 2017). An estimated 10 million women develop preeclampsia each year globally. An estimated 80,000 pregnant women die annually, and the number of infants thought to die from this order is an estimated 500,000 (Preeclampsia Foundation, 2013). Given the historical and rising prevalence of chronic disease among African American women, this research seeks to clarify the relationship between maternal chronic disease and pregnancy outcomes for both White and African American women. This could prove highly valuable for health program planning and policy development

Furthermore, the health outcomes and quality of life of African Americans living in Washington D.C. fails to reflect trends of the general population (Black Mamas Matter Alliance & Center for Reproductive Rights, 2016). Chronic disease rates among African Americans is higher than other demographics. African American residents of Washington D.C. are six time more likely to die from diabetes related complications, two times more likely to die from a stroke, 1.5 times more likely to die from breast cancer, two times

more likely to die from cardiovascular disease, three times more likely to be obese, and 4 times more likely to live below the poverty line (DC Matters, n.d.) Improvements in the maternal care of African American women will bode well for the survivability of African American women and infants.

A positive social implication would be that medical institutions in Washington D.C. can take heed to results derived from this study to better understand the drivers of maternal mortality for this population and implement specific, feasible actions to prevent them. The risk of maternal mortality varies greatly by state, more than is explained by mere demographics, which suggests that this risk of death is not a 'natural' distribution, but that state-by-state policies are implicated (Advisory Board, 2018). Health practitioners can use this study to inform prevention activities at local, state, regional, and national levels. Furthermore, they can be encouraged to consider the specific needs of pregnant obese women carefully, earlier identification of cardiovascular disease, ideally before pregnancy, and continuous, and risk-appropriate specialist care and follow-up throughout the pregnancy. Additional positive social implications for this study include the creation of health interventions premised on the pre-pregnancy health conditions of African American women in Washington D.C. Interventions to achieve social change by reducing or eliminating the significantly higher maternal death rates among African American women in Washington D.C. should include resources explicitly allocated for them. The knowledge from this study will assist political leaders in making decisions on the allocation of resources that African American mothers need to have a successful pregnancy and childbirth. Lastly, this study can form part of the basis for efforts to

potentially decrease the disparity gap for African American women, infants, and families, resulting from a decrease in maternal mortality.

Summary

The risk factors associated with the high maternal mortality of African American women in Washington, D.C., are myriad and complex. When addressing racial disparities in maternal mortality, it is essential to note the difference in underlying chronic disease risk. Chronic conditions like cardiovascular disease and overweight/obesity are more common among African American women and can occur at earlier ages than in white women. The impact of chronic disease on the maternal mortality rate of African American women in Washington D.C. has not been explored. Additionally, interventions and policy targeting the disparity gap between African American women and White women in D.C. are only beginning to be designed. Therefore, as policy and interventions are being developed, this research will remind policymakers of the significance of comprehensive data and the need to increase the collection of such data to decrease inequities. The current study is underpinned by a theoretical framework that offers evidence-based data that can be used in developing health policy and community-based programs to target not only pregnancy health but pre-pregnancy health conditions as well. Chapter 2 details the methods used to analyze the secondary data used to address the research questions of this study.

Section 2: Research Design and Data Collection

Methods Introduction

The purpose of this quantitative study was to explore, using a correlational research design, the possible reasons for the higher maternal death rate experienced by African American women living in the United States. compared to White women living in the United States. The study population consists of all African American mothers and White mothers who died in 2017.

The dependent or criterion variable is maternal mortality. The independent variable or predictor variables, hypothesized to be possible risk factors for African American maternal death, were as follows: chronic conditions which include cardiovascular disease and diabetes.

Research Design and Rationale

A retrospective analysis was conducted using secondary archival data obtained from the National Center for Vital Statistics based on Mortality Multiple Cause-of-Death Public Use Data Records. Descriptive and inferential statistical analysis was performed to (a) compare the maternal mortality 2017 in the U.S. between African American and White mothers, and (b) explore the effects of chronic diseases such as cardiovascular disease and diabetes on maternal death.

A correlational research design was used to create empirical models that may predict future events from current data. The empirical models created in this study explored the statistical relationships between one dependent or criterion variable

(maternal mortality) and two independent risk factors that may be predictors of maternal mortality.

Population

The population consisted of African American women and White women residing in the United States in 2017. The population contained in the dataset was diverse. Frequencies and percentages were calculated for *Race* and *Sex*.

The most frequently observed category of *Sex* was *Male* (*n* = 541344, 52%). The most frequently observed category of *Race* was African American (*n* = 247724, 24%). Frequencies and percentages are presented in Table 1.

Table 1

Frequency Table for Nominal Variables

Variable	*n*	*%*
Sex		
Male	541344	51.62
Female	507231	48.37
Missing	69	0.01
Race		
White	233065	22.23
African American	247724	23.62
American Indian	218773	20.86
Japanese	91389	8.71
Hawaiian (includes Part-Hawaiian)	51196	4.88
Chinese	152677	14.56

Filipino	27167	2.59
Other	26584	2.54
Missing	69	0.01

Note. Due to rounding errors, percentages may not equal 100%.

Instrument and Variables

Because this study was based on secondary/archival data, no specific instrument was used. The dependent variable was the Maternal Mortality. The independent or predictor variables, representing the risk factors for maternal mortality, were as follows: cardiovascular disease, and diabetes.

United States maternal mortality data used for analysis and study are premised on information disclosed on death certificates filed in state vital statistics agencies, and later aggregated into national data through the National Vital Statistics System (National Center for Health Statistics, 2018). Maternal mortality data used in this research study were extracted from the detailed mortality data files publicly accessible from the National Center for Health Statistics, and also obtainable via the Centers for Disease Control and Prevention website (National Center for Health Statistics, 2018). The statistical analysis of the data was conducted using SPSS version 25.0.

Healthcare professionals, examiners or coroners are entrusted with finishing the medical section of the death certificate, specifically the cause of death. From 1999 to the present, cause-of-death information in the U.S. have been encrypted based on the International Statistical Classification of Diseases and Related Health Problems, 10th

Revision (ICD-10) (National Center for Health Statistics, 2020). Maternal deaths are defined by codes O00-O95, O98-O99, while late maternal deaths are denoted by codes O96-O97 (WHO, 2012). Maternal deaths are further subdivided into direct and indirect obstetric deaths. Direct obstetric deaths are denoted as deaths consequent from obstetric problems of the pregnant state (pregnancy, labor, and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above (ICD-10 codes O00-O92) (WHO, 2012). Indirect obstetric deaths are defined as deaths resulting from pre-existing disease, or disease that formed during pregnancy and which was not the result of direct obstetric causes, but which was aggravated by the physiological effects of pregnancy (O98-O99) (World Health Organization, 2012). Deaths of unknown cause (O95) are not categorized as direct or indirect causes. Maternal deaths due to each underlying cause was also defined by the categorization of the International Classification of Disease (ICD) codes. Cardiovascular disease was defined by codes I00-I99 as outlined in Table 2. Diabetes also referred to as metabolic disease was defined by codes E00-E89 as outlined in Table 3 (WHO, 2012). Metabolic disease also included overweight and obesity.

