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Diabetes Management Regimens and Cardiovascular Disease Risk in African American Men

Joseph Garilus
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral dissertation by

Joseph Garilus

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Review Committee
Dr. Gudeta Fufaa, Committee Chairperson, Public Health Faculty
Dr. Ahmed Arif, Committee Member, Public Health Faculty
Dr. Kimberly Brownley, University Reviewer, Public Health Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2016

Abstract

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MA, Webster University, 2008

BA, University of New Orleans, 2000

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

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Abstract

One of the most common health complications related to diabetes is the development of cardiovascular disease (CVD). Studies addressing the association between adherence to diabetes management regimens and the risk of CVD among minority populations are limited. This cross-sectional study was conductedto examine the association between diabetes management regimens and risk of CVD among African American men. The health belief model was used to frame the study. Data were collected from the Behavioral Risk Factor Surveillance System database for the states of Missouri and Ohio. Multiple logistic regression analysis was used to assess the association between adherence to diabetes management regimens and the risk of CVD in diabetic African American men in the 2 states. Results indicated that adherence to recommended checkup frequencies and insulin therapies were not significantly associated with the risk of CVD. Participants who attended college or technical school had a lower risk of diagnosis of CVD compared to those who did not attend. Participants in the top income bracket had a lower risk of diagnosis of CVD compared tothose in the bottom income bracket. Social change implications include consideration of socioeconomic factors such as educational status and income when planning and implementing diabetes management regimens to reduce the risk of CVD among diabetic African American men.

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Dedication

This dissertation is dedicated to God. Because without him reaching this phase of the process of completing my dissertation would not have been possible. Firstly, I am grateful to my father and my mother. Without them, I would not have been born. Both of them always encouraged me to move forward with my education. I grew up in Haiti and daily living was not so easy, and they were always been there for me. My mother would be very proud of me if she was still alive, but God had a plan for her and she is in heaven now. I am grateful for my brothers and sisters Guillaume, Myrtha, Roger, France, Vilaire, Gladys and Carlo. We grew up together in Haiti, and we always had fun. They always support me any way they can, and they always encourage me to move forward with my education. A special thanks to my fabulous wife, Gladys; she has always been there for me throughout good and bad moments during this phase of the process of completing my dissertation. Thank you to Dr. Sandreth Sherry, who I met in Los Angeles, California during my first residency. She has been very supportive and helpful to me. A special thanks to my friends Micheline Francois, Adilis St. Cyr, Dr. Timothy Macabuya, Dr. Ayala Sharron, Roosevelt L. Ducelus, Pierre Paul Ducelus, Charlise Alexis, Perpetua Charles, Nathan Charles, Soluce Charles Choucard Jean Louis, Erns Ais, Ruth Franklin, Myriame Jean Louis, Duverne Jean Michele, Edy Dume, Marie Rousseau, Jude Claudele Leconte, Patrik Norzeus,Tanis and Lucien Philippe.

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Chapter 1: Chapter 1: Introduction

Diabetes is one of the most pressing public health problems in the United States, and it is growing among minority populations. About 80% of individuals with diabetes belong tominority populations, such as African Americans, Hispanics, and Native Americans (Zimmet, Magliano, Herman, & Shaw, 2013). The healthcare costs of diabetes, risks of related health complications, and mortality increase with an increase in the prevalence and incidence of the disease. The prevalence of diabetes is disproportionately high among African Americans, which translates into higher risks of mortality due to diabetes and elevated risks of health complications related to diabetes (Zimmetetal., 2013). Adherence to diabetes management regimens among individuals with diabetes is known to be effective in reducing mortality and morbidity (King et al., 2010).

One of the most common health complications related to diabetes is cardiovascular disease (CVD). The risk of CVD among individuals with diabetes is high for those who poorly manage their blood pressure, cholesterol, and weight (King et al., 2010). Individuals who adhere to recommended management regimens, such as eating healthy foods, staying physically active, and taking prescribed medications following the recommended dose and frequency are describedasadhering to diabetes management regimens, and individuals who do not use recommended diabetes management regimens are described as non-adherent (Blackburn, Swidrovich, & Lemstra, 2013).

Healthy food eating has been proven to reduce blood glucoselevel in people with diabetes. A number of factors, including good adherence to recommended levels of physical exercise (Colberg et al., 2010) and healthy food eating can help people with diabetes control their glycemic levels (American Diabetes Association, 2014). The relationship between adherence to the recommended diabetes management regimens and the risk of CVD among African American men with diabetes has not been comprehensively investigated using nationally representative samples. Therefore, the purpose of this study was to investigate the association between perceived adherence to recommended diabetes management regimens and the risk of CVD among African American men with diabetes using the Behavior Risk Factor Surveillance (BRFSS) data with particular emphasis on African American men residing in the states of Missouri and Ohio. The main reason that my research was focused on the states of Missouri and Ohio is that both states have a higher prevalence rate for diabetes in the nation for ratio of people who were diagnosed with diabetes compared to the general population. The diabetes prevalence rates for African American men in Missouri was 9.2 % compared to Caucasian men 6.3%. According to the Ohio Minority Health (OMH, 2014), the diabetes prevalence rates for Ohio African American men was 12.5% compared to Caucasian men 11.3% (OMH, 2014).

Background

Approximately 24 million people in the United States are affected with diabetes, and its impact is disproportionately high among minority populationsof low

socioeconomic status, such as African American men (Chow, Foster, Gonzalez, & McIver, 2012). African American men are 20% to 50% more likely to be diagnosed with diabetes compared to their Caucasian counterparts. Diabetes prevalence has doubled among African American men (Treadwellet al., 2010). African Americans are 2.5 times more likely to die from diabetes compared with their Caucasian counterparts (Livingston, 1994). The states of Missouri and Ohio have higher prevalence of diabetes than the national average. The national prevalence rate for diabetes in 2012 was 8.7%, but it was 10.2% and 10.1% for the states of Missouri and Ohio, respectively (BRFSS, 2013; Ohio Diabetes Prevention and Control Program, 2012). People from lower socioeconomic backgrounds who develop diabetes are at a greater risk for health complications related to diabetes (Zhao et al., 2014). Although adherence to established diabetes management regimens reduces the risk of health complications related to diabetes, African American men are predominantly of lower socioeconomic status; limited access to health care due to low socioeconomic status can contribute to poor adherence to diabetes management regimens (Delamater, 2006). The recommended methods for managing diabetes are maintaining ahealthy weight; exercising regularly; monitoring blood glucose levels; dietinghealthfully; reducing stress; and taking recommended medications for glycemic control, dyslipidemia, and hypertension (Logue et al., 2013). Adherence to the recommended management regimens reduces the risk ofcardiovascular diseases and cardiovascular events among individuals with diabetes (Karwalajty & Kaczorowski, 2010; King, Peacock, & Donnelly, 1999).