Table 2

Cardiovascular Diseases

ICD Code	Health Condition
I00-I02	Acute rheumatic fever
I05-I09	Chronic rheumatic heart diseases
I10-I15	Hypertensive diseases

I20-I25	Ischemic heart diseases
I26-I28	Pulmonary heart disease and diseases of pulmonary circulation
I30-I52	Other forms of heart disease
I60-I69	Cerebrovascular diseases
I70-I79	Diseases of arteries, arterioles and capillaries
I80-I89	Diseases of veins, lymphatic vessels and lymph nodes, not elsewhere classified
I95-I99	Other and unspecified disorders of the circulatory sys

Table 3

Nutritional and Metabolic Diseases

ICD Code	Health Condition
E10-E14	Diabetes mellitus
E15-E16	Other disorders of glucose regulation and pancreatic internal secretion
E50-E64	Other nutritional deficiencies
E65-E68	Obesity and other hyperalimentation
E70-E90	Metabolic disorders

I included the complete population of maternal deaths associated with nutritional and metabolic diseases and maternal deaths associated with diseases of the circulatory system for the 50 states and the District of Columbia that had adopted the US standard pregnancy question by January 1, 2008.

Data Analysis Plan: Binary Logistic Regression

Research Questions and Hypothesis:

The chronic conditions that will serve as independent variables for this study will include cardiovascular disease and diabetes. Maternal mortality will serve as the dependent variable.

Research Question 1 –What is the difference in maternal mortality associated with chronic conditions (cardiovascular disease and diabetes) between African American women and White women?

$H_0$1- There is no significant difference in pregnancy related death associated with chronic conditions (cardiovascular disease and diabetes) between African American women and White women.

$H_1$1- There is a significant difference in pregnancy related death associated with chronic conditions (cardiovascular disease and diabetes) between African American women and White women.

Data Analysis

To examine the research question, a binary logistic regression will be conducted to assess if Diabetes and Cardiovascular Disease predict Maternal Mortality. The binary logistic regression is an appropriate statistical analysis when the purpose of research is to assess if a set of nominal, ordinal, or interval/ratio predictor variables predict a dichotomous dependent variable (Stevens, 2009). This analysis permits the evaluation of the odds of membership in one of the two outcome groups based on the combination of predictor variable values.

Binary logistic regression analysis, by design, overcomes many of the restrictive assumptions of linear regression. For example, normality and homoscedasticity of the residuals are not assumed. Binary logistic regression does require that there should be no multicollinearity among the independent variables.

The overall model significance for the binary logistic regression will be examined using the χ^2 omnibus test of model coefficients. Predicted probabilities of an event occurring will be determined by Exp(B), also known as the odds ratio.

Ethical Procedures

After approval was granted by the IRB for me to collect data, I requested secondary/archival data from the National Center for Vital Statistics. IRB number is: 05-27-20-0724069. There was no physical contact with the participants. I filed an agreement that stipulated the conditions for obtaining access, the data variables, the specific purpose of use, and expiration requiring the destroying of data files. I signed and dated the agreement and submitted it to the National Center for Vital Statistics Office via-email. All the participant identifiers were redacted from the dataset to protect their confidentiality and identity.

The findings of this study may be shared with policymakers, public health practitioners, medical professionals and community leaders. Data that remain with the researcher will be kept for three years on a personal computer that only the researcher can access. Data sharing may be accomplished by publishing the results in an academic journal.

Selection Process

The National Center for Vital Statistics employs the World Health Organization's definition for maternal death: deaths of women while pregnant or within 42 days of being pregnant, from any cause related to or aggravated by incidental causes (i.e., neither caused nor complicated by the woman being pregnant at the time of or within 1 year of death) (WHO, n.d.). The designation of deaths related to pregnancy, childbirth and puerperium explicitly omits external causes (i.e., accidents, homicides, and suicides) as

incidental. Late maternal deaths (deaths between 43 days and 1 year after birth) are also not enclosed as part of the WHO definition of maternal death.

To address the underreporting of maternal deaths in vital statistics, a separate pregnancy checkbox item was added to the U.S. Standard Certificate of Death in 2003. Along with the checkbox implementation, coding procedures were adopted as well. A maternal code from the International Classification of Diseases, 10th Revision (ICD–10) is used to report all medical conditions including indicating if the individual was pregnant. These indications include when causes specific to pregnancy, delivery, or the puerperium are reported in the cause-of-death section of the death certificate.

Cases for maternal mortality were selected based on these criteria along with an accompanying classification of and appropriate ICD code for cardiovascular disease or diabetes.

Data Cleaning Process

The variables defined in Table 2 were used for the statistical analysis. Maternal mortality was the dependent variable. Diabetes and cardiovascular disease were classified as the independent variable or risk factors for maternal death.

Table 4

Variables in Statistical Analysis

Variables	Unit
01 Resident Status	1= Resident, 2=Intrastate Non-Residents, 3=Non-Intrastate, 4=Foreign Residents
02 Education	1= 8th grade or less, 2 =9th -12th grade, no diploma, 3 = high school graduate or GED completed, 4 = some college credit but no degree, 5 = Associate degree, 6 = Bachelor's degree, 7= Master's degree, 8 = Doctorate or professional degree, 9 = Unknown
03 Sex	0 = Male, 1 = Female
04 Age	1 001-135,999 ... Years 2 001-011,999 ... Months 4 001-027,999 ... Days 5 001-023,999 ... Hours 6 001-059,999 ... Minutes 9 999 ... Age not stated
05 Martial Status	M= Married, D = Divorced, S = Never married, singe, U = Marital status unknown, W = widowed
06 ICD Code	0 = Diabetes, 1 = Cardiovascular disease, 2 = Maternal Mortality
07 1st Condition	0 = Diabetes, 1 = Cardiovascular disease, 2 = Maternal Mortality
08 2nd Condition	0 = Diabetes, 1 = Cardiovascular disease, 2 = Maternal Mortality

09 3rd Condition	0 = Diabetes, 1 = Cardiovascular disease, 2 = Maternal Mortality
10 4th Condition	0 = Diabetes, 1 = Cardiovascular disease, 2 = Maternal Mortality
11 5th Condition	0 = Diabetes, 1 = Cardiovascular disease, 2 = Maternal Mortality
12 6th Condition	0 = Diabetes, 1 = Cardiovascular disease, 2 = Maternal Mortality
13 7th Condition	0 = Diabetes, 1 = Cardiovascular disease, 2 = Maternal Mortality
14 8th Condition	0 = Diabetes, 1 = Cardiovascular disease, 2 = Maternal Mortality
15 Race	01 =White, 02 = Black, 03 = American Indian, 04 = Chinese, 05 = Japanese, 06 = Hawaiian (includes Part-Hawaiian), 07 = Filipino, 18 = Asian Indian, 28 = Korean, 38 = Samoan, 48 = Vietnamese, 58 = Guamanian, 68 = Other Asian or Pacific Islander in areas reporting codes 18-58, 78 = Combined other Asian or Pacific Islander, includes codes 18-68 for areas that do not report them separately

1. The 2017 Multiple Cause Mortality files and codebook were downloaded from the CDC National Center for Vital Statistics website
2. The file was opened using Microsoft Excel to access variable setup and distribution.

3. Upon opening the dataset, all the data was located in the first column, rather than distributed across the spreadsheet in each column according to variable type. This required the data to be un-concatenated.
4. The data set was un-concatenated by selecting the first column, that contained the text which I desired to split
5. Then select **Data** > **Text to Columns**
6. In the **Convert Text to Columns Wizard**, select **Delimited** > **Next**
7. I selected the **Delimiters** for the dataset which were **Space**
8. I then selected **Next** and select the **Column data format**
9. I selected the destination for here you want the split data to appear on the worksheet and then selected **Finish.** This resulted in the dataset being distributed across the Excel spreadsheet according to variable.
10. Then I used the codebook to highlight the variables I needed for data analysis and labeled each column containing the study variables. All other variables were deleted from the dataset.
11. The final un-concatenated and labeled dataset was uploaded into SPPS for cleaning.
12. The **ICD codes**' (ICD and 1^{st}-8^{th} Conditions) **TYPE** was changed from **String** to **Numeric**.
13. Each **ICD code** that coded for Diabetes, Cardiovascular Disease, and Maternal Mortality, was recoded into 0,1, and 2 respectively. All other values were recoded to 999. The following table displays the ICD codes and the condition it coded for:

Table 5

ICD Code: Condition and Definition

Condition	ICD Code	New Value
Diabetes	E-10 -E14, E40-E64, E00-E88	0
Cardiovascular Disease	I00-I78, I80-I99, I00-I99	1
Maternal Mortality	O00-O99, P00-P96	2

14. The 9 original variables (ICD code 1st-8th Conditions) were recoded into the value of 1.

Table 6

Maternal Mortality Variable Recoding

Old Name	New Name
ICD Code	MMICD
1st Condition	MM1
2nd Condition	MM2

Original Value	New Value
2	1

All other values were recoded to 0.

Table 7

Diabetes Variable Recoding

Old Name	New Name
ICD Code	DIAICD
1st Condition	DIA1
2nd Condition	DIA2

Original Value	New Value
0	1

All other values were recoded to 0.

Table 8

Cardiovascular Disease Variable Recoding

Old Name	New Name
ICD Code	CVDICD
1st Condition	CVD1
2nd Condition	CVD2

Original Value	New Value

1 1

All other values were recoded to 0.

Conclusion

This quantitative study used correlational research design to compare maternal mortality between African American mothers and White mothers residing in the United States. The McCarthy Model was used as the theoretical framework to measure the dependent variable and the independent variables based on data provided by the National Center for Vital Statistics. How the data were collected and analyzed to address the research questions were discussed in this chapter. The next chapter will introduce the findings of the study and address the research questions.

Section 3: Presentation of the Results and Findings

Results

The purpose of this study is to (a) compare maternal mortality of African American women and White women living in the United States in 2017 and (b) explore the effects of chronic conditions on maternal mortality rates.

Research Questions and Hypothesis:

The following research question was addressed:

The chronic conditions that will serve as independent variables for this study will include cardiovascular disease and diabetes. Maternal death will serve as the dependent variable.

Research Question 1 –What is the difference in maternal mortality associated with chronic conditions between African American women and White women?

$H_0$1- There is no significant difference in maternal mortality associated with chronic conditions between African American women and White women.

$H_1$1- There is a significant difference in maternal mortality associated with chronic conditions between African American women and White women.

Research Questions Analysis

Frequencies and percentages were calculated for Maternal Mortality filtered by Sex (Female) and Diagnosis of Diabetes (Yes Diagnosis of Diabetes)

The most frequently observed category of Maternal Mortality was No Maternal Mortality (n = 466259). Frequencies are presented in Table 7.

Table 9

Frequency Table for Nominal Variables

Diagnosis of Diabetes		N	Minimum	Maximum	Mean	Std. Deviation
No Diagnosis of Diabetes	Maternal Mortality	466259	0	1	.01	.103
	Valid N (listwise)	466259				
Yes Diagnosis of Diabetes	Maternal Mortality	40972	0	1	.01	.076
	Valid N (listwise)	40972				

Table 10

Maternal Mortality

No Maternal Mortality	N	Valid	466259
		Missing	0
Yes Maternal Mortality	N	Valid	40972
		Missing	0

Table 11

Maternal Mortality- Diagnosis of Diabetes

			Frequency	Percent	Valid Percent	Cumulative Percent
No Diagnosis of Diabetes	Valid	No Maternal Mortality	461258	98.9	98.9	98.9
		Yes Maternal Mortality	5001	1.1	1.1	100.0
		Total	466259	100.0	100.0	
Yes Diagnosis of Diabetes	Valid	No Maternal Mortality	40733	99.4	99.4	99.4
		Yes Maternal Mortality	239	.6	.6	100.0
		Total	40972	100.0	100.0	98.9

Note. Due to rounding errors, percentages may not equal 100%.

Figure 1

Maternal Mortality Diagnosis of Diabetes: No Diagnosis of Diabetes

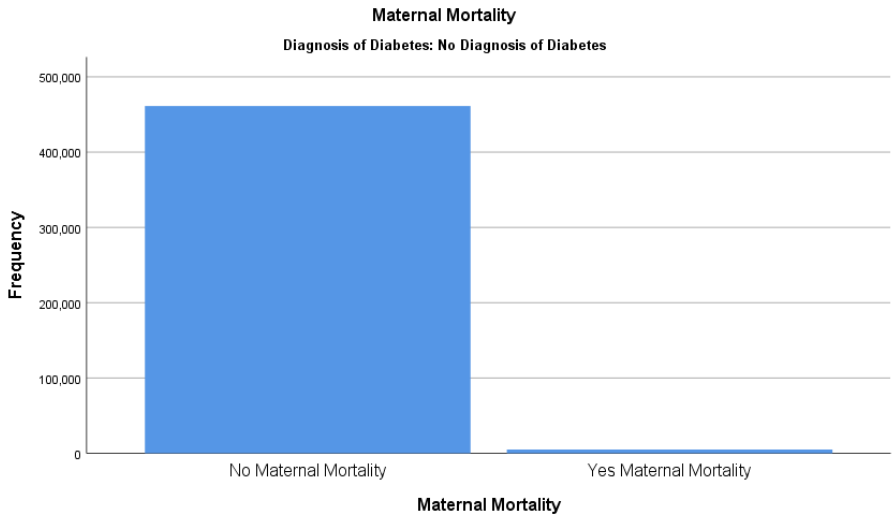
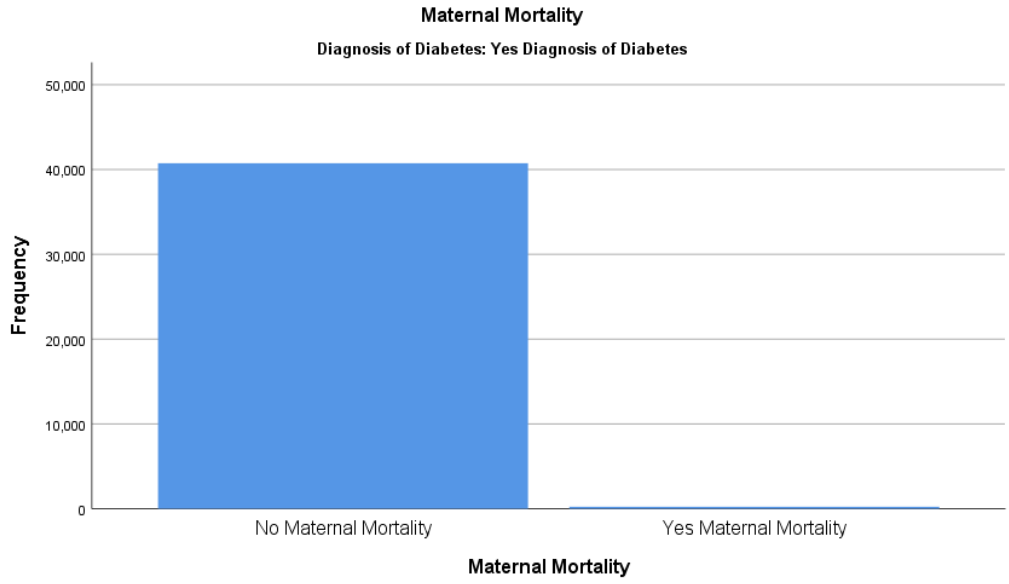