The disproportionately high prevalence of diabetes and related health complications among African American men can be described in terms of health disparity. Braveman (2009) defined health disparities as the differences in racial/ethnic groups in social advantage,which are avoidable and maybe considered unfair.Health disparities are a major public health issue in the United States. The disparities in diabetes prevalence translate into high diabetes-related mortality and morbidity among African Americans (Huang, Cargill, & Peek, 2007).

Disparity in diabetes prevalence and its complications has increased in the state of Missouri.Based on data from 1992 to 2002 in the state of Missouri, diabetes-related deaths among African Americans were twice those of Caucasians. Emergency room visits for diabetes-related complications were four times those of Caucasians (LeMaster, Chanetsa, Kapp, & Waterman, 2006). According to the Missouri Foundation for Health (2013), the rate of emergency room visits due to diabetes-related health complication among African Americans is 3.3 times higher than that of Caucasians, which suggests the persistence of the disparity in the burden of diabetes and related health complications.

In the state of Ohio, approximately 11.5% of African Americans were diagnosed with diabetes compared to 7.8% of Caucasians (Salling, 2010). Income and education play a significant role in diabetes disparity prevalence in the state of Ohio. People who have a higher income and educational background are less likely to be diagnosed with diabetes (Salling, 2010). According to Salling (2010), African Americans are more likely to be uninsured (27.9%) compared to Caucasians (14%).

Diabetes treatment regimens are important in improving the quality of life of individuals with diabetes.According to Crowley, Melnyk, Coffman, and Jeffreys (2013), diabetes treatment regimens canimprove patients' health outcomes and reduce morbidity and mortality. An improvement in glycated hemoglobin (HbA1c) can decrease the rates of hypoglycemia in diabetes patients. Diabetes patients who adhere to diabetes management regimens can achieve better health outcome and improve their quality of life. To benefit from diabetes management regimens, people who develop diabetes should adhere to certain interventions such as medication administration, exercise, self-monitoring of blood glucose, lowering HbA1c, and reducing dietary intake (Crowley et al., 2013).

According to Deshpande, Marcie Harris-Hayes, and Schootman (2008), the estimated prevalence of diabetes has increased dramatically in the United States. The estimated prevalence of people who develop diabetes has consistently been higher among African American men compared to Caucasian men. The estimated prevalence of diabetes is 8.0% in African American men and 5.4% in Caucasian men in the United States (Deshpandeet al., 2008).

The estimated prevalence of diabetes has risen in the state of Missouri and Ohio for African American men and Caucasian men in previous decades. In Missouri, there is an estimated prevalence of 492,047 people (10%) who are diagnosed with diabetes. The estimated prevalence of diabetes is higher in African American men compared to Caucasian men from Missouri. Also, African American men are 20% to 50% more likely to develop diabetes compared to Caucasian counterparts (Treadwell et al., 2010). In the

state of Ohio, the estimated prevalence of people diagnosed with diabetes has doubled among African American men compared to their Caucasian counterparts (Treadwell et al., 2010).

The risk of diabetes-related health complications and mortality among African Americans is disproportionately higher than that of Caucasians (Walker, O'Dea, Gomez, Girgis, & Colaqiuri, 2010). The diabetes-related death rates in African Americans aged 45 years and above were at 48.3% per 100,000 populations compared to 21.9% per 100,000 populations for Caucasians (Walker et al., 2010). Although it is generally recognized that adherence to recommended diabetes management regimens reduces the risk of mortality and diabetes related healthcomplications (Delamater, 2006), the association between adherence to recommended diabetes management regimens and risk ofdiabetes-related health complications among African American men has not been sufficiently studied. One of the most common diabetes-related health complications is CVD. In this study, I examined the association between adherence to recommended diabetes management regimens and the risk of CVD among African American men with diabetes.

Problem Statement

Diabetes is one of the leading causes of morbidity and mortality in the United States (Centers for Disease Control and Prevention [CDC], 2011). The incidence and prevalence of diabetes and its associated health complication risks are increasing in the United States (CDC, 2013; Harris, 1998). About 1.9 million new cases of diabetes were diagnosed in people ages 20 years and older in 2010(Healthy People 2020, 2011). In the

United States, diabetes contributed to 231,404 deaths in 2007, and the total health care cost associated with diabetes in 2012 was estimated to be $245 billion (CDC, 2012). One of the most debilitating health complications associated with diabetes is cardiovascular disease(CVD) (Nickerson &Dutta, 2012). The risk of death due to CVD is 2 to 4 times higher among individuals with diabetes than individuals without diabetes (CDC, 2011). CVD is a class of diseases that involves the heart, the blood vessels, or both, and includes health outcomes, such as heart valve problems, arrhythmia, heart attack, and stroke (CDC, 2011).

There are disparities in diabetes incidence and prevalence, associated co-morbidities, and mortality among members of racial and ethnic populations in the United States (LeMaster et al., 2006). In 2005, the age-adjusted death rate due to CVD among African Americans was 1.5 times that of Caucasians (Kung, Hoyert, Xu, & Murphy, 2008). The state of Missouri ranks 33rd out of 50 states in regards to prevalence of type 2 diabetes. The state of Ohio is one of the states that has a relatively high prevalence of diabetes. The prevalence of diabetes has increased in the past years from 10% to 11.7% among adults (Healthy People 2020, 2011). In both Missouri and Ohio, diabetes is more prevalent among African Americans than other racial/ethnic groups.

Adherence to recommended management regimens such as getting glycated hemoglobin (HbA1c) checked every 3 months and daily monitoring of sugar levels at recommended intervals is expected to reduce diabetes-related health complication risks such as CVD (American Diabetes Association, 2014; Colayco, Niu, McCombs, & Cheetham, 2011; Zhaoetal., 2014). Artinian (2010) demonstrated that cardiovascular risk

factors can be controlled by adherence to behavior change recommendations. Physical activity and diet intervention among racial/ethnic groups and minorities can reduce mortality and morbidity in the United States population.African Americans who are diagnosed with diabetes are more likely to develop CVD compared to their Caucasian counterparts. By eliminating all major forms of risk factors for CVD, life expectancy could increase by almost 7 years. Adherence to low-density lipoprotein (LDL) cholesterol, blood glucose, high blood pressure and glycated hemoglobin (HbA1c) can reduce CVD among African American who develop diabetes (Artinian, 2010).