Figure 2

Maternal Mortality Diagnosis of Diabetes: Yes Diagnosis of Diabetes



Frequencies and percentages were calculated for Maternal Mortality filtered by Sex (Female) and Diagnosis of Cardiovascular Disease (Yes Diagnosis of Cardiovascular Disease)

The most frequently observed category of Maternal Mortality was No Maternal Mortality (*n* = 166151). Frequencies are presented in Table 10.

Table 12

Frequency Table for Nominal Variables

Diagnosis of CVD		N	Minimum	Maximum	Mean	Std. Deviation
No Diagnosis of CVD	Maternal Mortality	166151	0	1	.02	.133
	Valid N (listwise)	166151				
Yes Diagnosis of CVD	Maternal Mortality	341080	0	1	.01	.081
	Valid N (listwise)	341080				

Table 13

No Diagnosis of CVD	N	Valid	166151
		Missing	0
	N	Valid	341080

Yes	Diagnosis of CVD	Missing	0

Table 14

Maternal Mortality- Diagnosis of CVD

			Frequency	Percent	Valid Percent	Cumulative Percent
No Diagnosis of CVD		No Maternal Mortality	163144	98.2	98.2	98.2
	Valid	Yes Maternal Mortality	3007	1.8	1.8	100.0
		Total	166151	100.0	100.0	
Yes Diagnosis of CVD		No Maternal Mortality	338847	99.3	99.3	99.3
	Valid	Yes Maternal Mortality	2233	.7	.7	100.0
		Total	341080	100.0	100.0	98.2

Figure 3

Maternal Mortality Diagnosis of CVD: No Diagnosis of CVD

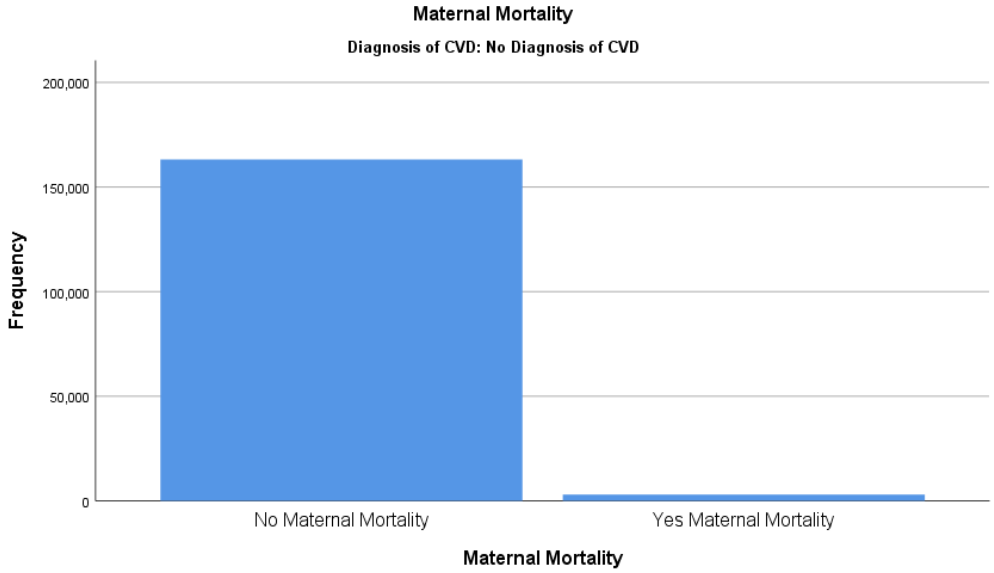
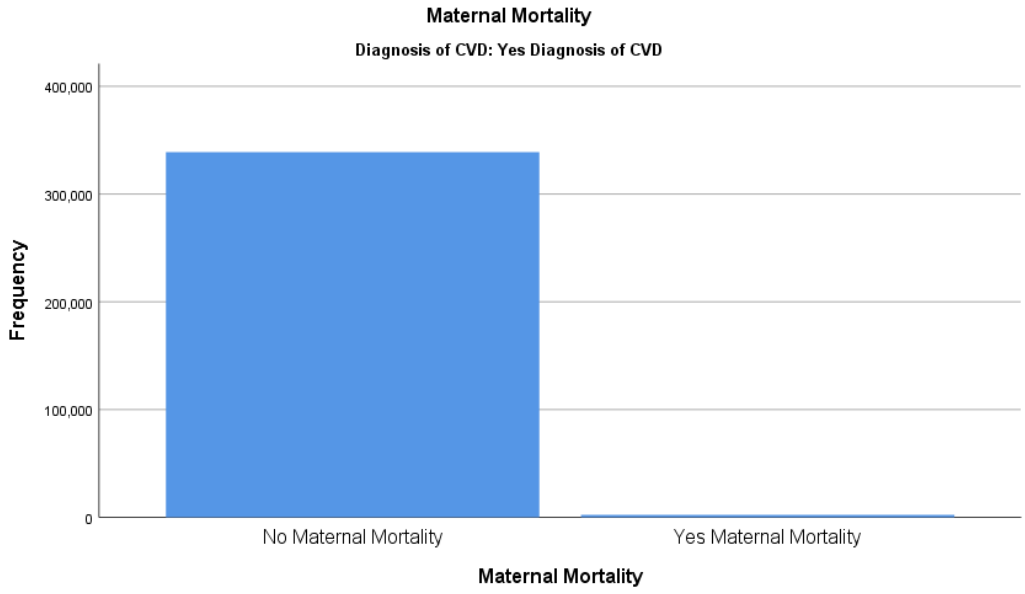


Figure 4

Maternal Mortality Diagnosis of CVD: Yes Diagnosis of CVD



The following five sections present the evidence to address the research questions.

Diagnosis of Diabetes and Maternal Mortality

A logistic regression analysis was conducted to investigate if there is an association between the *Diagnosis of Diabetes* and *Maternal Mortality*. The predictor variable *Diagnosis of Diabetes* in the logistic regression analysis was found to contribute to the model ($p < .05$). Estimation terminated at iteration number 7 [Initial -2 Log Likelihood: 58347.000]. The Model Summary showed [- Log Likelihood = 58243.793, Nagelkerke R Square = .002]. The unstandardized Beta weight for the constant; *B*= -4.524, *SE*=0.014, *Wald*=101269.834, $p < 0.001$. The unstandardized Beta weight for the predictor variable: *B*= -0.614, SE=0.066, *Wald*=85.474, $p < 0.001$. The estimated odds ratio favored a decrease of nearly 46% [*Exp (B)*= 0.541, 95% *CI* (0.475,0.616)] for *Maternal Mortality* for women with a *Diagnosis of Diabetes* (see Appendix A).

Diagnosis of Cardiovascular Disease and Maternal Mortality

A logistic regression analysis was conducted to investigate if there is an association between the *Diagnosis of Cardiovascular Disease* and *Maternal Mortality*. The predictor variable *Diagnosis of Cardiovascular* in the logistic regression analysis was found to contribute to the model ($p < .05$). Estimation terminated at iteration number 7 [Initial -2 Log Likelihood: 58347.000]. The Model Summary showed [- Log Likelihood = 56996.981a, Nagelkerke R Square = .024]. The unstandardized Beta weight for the constant; *B*= -3.994, *SE*=.018, *Wald*=47092.349, $p < 0.001$. The unstandardized Beta weight for the predictor variable: *B*= -1.029, *SE*=0.028, *Wald*=1339.941, $p < 0.001$. The estimated odds ratio favored a decrease of nearly 64% [*Exp (B)*= 0.358, 95% *CI*

(0.338,0.378)] for *Maternal Mortality* for women with a *Diagnosis of Cardiovascular Disease* (see Appendix B).

Diagnosis of Diabetes and Maternal Mortality Among White Women

A logistic regression analysis was conducted to investigate if there is an association between the *Diagnosis of Diabetes* and *Maternal Mortality* for White Women. The predictor variable *Diagnosis of Diabetes* in the logistic regression analysis was found to contribute to the model ($p < .05$). Estimation terminated at iteration number 7 [Initial -2 Log Likelihood: 18216.974]. The Model Summary showed [- Log Likelihood = 18213.334, Nagelkerke R Square = .000]. The unstandardized Beta weight for the constant; B= -4.244, SE=0.024, *Wald*=30542.312, $p < 0.001$. The unstandardized Beta weight for the predictor variable: B= -0.491, *SE*=0.028, *Wald*=3.089, $p < 0.001$. The estimated odds ratio favored a decrease of nearly 39% [*Exp (B)*= 0.612, 95% *CI* (0.354,1.058)] for *Maternal Mortality* for women with a *Diagnosis of Diabetes* (see Appendix C).

Diagnosis of Cardiovascular Disease and Maternal Mortality Among White Women

A logistic regression analysis was conducted to investigate if there is an association between the *Diagnosis of Cardiovascular Disease* and *Maternal Mortality* for White Women. The predictor variable *Diagnosis of Cardiovascular Disease* in the logistic regression analysis was found to contribute to the model ($p < .05$). Estimation terminated at iteration number 7 [Initial -2 Log Likelihood: 18216.974]. The Model Summary showed [- Log Likelihood = 17933.056a, Nagelkerke R Square = .017]. The unstandardized Beta weight for the constant; B= -3.885, *SE*=0.030, *Wald*=17005.138, $p <$

0.001. The unstandardized Beta weight for the predictor variable: *B*= -0. 835, *SE*=0.051, *Wald*=266.521, $p < 0.001$. The estimated odds ratio favored a decrease of nearly 57% [*Exp (B)*= 0.434, 95% *CI* (0.392, 0.479)] for *Maternal Mortality* for women with a *Diagnosis of Cardiovascular* (see Appendix D).

Diagnosis of Diabetes and Maternal Mortality Among African American Women

A logistic regression analysis was conducted to investigate if there is an association between the *Diagnosis of Diabetes* and *Maternal Mortality* for African American Women. The predictor variable *Diagnosis of Diabetes* in the logistic regression analysis was found to contribute to the model ($p < .05$). Estimation terminated at iteration number 7 [Initial -2 Log Likelihood: 13079.808]. The Model Summary showed [- Log Likelihood = 13074.814a, Nagelkerke R Square = .000]. The unstandardized Beta weight for the constant; *B*= -4.612, SE=0.030, *Wald*=23923.342, $p < 0.001$. The unstandardized Beta weight for the predictor variable: *B*= -0. -.416, *SE*=0. 199, *Wald*=4.368, $p < 0.001$. The estimated odds ratio favored a decrease of nearly 34% [*Exp (B)*= 0.660, 95% *CI* (0.447,0.974)] for *Maternal Mortality* for African American women with a *Diagnosis of Diabetes* (see Appendix E).

Diagnosis of Cardiovascular Disease and Maternal Mortality Among African American Women

A logistic regression analysis was conducted to investigate if there is an association between the *Diagnosis of Cardiovascular Disease* and *Maternal Mortality* for African American Women. The predictor variable *Diagnosis of Cardiovascular Disease* in the logistic regression analysis was found to contribute to the model ($p < .05$).

Estimation terminated at iteration number 7 [Initial -2 Log Likelihood: 13079.808]. The Model Summary showed [- Log Likelihood = 12794.263, Nagelkerke R Square = .023]. The unstandardized Beta weight for the constant; *B*= -4.132, *SE*=0. 061, *Wald*=12415.857, $p < 0.001$. The unstandardized Beta weight for the predictor variable: *B*= -4.132, *SE*=0.037, *Wald*=271.533, $p < 0.001$. The estimated odds ratio favored a decrease of nearly 64% [*Exp (B)*= 0.364, 95% *CI* (0.323,0.411)] for *Maternal Mortality* for African American women with a *Diagnosis of Cardiovascular Disease* (see Appendix F).

Summary

This study utilized secondary archival data obtained from the National Center for Vital Statistics based on Mortality Multiple Cause-of-Death Public Use Data Records to investigate the possible reasons for the higher maternal mortality rate experienced by African American women living in the U.S. compared to White women living in the U.S. Additionally, the study recognized cardiovascular disease and diabetes as potential risk factors for maternal mortality, and conducted a binary logistic regression that indicated that the presence of both cardiovascular disease and diabetes decreased the outcome of a maternal mortality outcome among both African American and White women.

Sufficient statistical evidence was provided to conclude that:

1. Overall, the presence of cardiovascular disease and diabetes decreased the chances of a maternal mortality outcome.
2. The presence of cardiovascular disease and diabetes among White women decreased a maternal mortality outcome by 57% and 39% respectively.

3. The presence of cardiovascular disease and diabetes among African American women decreased the presence of a maternal mortality outcome by 64% and 34% respectively.

A summary of how the study was conducted, a summary of the findings, and conclusion of the study based on the results of the McCarthy-Maine methodology and binary linear regression findings for RQ1, and discussion is presented in chapter 5. Additionally, the final chapter concludes with the implications for social change, recommendations for policy makers, and suggestions for future research.

Section 4: Application to Professional Practice and Implications for Social Change

Interpretation and Recommendations

This quantitative study explores, using a correlational research design, the possible reasons for the higher maternal mortality rate experienced by African American mothers living in the United States. The study population consisted of African American and White mothers residing in the United States in 2017.

This chapter presents a discussion of the results in six sections: (a) Summary of the study; (b) Interpretation of the findings; (b) Implications for social change; (c) Recommendations for policymakers; (d) Recommendations for future research; and (e) Conclusions.

Summary of the Study

Despite dramatic declines in U.S. maternal mortality during the 20th century and improvements in pregnancy care, women still die from pregnancy complications (Creanga, Syverson, Seed & Callaghan, 2017; Peterson et al., 2019; Wilson, 2018).