Medication nonadherence among people with diabetes elevates risk of CVD (Grant et al., 2007). Barriers to adherence include educational backgroundand household income (Grant et al., 2007). Furthermore, Zeberand & Parchman(2010) reported that medicationis important to reduce the risk of CVD, and healthy food eating and maintaining optimum levels of physical activity substantially reduce CVD risk among diabetes patients.Althoughthe population studied by Zeber and Parchman (2010) was predominately female Hispanic, the population studied by Grant et al. (2007) was predominantly Caucasian. Studies that addressed the associations between perceived adherence to diabetes management regimens and the risk of CVD events among diabetic African American men are limited.

Purpose of the Study

Individuals with diabetes have a two-fold increased risk of CVD compared to nondiabetic individuals (Laakso, 2010). Adherence to diabetes management regimens may reduce the risk of CVD among individuals with diabetes (Nesto, 2008). However,

studies that addressed the association between adherence to diabetes management regimens and the risk of CVD among African American men with diabetes are limited. Therefore, the purpose of this study was to assess the association between perceived or self-reported diabetes management regimens and the risk of CVD among African American menin the states of Missouri and Ohio. The cross-sectional quantitative study included BFRSS data for the states of Missouri and Ohio.

Research Questions and Hypotheses

The study addressed the following research questions (RQs):

RQ1: Having accounted for relevant covariates such as BMI, age, and education, is there a statistically significant association between reported adherence to the recommended number of annual visits to health care services for general health checks and risk of CVD among diabetic African American men?

H_{10}: There is no significant association between reported adherence to the recommended number of annual visits to health care services for general health checks and risk of CVD among diabetic African American men.

H_{1A}: There is a significant association between reported adherence to the recommended number of annual visits to health care services for general health checks and risk of CVD among diabetic African American men.

RQ2: Having accounted for relevant covariates suchas BMI, age, and education, is there a statistically significant association between reported adherence to the recommended number of annual visits to health care services for HbA1c check and risk of CVD among diabetic African American men?

H_{20}: There is no significant association between adherence to the recommended number of annual visits to health care services for HbA1ccheck and risk of CVD among diabetic African American men.

H_{2a}: There is a significant association between adherence to the recommended number of annual visits to health care services for HbA1c check and risk of CVD among diabetic African American men.

RQ3: Having accounted for relevant covariates such as BMI, age, and education, is there a statistically significant association between reported adherence to the recommended insulin therapy use and risk of CVD among diabetic African American men?

H_{30}: There is no significant association between adherence to the recommended insulin therapy use and risk of CVD among diabetic African American men.

H_{3a}: There is a significant association between adherence to the recommended insulin therapy use and risk of CVD among diabetic African American men.

Theoretical Framework

The health belief model (HBM) was used as the theoretical framework in describing the relationship between diabetes management regimens and the risk of CVD. Adherence to recommended diabetes management regimens can help improve the quality of life among people who live with diabetes. A number of studies have focused on HBM to assess diabetes self-management in patients.The HBM is based on perceived susceptibility, perceived severity, perceived benefits, and perceived barriers (Jalilian, Motlagh, & Gharibnavaz, 2014). The HBM was developed by Hochbaum in the early

1950s, and the goal of the (HBM) was to help understand the failure of the United States population to adopt disease prevention and screening tools in the early detection of disease (Turner, Hunt, DiBrezzo, & Jones, 2004).

The HBM allows the researcher to understand the patient's attitude toward diabetes and its complications, and to examine awareness of individuals regarding the importance of adhering to recommended management regimens to reduce the risks of health complications associated with diabetes. The HBM had been used to describe the relationships between diabetes management regimens and the risk of CVDs (Bayat et al., 2013). The relevance of the HBM in describing these relationships involves various aspects of psychosocial determinants of health such as perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and self-efficacy within the context of the diabetes management perspectives of the African American men. Kendall, Harris, and Auld (2011) demonstrated the effectiveness of the expanded health belief model (EHBM) and the (HBM). Both models provided adequate information on perceived threats, benefits, barriers, and cues to action. The EHBM allows researchers to measure health importance control, emotional response, value of action, and situational factors. In addition, the EHBM helps researchers measure a subject's attitude and reasons for engaging in or failing to engage in adherence to a treatment (Wdowik et al., 2011). Variables used to measure adherence to recommended diabetes management regimens are behavioral variables that can be related to the health outcome of interest(CVD) using the HBM and EHBM in the target population.

Nature of the Study

The study was a cross-sectional quantitative study. According to Creswell (2009), in quantitative research studies the problem is best addressed by understanding what factors or variables influence an outcome. This helps the researcher better understand the problem. Bivariate analyses were used to identify potential associations between each variable. The multivariable analysis was used to examine the association between CVD risk and independent variable and relevant covariates. The BRFSS database for the years 2008 to 2012 was used in conducting the study. I examined incident and prevalent diabetes cases obtained from the BRFSS database along with the risk of CVD using the responses to questions on angina or coronary heart disease, heart attack or myocardial infarction, and stroke. The data collection includedMissouri and Ohio residents who had beendiagnosed with diabetes.

Definitions of Terms

Blood glucose:Blood glucose is the sugar the body creates from the food in the person's diet. Glucose is a type of sugar.The body produces it from fat, protein and carbohydrate (ADA, 2010). Glucose plays a significant role in the human body,andit regulates hormones, including insulin, glucagon, and adrenaline.After a meal, glucose enters into circulation inthe human body and insulin is released from the pancreas (Akbaset al., 2014).A normal blood glucose may be in the range from 70 to 100 mg/dl.If a personwith impaired fasting glucose (IFG) or fasting plasma glucose (FPG)ranges from 101 to 125 mg/dl, then thisindicates thatthe person is at risk of developing diabetes (Sacks, 2011).

Body mass index (BMI):The CDC (2015) defined BMI as a person's weight in kilograms divided by the square of height in meters. A high BMI indicates a high amount of fat in the body. A BMI test is important to determine whether a patient is obese or overweight (CDC, 2015).

Cardiovascular disease (CVD): CVD refers to the diseases of the heart or blood vessels. There are four types of CVDs: coronary heart disease, stroke, peripheral arterial disease, and aortic disease (ADA, 2011). Coronary heart disease exists when there is blockage or interruption in the blood supply by the atheroma in coronary arteries. A stroke can occur when blood supply to the brain is disturbed. The aortic disease occurs when the wall of the aorta becomes weakened and bulges outwards.The aorta carries blood from the heart to the body (ADA, 2011).

Diabetes:Diabetes is defined as a group of metabolic diseases that are characterized by the rise of blood glucose, which results from defects in insulin secretion (ADA, 2011). Diabetes is correlated with long-term damage and dysfunction in certain organs such as the eyes, kidneys, nerves, heart, and blood vessels.There are a number of pathogenic causes for the development of diabetes.There is an autoimmune destruction of the β-cell of the pancreas that links with resistance to insulin action (ADA, 2011).Also, any anomalies in carbohydrate, fat, and protein can create a deficiency in insulin. There is an insulin deficiency when there is an inadequate insulin secretion in response to a hormone action. An impairment in insulin can lead to hyperglycemia (ADA, 2010).

Diabetes management regimens: Mahfouz and Awadalla (2011) defined diabetes management regimens as a process of maintaining an adequate control of diabetes

diseases. Diabetes management regimens include self-monitoring of blood glucose, exercise education, modification in diet intake, and medication administration. Health care providers and family members play a significant role in diabetes management regimens because family members can support and encourage behavior changes to improve the quality of life of individuals who are diagnosed with diabetes. It is important for the diabetes patients being involved in treatment to adhere to regimens to achieve the treatment goals. Adherences to treatment can help the individual to delay diabetes progressions (Mahfouz & Awadalla, 2011). A number of diabetes management regimens were measured in the study including: Diet, the condition of being overweight, obesity, HbA1c, and BMI. Research studies have demonstrated there was a strong correlation between HbA1c and diabetes. People with an HbA1c of 6.00-6.49 percent are at a higher risk of developing diabetes.

HbA1c:Glycatedhemoglobin (HbA1c) has been used in relation to diabetes. HbA1c develops when protein in the red blood cells that carries oxygen in the body sticks with glucose in the blood and becomes glycated. Anyone with an HbA1c level of 6.5% is said to have developed diabetes. If a patient hasan HbA1c range from 6% to 6.4%, he or she requires intervention treatment (Kowall & Rathmann, 2013). In addition, an HbA1c level ≥ 6.5%(48 mmol/l) is confirmed for a person to be diagnosed with diabetes.The high risk group ranges from 5.7% to 6.4%. Furthermore, HbA1c can be an indicator to predict impaired blood levels in patients.A patient with HbA1c of 6.00d.49% is at a higher risk of developing diabetes (Raut, Jha, Koju, Khanal, & Malla, 2014).

Obesity: Obesity is the accumulation of excess fat and is based on body mass index (BMI), a weight in kilogram divided by height in meters squared. A BMI of 30 or greater in adults is considered obese. Obese people are at a higher risk ofdeveloping hypertension, type 2 diabetes, and stroke (Hammond & Levine, 2010).

Socioeconomic status:Socioeconomic status is based on an individual's income, power, background, and prestige. It can be referred to as low, moderate, orhigh. Socioeconomic status is associated with poverty level, and it refers to lower, middle, and higher class in the society (Kuntz & Lampert, 2010).

Type 2 diabetes (T2D): T2D refers to a predominant insulin resistance with relative insulin deficiency, which creates an insulin secretory defect with insulin resistance (ADA, 2011).T2D accounts for 90% to 95% of all cases, and it is classified as noninsulindependent. People who are diagnosed with diabetes tend to be obese, and obesity creates insulin resistance (ADA, 2011).

Assumptions

One of the assumptions made in this study was that self-reported diabetes management regimens were of acceptable accuracy to relate with episodes of CVD for each subject within the BFRSS data. I also assumed that the African American men sampled by the BFRSS surveillance for the states of Missouri and Ohio were representative of the African American men in the respective states. I also assume that all episodes of CVD among African American men with diabetes were accurately captured by the BFRSS surveillance in the respective states.

Scope and Delimitations

The study's scope included secondary data from the Missouriand Ohio BRFSS data. I evaluated the correlation between adherence to recommended diabetes management regimens and CVD among African American men with diabetes in the states of Missouri and Ohio. The BRFSS database for the years 2008-2012 was used in conducting the study. The use of multiple years of data allows researchers to have a more representative sample in the study of the population that is at a higher risk of developing the disease (BRFSS, 2011). Incident and prevalent diabetes cases were obtained from the BFRSS database for the states of Missouri and Ohio on African American men 20 years and older. This study focused on the major problem of people who develop diabetes in the states of Missouri and Ohio. Diabetes risk factors were identified among African American men. BMI is considereda major concern in increasing risk for developing diabetes, and carries severe health outcomes. Diabetes self-management has proven to be effective in reducing diabetes. This studymay help reduce mortality and morbidity among African American men and other ethnic groups. It is significantly important to focus on African American men because thisethnicgroup is the most at risk for developing diabetes and there is a higher diabetes prevalence inthis population. This study focused on the internal validity to reduce all systematic error during data collection stages. Major concerns related to bias, confounding variables, and thechance were taken into account to minimize the internal threat to validity. Also, external validity concerns were considered in the study to focus on modality of outcome and a correct basis for generalization

(Zaccai, 2003). The health belief model was used as the theoretical framework for the study.

Limitations

This study has a number of potential limitations related to its cross-sectional design besides using secondary data from the BFRSS database. Bias may have led to the findings being less generalizable. Information bias may occur in the study if data related to the study's variables were improperly entered, which may create misclassification of the outcomes. Quality control measures may help reduce the risk of information bias in the study. The BFRSS data are known to have limitations, such as higher levels of noncoverage due to the use of telephone surveys, particularly among people with low incomes, people in rural areas, people without a high school diploma, and people in poor health.

The CDC (2013) reported that both the telephone and face-to-face interviews have potential bias. However, self-reported subjects' information is more likely to be biased than that which is based on physical measurements. Underreporting may contribute to bias in the study. The BRFSS data collected from self-reported subjects tend to recall bias (CDC, 2013).According to Goodman (2010), the BRFSS used small-area analysis techniques to obtain county prevalence estimates, the county-level reference estimates received from the local data collection. They were discrepancies between the county-level reference estimates because of the existence of small subgroup sample sizes of the county level. The differences in the telephone coverage for each state and sub-population create selection bias in BRFSS data collection (Goodman, 2010).

Significance of the Study

There are disparities in the incidence and prevalence of diabetes among African Americans and Caucasians. In the United States, while about 18.7% f all African Americans ages 20 and older are diagnosed with diabetes, only 10.2% of Caucasians ages 20 or older are diagnosed (Healthy People 2020, 2011). The disparity in the incidence of diabetes translates into disparity in the diabetes-related health complication risks between the two populations. Perceived adherence to recommended diabetes management regimens may reduce the risks of diabetes-related health complications among individuals with diabetes. Studies that addressed the association between diabetes management regimens and the risk of CVD among African American men are lacking (CDC, 2012). This study may fill the research gap using data from the BRFSS database. The findings of the study may be valuable in informing policymakers and educating the target population about the importance of adherence to the recommended diabetes management regimens and the risk of CVD. This study may contribute to positive social change by providing evidence regarding the association between perceived adherence to recommended diabetes management regimens and the risk of CVD among African American men. Results may also be used for promoting the importance of diabetes self-care in preventing CVD among the target population.