Between 700 to 900 American mothers die every year, more than any other developed nation (GBD 2015 Maternal Mortality Collaborators, 2017; Petersen et al., 2019). Women in the United States stand the risk of death during their pregnancies and childbirth. Currently, the U.S. is the only developed nation where the rates of women dying during childbirth are 26.7 mothers per 100,000 births, and substantial racial disparities persist (CDC, n.d.). African American women die due to birth and complications at higher rates than any other ethnic group. They are 3 to 4 times more likely to die from childbirth or pregnancy-related complications including cardiovascular disease and diabetes (Petersen et al., 2019; Rosenthal & Lobel, 2018; Tucker, Berg, Callaghan, & Hsia, 2007; Wilson, 2018).

Gross disparities exist in maternal health outcomes between African American women and the general population, with 2–3 times increased maternal and fetal morbidity and mortality reported in African American women. Cardiovascular disease and diabetes, which present as early as adolescent years, are associated with adverse pregnancy outcomes (AHA, 2019). Rates of cardiovascular disease and diabetes are high among African American women (AHA, 2019; Kartera et al., 2017). Furthermore, African American women have higher percentages of low attendance to prenatal care visits, general health care appointments, and prenatal education classes, which may impact maternal mortality outcomes due to lack of health status knowledge (Blackwell et al., 2020). Health education is an integral part of prenatal care, particularly for pregnant women for the first time. Theoretically, this should be offered at every prenatal appointment. However, due to multiple determinants, it cannot be surmised that African-

American women's prenatal education needs are being met during their regular prenatal clinic visits (Blackwell et al., 2020; Kim et al., 2017; Merewood et al., 2019). Lack of health education, coupled with high rates of cardiovascular disease and diabetes, can have a compounding negative outcome on African American women's maternal health. The purpose of this quantitative study was to explore, using a correlational research design, the possible reasons for the higher maternal death rate experienced by African American women living in the U.S. compared to White women living in the U.S. The study population consists of all African American mothers and White mothers who died in 2017.

The dependent or criterion variable is maternal mortality. The independent variable or predictor variables hypothesized to be possible risk factors for African American maternal death were chronic conditions that include cardiovascular related diseases and diabetes. The total number of participants in the study was N=480,789, of which the majority were African American women. The analysis of data provided by the National Center for Vital Statistics is underpinned by the McCarthy-Maine model developed by McCarthy and Maine to explain the determinants that contribute to maternal mortality differences between African American women and White women. The McCarthy-Maine Model investigates maternal mortality determinants by categorizing them into biological, social, economic, cultural, behavioral, and environmental groups. The framework suggests a pathway through which social determinants lend to maternal mortality (McCarthy & Maine, 1992). The conjugation of these determinants implicitly or explicitly contributes maternal mortality, pregnancy

complications, and morbidity, therefore underscoring different mechanisms for interventions to mitigate adverse outcomes (Borrell et al., 2016; Prather et al., 2018; Wilson, 2018).

Overall, this study's findings supported the research hypothesis that there is a significant difference in maternal mortality associated with chronic conditions between African American women and White women.

Interpretation of the Findings

The two chronic conditions that were of interest to this study were cardiovascular disease and diabetes. The binary logistic regression results indicated a significant association between chronic disease diagnosis and maternal death. Both conditions (cardiovascular related diseases and diabetes) were found to decrease the outcome of maternal death among both African American and White women. Overall, a 46% decrease and a 64% decrease in a maternal death outcome were associated with diabetes and cardiovascular related disease diagnosis, respectively. Among White women, a diabetes diagnosis was associated with a decreased maternal death outcome by 39%, while a diagnosis of cardiovascular related disease was associated with a decreased maternal death outcome by 57%. Among African American women, a diabetes diagnosis was associated with a decreased maternal death outcome by 34%, while a diagnosis of cardiovascular related disease was associated with a decreased maternal death outcome by 64%.

These findings point to how the knowledge of chronic disease status should, in theory, result in better health outcomes. Stable favorable health beliefs, knowledge, and,

behaviors from adolescence to early adulthood are associated with better health (Caprio et al., 2008; Wrobleski et al., 2018). However, knowledge of chronic disease prevention varies by education, income, age, and race (Long et al., 2017; Wrobleski et al., 2018), with misinformation common (Swire-Thompson & Lazer, 2020). There is an appreciable disease disparity between African American women and their White counterparts, and the reason for the disparity is multifactorial. African American women experience higher rates of cardiovascular-related diseases (Belgrave & Abrams, 2016), which is likely due to social, economic, and biological circumstances that impact primary cardiovascular disease factors: hypertension, physical inactivity, overweight, cigarette smoking, and non-insulin-dependent diabetes (Barber et al., 2016; Wendell et al., 2017; Rosengren et al., 2019). Furthermore, differential health care access and quality, environmental or neighborhood influences, disease awareness, and knowledge, persistent racial discrimination, and genetic variation have been hypothesized (George et al., 2017; Bell et al., 2018).

Some of these factors are uncontrollable, while others can be controlled by modifying health behaviors, thereby decreasing the risk of developing a chronic condition. Of the various social determinants of health that explain health disparities among African Americans, the literature has always pointed prominently to health status knowledge. Studies founded on years of experience in the developing world have recognized health status knowledge (especially of the mother) as a leading predictor of health outcomes. Early research proposes that women, in general, underestimate their risk of developing diabetes and cardiovascular disease (Jouyandeh et al., 2013; Villablanca et

al., 2016). However, African American women are more likely to minimize their chronic disease risk because they have inadequate knowledge of the disease and the associated risk factors (American Heart Association Advocacy Department, n.d., 2015; Hamner & Wilder, 2008). Specifically, African American women tend to be the least knowledgeable of chronic disease risk factors (American Heart Association Advocacy Department. n.d.; Mosca et al., 2013; Giardina et al., 2011).

Women with a lack of knowledge of their health status are more likely to have an unplanned pregnancy, less likely to take folic acid before becoming pregnant, and less to have discussed pregnancy with their physician before becoming pregnant (Evans et al., 2020; Mirzaii Najmabadi & Sharifi, 2018). This is substantial, considering the high risk of cardiovascular disease and diabetes among African American women and its association with maternal death outcomes.

Knowledge of health status is a significant predictor of health outcomes. In this instance, a chronic disease diagnosis was associated with a decreased maternal mortality outcome. Among the most obvious explanations for the association between education and health is that education itself produces benefits that later predispose the recipient to better health outcomes. The individual will receive specific baseline care with knowledge of their health status. It is entirely possible that the women included in this analysis, who knew their chronic disease status through diagnosis, had a decreased risk of a maternal death outcome associated with the chronic disease because they received the appropriate baseline care. Coupling the ignorance of health status with other socioeconomic factors prevalent among African American women, and the likelihood of a maternal death

occurring is potentially more likely. Thus, it can arguably be stated that knowing one's health status and chronic disease diagnosis influences maternal health outcomes among African American women.

Implications for Social Change

To achieve the goal of social justice, theoretical models need to be implemented in reality to decrease maternal mortality by identifying and addressing the populations that are at the highest risk. The empirical findings need to be interpreted, to underpin professional practice, to guarantee that new insights and proficiencies extend to the populations for which the research is initially intended. The current study applied the McCarthy Maine Model to identify the following risk factors: The difference in maternal death associated with cardiovascular related disease and diabetes between African American women and White women. In this instance, a chronic disease diagnosis was associated with a decrease in a maternal death outcome, suggesting that health status knowledge is associated with a better health outcome.