Summary

This chapter included a description of the study background, statement of the problem, and research questions along with the health model used to frame thestudy.

Diabetes remains a major public health concern in the United States in general and in minority populations such as African American men in particular. CVD is a major cause of mortality among diabetes patients. Published findings regarding the claim that adherence to diabetes management regimens reduce the risk of CVD among diabetes patients wereexamined.The brief study background review helped to establish that although a number of studies have been conducted in other populations to examine the link between adherence to diabetes management regimens and risk of CVD, studies addressing African American men are lacking.This study addressed the association between adherence to recommended diabetes management regimens and the risk of CVD among African American men with diabetes using datafrom the BRFSS database for the states of Missouri and Ohio.

Chapter 2: Literature Review

Diabetes is an important public health issue due to the associated health complications, mortality, and health care cost. According to the CDC (2011), there were approximately 10.9 million people (26.9%) ages 65 or older diagnosed with diabetes in 2010. Also, about 1.9 million people between the ages of 20 and 65 years were diagnosed with diabetes in the year 2010(CDC, 2011).Being overweight or obese increases the risk of diabetesandmortality. Diabetes management is one of the strategies used in reducing the risk of diabetes-related health complications and mortality. Diabetes management regimens can reduce obesity and overweightonthe individual level and the population level (CDC, 2011).

According to Sherman and McKyer (2015), there is a lack of attention focused on African American men in the research literature. Due to barriers that exist in the African American men's studies, there is a gap in current literature. There isalsoa lack of progress and information made in the understanding of diabetesmanagement among African American men. To fill this gap, it was imperative to address health disparities in diabetes regarding African American men and the inclusion and participation of African American men in research studies. It was important to introduce future research efforts to address African American men with diabetes concerns. Investigators should be encouraged to include African American men in research studies (Sherman & McKyer, 2015). It was imperative to address the health issues of African American men to eliminate health disparities in the United States population. Race/ethnicity and socioeconomic status play a role in African Americans' health status. African Americans have a lower life expectancy compared to their Caucasian counterparts. There is a higher prevalence of strokes and diabetes inAfricanAmerican men compared to their Caucasian counterparts (Sherman &McKyer, 2015).

In this chapter, critical reviews of the literature related to diabetes management and cardiovascular disease (CVD) risk with particular emphasis to the African American men are presented. A synthesis of the current state of knowledge about this association and the identification of a knowledge gap pertaining to this association is also included. The chapter concludes by presenting a summary of the conducted literature review.

Literature Search Strategy

In conducting the literature review, I used the following databases: Diabetes Care, New England Journal of Medicine, the Lancet, Medline, CDC, CINAHL, andEbscoHost. Important key words that were used were *diabetes*, *diabetes self-management*, *T2D*, *behavior changes*, *Health Belief Theory*, *BMI*, *hemoglobin A1C*, *racial disparities in diabetes*, *socioeconomic status and diabetes*, *diabetes prevalence*, *lifestyle changes*, *independent variable*, *dependent variable*, *socioeconomic status*, *theoretical framework*, *diabetes self-care*, and *self-efficacy*. In conducting the literature review, I retrieved articles from these databases using the indicated search key words as they pertained to findings on diabetes self-management and risk factors of CVD in African American men. Most of the articles I selected for the study were peer reviewed and were published between2009 and 2014.

Theoretical Foundation

The study was based on the health belief model (HBM). HBM was developed by Hochbaum in the early 1950s, and the goal of the HBM was to help understand the failure of the United States population to adopt disease prevention and screening tools in the early detection of the disease (Turner et al., 2004). A number of studies have focused on HBM to assess diabetes self-management in patients.The HBM is based on perceived susceptibility, perceived severity, perceived benefits, and perceived barriers (Jalilian et al., 2014). This model offers a framework for diabetes research studies.investigators have used the HBM concepts to investigate diabetes and the correlations with CVD risk factors. The research questions incorporated the health belief model's effectiveness in

predicting behavioral change effects on health outcomes. Thestudy included a cross-sectional designto examine the correlation between diabetescharacteristics, including BMI, education background, age, income, and HbA1c (Huang, 2014).Researchers have used HBM to promote adherence to medication regimens for people who develop diabetes. Positive attitude can improve adherence.Also, self-efficacy can help subjects engage in self-care behaviors to improve their quality of care (Wdowik et al., 2011). Researchers and health care professionals have played a significant role in supporting patients with diabetes to improve their quality of life and health outcomes. Diabetes self-management behaviors include self-monitoring blood glucose level, consuming a healthy diet, and performing physical activity on a regular basis. These positive behaviors are key factors when it comes to keeping diabetes under control and delaying its complications. Health education programs and research studies related to behavior changes such as dietary intake, exercise, and physical activities are important approaches to reduce mortality and morbidity prevalence in the United States populations (Hunt, 2013).

Adherence to Diabetes Management Regimens

Adherence to diabetes management regimens plays a significant role in reducing diabetes-related health complications (Funnell & Anderson, 2004). Funnellet al., (2012) argued that adherence to diabetesmanagement regimens helps to improve health outcomes and quality of life by offering patients the opportunity to participate in the assessment and planning of goals toward achieving desired health outcomes. The role of promoting adherence to diabetes management regimens using diabetes education for reducing mortality and morbidity at the population level has been well documented. The

specific mechanisms by which adherence to diabetes management regimens helps achieve desirable health outcomes, include proper management of medication, healthy food eating, and blood glucose self-monitoring (Funnellet al.,2012).

According to the American Diabetes Association (2011), diabetes self-management is one of the core components of diabetes care. Adequatediabetesself-management has been shownto lower blood glucose levels, HbA1c, diabetes-relatedhealth complications, and the risk of CVDs (ADA, 2011). The specific activities that are part of the diabetes self-management regimens are medication adherence, self-monitoring blood glucose control, nutrition adjustment, and exercise. Psychosocial factors affect the success of diabetes self-management in achieving desired health outcomes. The potential success of diabetes self-management in realizing desired health outcomes depends on the extent to which patient self-efficacy is enhanced by taking into account relevant demographic and psychosocial factors at the individual and community levels (ADA, 2011). Demographic and psychosocial factors that affect theefficacyof diabetes self-management include socioeconomic status (SES), race, and individual behaviors in terms of lifestyle, and dieting patterns.