As a result of the current study, a comprehensive approach perhaps would be beneficial in taking action to understand the unique experiences African American women undergo before, during, and after pregnancy compared to White women. To prevent pregnancy-related deaths and sustainably improve maternal health, states must make transformative investments in African American women and girls' health and well-being throughout the life course, including health education, housing, nutrition, transportation, violence, environmental health, and economic justice. Eliminating the disparity of chronic diseases and maternal mortality must start with knowledge and

awareness. Thus, African American women need to become aware that chronic conditions like cardiovascular disease and diabetes can have adverse downstream effects on their reproductive health. To promote health, improve health outcomes, and achieve equity, African American women must understand and use the health information they hear, read, and see from numerous sources. Efforts to identify barriers to African American women's maternal health and expand access to high-quality, culturally significant care are critical to decreasing maternal mortality rates in the U.S. and safeguarding women's rights to healthy pregnancy childbirth.

Recommendations for Policy Makers

Unpacking the reasons for the connections between knowledge of health status and maternal mortality is not just an exercise in scientific inquiry; it is also essential to setting policy priorities. As increasing attention is focused on the need to address social inequity in order to address maternal mortality, understanding the links between broad upstream factors such as knowledge of health status and maternal outcomes becomes a critical challenge. Awareness of health status's importance might help drive investment in education and improvements in maternal health policy.

Policies with goals of achieving change by reducing or eliminating the significantly higher maternal mortality rates among African American women should include targeting resources to specific groups of mothers. These policies should include (a) enhancing the knowledge base of African American women to have an increased awareness of the maternal implications of health behaviors that cause cardiovascular

disease and diabetes and (b) informing African American women to start prenatal medical care in their first trimester.

Although all women are at increased risk of enduring life-threatening conditions before, during, or after birth, African American women's risk is more substantial. Pregnancy in African American women is more likely to be complicated by adverse outcomes including obesity, gestational diabetes, preeclampsia, stillbirth, preterm birth, cesarean section, and postpartum weight retention (Goland et al., 2013; Tang et al., 2014; Most et al., 2018). Education and information on pre-pregnancy health, chronic disease diagnosis, postpartum warning signs, and when to seek care is limited for pregnant and postpartum women (Abbyad & Robertson, 2011; Wiltshire et al., 2019). African-Americans attend fewer prenatal education classes, prenatal appointments, and breastfeeding classes (Blackwell et al., 2020). Furthermore, they have lower rates of breastfeeding, are less likely to attend all prenatal clinic visits, and are more likely to have late entry to prenatal care, higher rates of low birth weights, and higher infant mortality (Kim et al., 2017; Merewood et al., 2019; Blackwell et al., 2020). Therefore, there is a need for health policy to increase pre-pregnancy, pregnant, and postpartum women's awareness on chronic conditions and maternal health.

Policymakers should promote a coordinated care experience that facilitates women's access to safe, quality care. Encouraging African American women to start prenatal care in their first trimester will increase their encounters with medical providers allowing for knowledge of health status, better care coordination, improved case management, and home visiting services, if applicable, over a more extended period.

To educate African American women, policymakers can create an inventory of available educational resources, select an education program that can be implemented in multiple sites for piloting, and set a timeline to pilot the education program. Additionally, policymakers can expand pregnant and postpartum women's eligibility to participate in existing case management, care coordination, and home visitation programs and promote existing services to pregnant and postpartum women. This must be accompanied by actions to expand Medicaid coverage. Medicaid expansion is an essential mechanism for improving maternal health because it would provide millions of currently uninsured women in the United States with access to basic healthcare (Eliason, 2020). Primary care can help prevent health problems that lead to pregnancy complications. It can also help with the diagnosis and management of chronic conditions that may be exacerbated during pregnancy, helping women achieve higher preconception health (Eliason, 2020).

Recommendation for Future Research

The findings of the current study can perhaps be used in future research to evaluate the relationship of maternal mortality, knowledge of health status, and socioeconomic status among African American women. During reproductive years, African American women at the peak of sexual activity and fertility will face more reproductive health problems related to pregnancy, especially those of low socioeconomic status (National Institutes of Health Office of Research on Women's Health, 2014). Stable favorable health beliefs from adolescence to early adulthood are associated with improving knowledge and understanding, building equitable norms and values, and promoting self-reflection. African American women from the time of

adolescents to early adulthood are less likely to engage in physical activity, experience pregnancy during teenage years, and develop a chronic disease earlier in life than their white counterparts (Thind et al., 2015; Galloway et al., 2017; Wrobleski et al., 2018). To address this issue, further study should investigate the general health status and knowledge and reproductive health status and knowledge of African American women.

African-American women experience high rates of cardiovascular disease and diabetes, which is likely due to social, economic, and biological circumstances that influence primary chronic disease risk factors: hypertension, physical inactivity, overweight, and cigarette smoking. Low socioeconomic status has a strong association with chronic disease risk, particularly relevant for African-American women because of the large proportion who live below the poverty level (30% compared with 10% of white women) (Barber et al., 2016). Warren Andersen et al., 2016; Tan, Mamun, Kitzman, & Dodgen, 2019). Factors associated with lower knowledge levels are lower education, no history of gynecopathy, and lack of knowledge from medical staff or the internet. This facilitates a poor reproductive health situation and low general health status knowledge among African American women, thereby potentially contributing to higher maternal death rates.

Lastly, future studies should involve low-income African-American women in focus groups to elicit their perceptions about chronic disease and its association with maternal health to generate ideas for risk reduction interventions designed for women like themselves. Focus groups are frequently used to involve people who are often missed by traditional research methods (Guest et al., 2017). A qualitative approach can then guide

the design of health education and promotion programs for high-risk groups like African American women.

Conclusion

Maternal mortality is one of the measures of the quality of a health care system. More women die in the U.S. from complications related to childbirth than in any other developed country (Wilson, 2018; Creanga, Syverson, Seed & Callaghan, 2017; Peterson et al., 2019). Furthermore, substantial racial/ethnic inequalities in pregnancy-related mortality persist. While some progress has been made in primary care, recent studies suggest that little progress has been made in addressing maternal mortality among African American women (Hameed et al., 2015; King, 2012; Wilson, 2018). Today, African American women are four times more likely to die from pregnancy-related complications than White women (Tucker, Berg, Callaghan, & Hsia, 2007; Wilson, 2018; Petersen et al., 2019). Review committees have found that underlying chronic disease conditions are disparate and contribute to African-American women's mortality rates compared to White women. The current study investigated cardiovascular disease and diabetes's contribution to maternal death outcomes among African American women and White women.

These findings of this study agree with the view of several studies that contribute to health status knowledge to better health outcomes. In this instance, a chronic disease diagnosis was associated with decreased maternal death outcomes among African American and White women. The literature has always pointed prominently to health status knowledge of the various social determinants of health that explain health

disparities by geography or demographic characteristics. Research-based on decades of experience in the developing world has identified health status (especially of the mother) as a significant predictor of health outcomes. According to the American Academy of Pediatrics (2017), health education is an essential component of prenatal care, particularly for pregnant women. Ideally, this should be provided at every prenatal visit. Due to multiple factors, it cannot be assumed that African-American women's prenatal education needs are being met during their regular prenatal clinic visits (American Academy of Pediatrics, 2017). Several studies have found substantial disparities among African Americans in health status knowledge than other ethnic groups (Hansen et al., 2015; Behera et al., 2000). Due to a lack of knowledge and understanding, African American women have an inaccurate risk perception of chronic disease and its association with maternal mortality (Hansen et al., 2015). Hence their risk reduction efforts, including disease diagnosis, behavioral, and lifestyle changes, are misguided and not beneficial towards reducing maternal death.

To achieve social justice, the current study's findings need to be applied in practice to help close the disparity gaps by reducing maternal mortal among African American women. This study found an association between chronic disease diagnosis and the decrease of a maternal mortality outcome. Resources should be targeted to increase awareness among African American women through campaigns for racial reproductive justice. Previous research has shown that health and prenatal education classes have a significant impact on maternal knowledge, chronic disease knowledge, attitude and satisfaction toward labor, delivery, breastfeeding, nutrition, smoking cessation, and

conditions of the postpartum period (Lori et al., 2017; Kazemi & Hajian, 2018; Kocher et al., 2018)**.** Resources should be allocated to developing health care and collaborative research groups to advance African American women's and infants' health outcomes. Studies show that family and community are the preferred primary sources for information about pregnancy and childbirth preparation in African-American communities (Yanek et al., 2001; Mkandawire-Valhmu et al., 2018; Piper et al., 2020). Implementation should include identifying culturally specific content to create the curriculum framework, developing a prenatal education curriculum that can be utilized by faith-based institutions in African-American communities, and disseminating the curriculum through local African American church leaders and health providers. Lastly, resources should be used for conducting studies that establish the association between a mother's health before, during, and between pregnancy and generate a dataset that includes information on social and environmental variables for African American women.

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Appendix A

Table 15

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	507231	100.0
	Missing Cases	0	.0
	Total	507231	100.0
Unselected Cases		0	.0
Total		507231	100.0

a. If weight is in effect, see classification table for the total number of cases.

Table 16

Iteration History[a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	154379.467	-1.959
	2	80566.354	-3.004
	3	61989.176	-3.824
	4	58592.521	-4.352
	5	58349.120	-4.542
	6	58347.000	-4.562
	7	58347.000	-4.562

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 58347.000

c. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table 17

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	58243.793[a]	.000	.002

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.

Table 18

Variables In Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	DIATotalV2(1)	-.614	.066	85.474	1	.000	.541	.475	.616
	Constant	-4.524	.014	101269.834	1	.000	.011		

a. Variable(s) entered on Step 1: DIATotalV2.

Appendix B

Table 19

Case Processing

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	507231	100.0
	Missing Cases	0	.0
	Total	507231	100.0
Unselected Cases		0	.0
Total		507231	100.0

a. If weight is in effect, see classification table for the total number of cases.

Table 20

Iteration History[a,b,c]

Iteration		-2 Log likelihood	Coefficients Constant
Step 0	1	154379.467	-1.959
	2	80566.354	-3.004
	3	61989.176	-3.824
	4	58592.521	-4.352
	5	58349.120	-4.542
	6	58347.000	-4.562
	7	58347.000	-4.562

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 58347.000

c. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table 21

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
	Constant	-4.562	.014	107939.805	1	.000	.010

Table 22

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	56996.981[a]	.003	.024

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.

Table 23

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
DIATotalV2(1)	-1.029	.028	1339.941	1	.000	.358	.338	.378
Constant	-3.994	.018	47092.349	1	.000	.018		

a. Variable(s) entered on step 1: CVDTotalV2.

Appendix C

Table 24

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	123080	100.0
	Missing Cases	0	.0
	Total	123080	100.0
Unselected Cases		0	.0
Total		123080	100.0

a. If weight is in effect, see classification table for the total number of cases.

Table 25

Iteration History

Iteration	-2 Log likelihood	Coefficients Constant
1	39675.601	-1.944
2	22710.026	-2.958
3	18811.490	-3.710
4	18241.712	-4.131
5	18217.047	-4.242
6	18216.974	-4.249
7	18216.974	-4.249

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 18216.974

c. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table 26

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
	Constant	-4.249	.024	30844.145	1	.000	.014

Table 27

Model Summary

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
18213.334a	.000	.000

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table 28

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper

Diagnosis of Diabetes	-.491	.280	3.089	1	.079	.612	.354	1.058
Constant	-4.244	.024	30542.312	1	.000	.014		

a. Variable(s) entered on step 1: Diagnosis of Diabetes.

Appendix D

Table 29

Case Processing

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	123080	100.0
	Missing Cases	0	.0
	Total	123080	100.0
Unselected Cases		0	.0
Total		123080	100.0

a. If weight is in effect, see classification table for the total number of cases.

Table 30

Iteration History

Iteration	-2 Log likelihood	Coefficients Constant
1	39675.601	-1.944
2	22710.026	-2.958
3	18811.490	-3.710
4	18241.712	-4.131
5	18217.047	-4.242
6	18216.974	-4.249
7	18216.974	-4.249

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 18216.974

c. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table 31

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Constant	-4.249	.024	30844.145	1	.000	.014

Table 32

Model Summary

	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
	17933.056a	.002	.017

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001

Table 33

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Diagnosis of Diabetes	-.835	.051	266.521	1	.000	.434	.392	.479
Constant	-3.885	.030	17005.138	1	.000	.021		

a. Variable(s) entered on step 1: Diagnosis of CVD.

Appendix E

Table 34

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	119482	100.0
	Missing Cases	0	.0
	Total	119482	100.0
Unselected Cases		0	.0
Total		119482	100.0

a. If weight is in effect, see classification table for the total number of cases.

Table 35

Iteration History [a,b,c]

Iteration	-2 Log likelihood	Coefficients Constant
1	36016.102	-1.961
2	18476.498	-3.012
3	13996.596	-3.843
4	13146.755	-4.391
5	13080.501	-4.599
6	13079.808	-4.623
7	13079.808	-4.623

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 13079.808

c. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table 36

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
	Constant	-4.623	.029	24595.554	1	.000	.010

Table 37

Model Summary

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
13074.814a	.000	.000

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.

Table 38

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Diagnosis of Diabetes	-.416	.199	4.368	1	.037	.660	.447	.974

Constant	-4.612	.030	23923.342	1	.000	.010

a. Variable(s) entered on step 1: Diagnosis of Diabetes.

Appendix F

Table 39

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	119482	100.0
	Missing Cases	0	.0
	Total	119482	100.0
Unselected Cases		0	.0
Total		119482	100.0

a. If weight is in effect, see classification table for the total number of cases.

Table 40

Iteration History

Iteration	-2 Log likelihood	Coefficients Constant
1	36016.102	-1.961
2	18476.498	-3.012
3	13996.596	-3.843
4	13146.755	-4.391
5	13080.501	-4.599
6	13079.808	-4.623
7	13079.808	-4.623

a. Constant is included in the model.

b. Initial -2 Log Likelihood: 13079.808

c. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table 41

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
	Constant	-4.623	.029	24595.554	1	.000	.010

Table 42

Model Summary

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
12794.263a	.002	.023

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.

Table 43

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Diagnosis of	-1.009	.061	271.533	1	.000	.364	.323	.411

Diabetes						
Constant	-4.132	.037	12415.857	1	.000	.016