SES and race are important determinants of health (Pappas, Queen, Hadden, & Fisher, 1993). Compared to Caucasians, African Americans have lower SES, which affects their access to quality care, quality food, and education, thereby creating a health disparity (Becker & Newsom, 2003). Behavioral factors influence the efficacy of diabetes self-management and the risk of health complications as related to diabetes. For instance, poor adherence to diabetesmanagement regimens is known to increase an individual’s

risk of heart attack, stroke, or myocardial infarction (CDC, 2011). The interplay among these factors and their potential associations with CVD can be described using the health belief model (HBM).

Diabetes Among African American Men

African American men are confronted with the necessity of diabetes self-management regimens.Shermanet al., (2014) stated that thereis a lack of literaturedirected at African American men about diabetes and limited exploration on the best way to live with and manage the disease. More information about the adverse outcomes of poor management of diabetes among African American men needs to be published to reduce mortality and morbidity among African American men withdiabetes. There are many challenges in diabetes self-management for American African men (Sherman and al. 2014). It is imperative for researchers to understand the need for focusing on African American men. Also, more effort is required to understand the major factors that create the current lack of researchon this ethnic group. Mistrust, masculinity, and lack of diabetes knowledge all have an impact on diabetes self-management among African American men. Diabetes self-management practices and research can help African American men improve their condition (Sherman et al., 2014).

Sherman et al. (2014) reported that inthe United Statesthere are great health inequalities that exist for racial/ethnic minorities compared to Caucasians.Diabetes prevalence formen of all races/ethnicities is about 11.8%, while the prevalence of diabetes among African American men is 17.6% percent between the ages of 45 and 64 compared to their Caucasian counterparts. This prevalence increases morbidity rates

among African American men. African American men have significantly fewer adherents to medication regimens compared to Caucasians, and there is a 30% higher rate of diabetes associated with blindness and twice as many amputations in African American men compared to their Caucasian counterparts (Sherman et al., 2014).

Adherence to Diabetes Management Regimens and the Risk of Cardiovascular Diseases

Adherence to diabetes management regimens among people with diabetes can be challenging. Epidemiological studies have indicated that a number of factors can affect adherence to diabetes management regimens in individuals with diabetes. For example, people may be out of medication, or they may not be able to afford the cost of their medications.Monitoring the adherenceis very important in diabetes management regimensasnonadherencecan have severe adverse health consequences.

Martin-Timon, Servillano-Collantes, Segura-Galindo, and Ganizo-Gomez (2014) reported that researchers should reinforce diabetics' knowledge of the benefits of adhering to diabetes management regimens.It is important to overcome barriers related to behavior changes, and diabetes patients should be motivated to adhere to diabetes management regimens.Adherent complexity should be recognized by researchers because diabetes patients are often reluctant to stick their finger for blood glucose monitoring.Another weakness in adherence to diabetes regimens is that diabetes patients are highly influenced by social desirability responding. Any negligence on the part ofdiabetic patients to adhere to diabetes management regimens can lead to diabetes complications and increase risk for developing CVDs. People who adhere to diabetes

management regimens are more likely to control their blood glucose and related CVD risk factors including high blood pressure and high cholesterol (Martin-Timon et al., 2014). Research studies have indicated a causal relationship between diabetes and CVDs. People who develop diabetes have higher cardiovascular mortality rates compared with non-diabetic individuals (Martin-Timon et al., 2014). Adherence to dietary intake and physical activities is important in diabetes management regimens. People who adhere to dietary intake and physical activities are less likely to be diagnosed with CVD.

Cardiovascular Disease, Hypertension, and Diabetes

Karwalajtys and Kaczorowski (2010) demonstrated a correlation between CVD, hypertension, and diabetes. In 2005, CVD caused 30% ofall deaths worldwide. Hypertension is a major risk factor that contributes to CVDs and stroke, and it is known to be a comorbidity associated with diabetes. In the United States, approximately 73 million adults (27%) have been diagnosed with hypertension, and 31% with pre-hypertension (Karwalajtys & Kaczorowski, 2010).

Individuals who have a low income and low socioeconomic status have a higher rate of hypertension than people from a higher socioeconomic status (Zhao et al., 2014). Proper use of diabetes management regimens could help reduce the risk of diabetes-related health complications such as CVD, limb amputation, kidney disease, and vision impairment and mortality (Zhao et al., 2014). Lifestyle interventions are the most commonly used diabetes management strategies. Lifestyle interventions such as weight loss, physical activity, exercise, and reduced intake of high calorie food are known to

reduce the riskofdiabetes-related health complications (Look AHEAD Research Group, 2013).

Li et al., (2014) demonstrated that lifestyle intervention led to lower mortality in men with impaired glucose and reduced the incidence of diabetes and other cardiovascular disease risk factors. According to Li et al., dietary modifications or physical activity reduced the incidence of diabetes, and it was hypothesized that such interventions can reduce the risk of CVDs by helping patients maintain normal blood pressure, cholesterol, and triglyceride levels. According to Heesoo and Lahir (2012), people who are diagnosed with diabetes are twice as likely to experience CVD problems as those without diabetes, and individuals with diabetes have heart disease mortality rates four times greater than people without diabetes. Although diabetes self-management has been successful in reducing diabetes rates in the general population, African Americans tend to utilize diabetes self-management regimens less than their Caucasian counterparts. Education level, SES, and poor adherence to management regimens are hypothesized to be the important contributors to the observed poor utilization of management regimens and health outcomes in African American men (Heesoo&Lahir, 2012).

The Prevalence of Diabetes in Ohio

There are approximately 895,571 people ages18 years and older in Ohio; about 10.1% of this population was diagnosed with diabetes in 2009 (Ohio Vital Statistics, 2010). The prevalence of diabetes in the state of Ohio is due to the associated high prevalence of obesityandbeingoverweight. According to BRFSS (2011), in the state of Ohio diabetes has increased considerably; in 2009, approximately 10.1% of

Ohioadultswere diagnosed with diabetes. The prevalence of diabetes in Ohio has increased by 37% since 2000. Diabetes is associated with a number of health complications such as CVD, blindness, kidney failure, and amputation.Those with diabetes are 2 to 4 times more likely to have a heart attack or stroke than those who do not havediabetes (Ohio Vital Statistics,2010). An estimated 268,571 people ages 18 years and older are believed to have diabetes but who may not know it. Also, the number of undiagnosed people with diabetes in Ohio is estimated at over 1.1 million people. According to BRFSS (2011), out of people ages 18 to 44, 167,388(4.1%) have diabetes; between the ages of 45 and 64,389,403 (12.4%) have diabetes; between the ages of 65 and 74,183,972 (22.0%) have diabetes; and for 75 years and up, 154,677 (20.1%) have diabetes (BRFSS, 2011). For race/ethnicity, African Americans have the highest prevalence of diabetes. For black non-Hispanics 124,034 or about 12.7%, Hispanics 734,501 or about 9.9%, White, non-Hispanic 26,044 or about 13.2%, and other races 16,044 or about 7.0%. According to the Ohio Vital Statistics (2010), education has an impact on people who are diagnosed with diabetes in Ohio. For people who attend some high school or less, about 15.8% have diabetes, while high school graduates make up 13.1%. People who have attended some college or tech school make up 9.6%, and college graduates made up only 5.9%. When considering the diabetes prevalence by income, there are huge differences (Ohio Vital Statistics, 2010). For people earning< to $ 15,000, about 17.8% were diagnosed with diabetes, between $ 15,000 to $24,999, about 14.6% were diagnosed with diabetes, between $25,000 to $49,999, about 11.9%, andfor $50,0000 and more 5.6% were diagnosed with diabetes. Also, there is a difference in

diabetes prevalence by county in Ohio. Jefferson, Harrison & Washington have the highest percentage of diabetes rates exceeding 12%. Counties, such as Delaware, Medina, and the Union have the lowest diabetes prevalence rates with 8.7 and 9 % (Ohio Vital Statistics, 2010).

In Ohio there are approximately 1,376,030 African Americans, or 12 percent of the total population (Ohio Vital Statistics, 2010).Traylor et al., (2010) reported that African Americans have the worst records controlling for A1c, cholesterol, and systolic blood pressure compared to Hispanics and Caucasians. There is a racial disparity in CVD risk factors control among African Americans.Also, there is a high prevalence of hypertension in African Americans. The county of Lorain contains 302, 260 residents, of which 8% (24,180) are African Americans, and it is also the county with the highest obesity and diabetes rates among African American men.

Prevalence of Diabetes in Missouri

The health problems that affect the population of Ohio are not very different fromthose in Missouri's. Being overweight and obese are major health concerns of the Missouri's population as these conditions lead to diabetes and increase the prevalence of mortality and morbidity.According to the Missouri Behavioral Risk Factors Surveillance Survey (MBRFSS) (2011), racial disparities in diabetes pose major health problems.The Behavioral Risk Factor Survey was conducted in Missouri in diabetes and found that there are racial disparities in diabetes among African Americans, Hispanics and Caucasians. The BRFSS interviewed diabetes patients in Missouri on Glycosylated hemoglobin testing, foot examination, and yearly eye dilation. The study demonstrated

that African Americans received diabetes screening like Caucasians, but they did not receive any glycemic control. One of the most effective ways ofmanaging diabetes is to regularymonitorHbA1c, lipids, cholesterol, and blood glucose (BRFSS, 2011).

Individuals with higher educational and income levels were less likely to be diagnosed compared with people who had lower educational and income levels (BRFSS, 2011). The study demonstrated that race/ethnicity was related to the prevalence rates of diabetes in Missouri. The trends in obesity and diabetes prevalence have risen in Missouri compared tothe national rates.In the year 2009, the prevalenceof obesity was 31.7% in Missouri and 28.2% in the United States (BRFSS, 2011).

According to Parham-Payne (2012), in Missouri, there is a higher rate of overweight and obesity among African Americans compared to Caucasians. The prevalence of obesity andbeingoverweight increased diabetes rates in African Americans. One major factor that contributes to the high rates of Body Mass Index (BMI) in African American men is that they consume unhealthy food(Parham-Payne,2012). A number of studies have shown that men with high Body Mass Index (BMI) have higher rates of diabetes in a number of states (Parham-Payne, 2012).

The increased rates of obesity and overweight patients contribute to the prevalence of diabetes and other chronic diseases in the population. The problem of high rates of obesity and overweightis correlated to nutritionintakeand a lack of financial support for African Americans to be able to buy healthy food. The increased consumption of fresh food and vegetables canhelp reduce Body Mass Index (BMI) (Parham-Payne, 2012).

In Missouri, the prevalence of diabetes and obesity were higher forAfrican Americans and Caucasians compared tothe national level. In addition, the prevalence of diabetes and obesity has increased significantly in Missouri. The mortality and morbidity rates due todiabetes have increased and there isdecrease in quality of life andproductivity. The problem is that there is a significant increased disparity in health care in Missouri, where African Americans and people of lower socioeconomic status have a higher prevalence of diabetes. In Missouri, African Americans' sedentary lifestyle is prevalent. It is 37.5% for African Americans and 25.7% for Caucasians. Missouri is ranked 23rd highest in the nation for ratio of people who were diagnosed with diabetes compared to the general population. In Missouri, 26.7 out of 100,000 deaths are due to diabetes and 6.7% of adults are diagnosed with diabetes. In 2005, 335.000 adults in Missouri were diagnosed with diabetes (Yun et al. 2013).

In Missouri, health disparities among African Americans are higher than with any other races. The risk for developing chronic diseases such as diabetes, hypertension and obesity were 40.4% among African Americans in the year 2011, compared with 29.3% for Caucasians. The prevalence rates of diabetes, hypertension, and obesity in Hispanics were 26.2%.The age-adjusted rate is significantly different for African Americans from Missouri among all race groups. African Americans are hospitalized for diabetes more than any other ethnic groups, including Hispanics, Caucasians, and Asians.The report mentioned that African Americans in Missouri visited Emergency Rooms for diabetes complications at a rate of 2.6 visits per 1,000 residents, while Caucasians had 0.8 visits per 1000 residents. These rates have been constant since 2006 for both groups.

Older people visited the ER more than younger people (Missouri Foundation for Health, 2013).

Walker et al. (2010) addressed the gaps that exist in diabetes among African Americans and Caucasians. Diabetes-related deaths in African Americans were twice as high as their Caucasian counterparts. There is a lack of literature on self-managing diabetes. The death rates in diabetes for African Americans aged 45 years and above were 48.3 per 100,000 populations, compared to 21.9 per 100,000 populations for Caucasians (Walker et al., 2010). The study conducted by McCollister et al. (2012), demonstratedthat the disparities in diabetes that exist between African Americansand Caucasians haveresulted in lower quality of life and life expectancy amongAfrican Americans. The study showed that mortality gaps that exist between African Americans and Caucasians have increased in the past decade; for instance, Caucasians have 3.5 moreQuality-Adjusted Life Years (QALYs) compared to African Americans. African Americans are more likely to have poor resources, poorer infrastructure, and fewer accommodations for disabilities. Those factors created the relative burden of diabetes among African Americans over Caucasians.McCollister et al. (2012) pointed out that important intervention strategy programs have been implemented to reduce racial disparities in morbidity and mortality due to diabetes. But little has been done to alleviate disadvantage among African Americans (McCollister et al. 2012).

Brownsonet al. (2010) recognized that in the past decade, there was significant improvement in attempting to reduce mortality and morbidity due to diabetes. However, there was a persistent gap between recommendedand actual levels of diabetes control

(Brownson et al. 2010) suggesting that there is a tremendous need for research on diabetes self-management, self- care, and self-efficacy by taking into account population differences (Brownson etal., 2010).

Summary

In this chapter, the need for a study that assesses the association between adherence to recommended diabetes management regimens and the risk of CVD among African American men with diabetes was established. The literature review's claim that adherence to recommended diabetes management regimens can help reduce the risk of diabetes related health complications such as CVD events in diabetes patients is based on study results conducted in other populations and studies that examining the association between African American men and diabetes management are lacking. This justified a study on the association between adherence to diabetesmanagement regimens and risks of CVD in minority populations with special emphasis to African American men in the states of Missouri and Ohio. In the next chapter, the methodological aspects of the study were described. A description of the study design, data sources, research questions, and hypotheses to be tested along with the statistical analysis protocol was provided.

Chapter 3: Methodology

This study was conducted within the framework of a quantitative method. In quantitative studies, the problem is best addressed by identifying the important variables that influence an outcome (Creswell, 2009). In this chapter, I describe the study design and data analysis procedures. Furthermore, I describe the study population, method of

data collection, and operationalization of the variables used in this study. I also address issues such as information bias, selection bias, threat to validity, and ethical considerations.

Research Design, Rationaland questions

I used a cross-sectional design that included BRFSS data for the states of Ohio and Missouri. A cross-sectional design was appropriate to look at the association between adherence to the recommended diabetes management regimens and risk of CVD among diabetic African American men. This study addressed the following research questions and hypotheses regarding the relationship between diabetes management regimens and the risk of CVD among African American men with diabetes in the states of Missouri and Ohio.

The study addressed the following research questions (RQs):

RQ1: Having accounted for relevant covariates such as BMI, age, and education, is there a statistically significant association between reported adherence to the recommended number of annual visits to health care services for general health checks and risk of CVD among diabetic African American men?

H_{10}: There is no significant association between reported adherence to the recommended number of annual visits to health care services for general health checks and risk of CVD among diabetic African American men.

H_{1A}: There is a significant association between reported adherence to the recommended number of annual visits to health care services for general health checks and risk of CVD among diabetic African American men.

RQ2: Having accounted for relevant covariates such as BMI, age, and education, is there a statistically significant association between reported adherence to the recommended number of annual visits to health care services for HbA1c check and risk of CVD among diabetic African American men?

H_{20}: There is no significant association between adherence to the recommended number of annual visits to health care services for HbA1ccheck and risk of CVD among diabetic African American men.

H_{2a}: There is a significant association between adherence to the recommended number of annual visits to health care services for HbA1c check and risk of CVD among diabetic African American men.

RQ3: Having accounted for relevant covariates such as BMI, age, and education, is there a statistically significant association between reported adherence to the recommended insulin therapy use and risk of CVD among diabetic African American men?

H_{30}: There is no significant association between adherence to the recommended insulin therapy use and risk of CVD among diabetic African American men.

H_{3a}: There is a significant association between adherence to the recommended insulin therapy use and risk of CVD among diabetic African American men.

Population

The study focused on African American men with diabetes who resided in the states of Missouri and Ohio between the years 2008 and 2012 and were 18 years and older. A minimum sample size of 377 was needed for the study. African Americans have higher death rates from diabetes compared to Caucasians. In Missouri, diabetes ranked as the sixth leading cause of death for African Americans and eighth for Caucasians (MDHSS, 2013, Oza-Frank, 2010). Similarly, in the state of Ohio compared to other ethnic groups, African Americans are the most affected by diabetes (Oza-Frank, 2010).

Data Collection

BRFSS data for the states of Missouri and Ohio were used for the years 2008 to 2012. After IRB approval, relevant data use agreements wereentered with the respective states to secure the needed data.The IRB approval number for this study is 08-26-15-0163332.The BRFSS data were collected using a telephone survey, and participants were asked questions related to several health conditions including diabetes. The survey asked questions such as “have you ever been told by a doctor that you have diabetes?” “are you taking insulin?” and “are you taking diabetes pills?” Participants had to answer “yes” or “no” Demographic questions were included regardingage, education level, income, health insurance status, BMI, diabetes duration, and insulin use. Brown & McBride (2015) reported that the Affordable Care Act (ACA) of 2010 does make big changes in people who develop diabetes. There is a high proportion of people who are diagnosed withdiabetes that are facing significant challenges when it comes to health insurance. There are millions of working-age adults who have been diagnosed with diabetes that do

not have access to health insurance. Also, low income people tend to face out-of pocket health care cost that make it difficult for people in the bottom income to keep with doctor's visit for routine checkups (Brown & McBride, 2015).

Sampling and Sampling Procedures

The sample was drawn from a pool of African American men who were18 years of age and older and who resided in the states of Missouri and Ohio from 2008 to 2012. The sample was identified from the BRFSS data for the respective states. A minimum sample size of 377 was neededin the study. A multistage sampling and a stratified random sampling based on income level, educational level, and BMI were used. Demographic data of study subjects such as age, gender, education level, and duration of diabetes were included. Information on adherence to diabetes management regimens and episodes of CVD experienced by study subjects was determined from the BFRSS data set.

Operationalization of Variables

In this study, CVD event was the dependent variable, and adherence to diabetes management regimens was the independent variable. In the context of this study, adherence was defined as getting glycated hemoglobin (HbA1c) checked every 3 months or daily monitoring ofblood sugar levels at recommended intervals. HbA1c is a measure of glucose-bound (glycated) hemoglobin expressed in percent and is hypothesized to be an important risk factor for CVD in diabetic populations. Demographic variables, such as age in years, gender, education level, and duration of diabetes were considered as

covariates.BMI is an index calculated from a person's weight and height and was used as a measure of body fat. BMI was hypothesized to be associated with cardiovascular risk both in diabetic and nondiabetic subjects. The education level was definedaccording to the categories high school graduate, some college or technical, and college graduate. Duration of diabetes was defined as the number of years since diagnosis with diabetes.

The studyincluded BMI in percentiles for age. Also, weight and obesity were identified in African American men. The BMI measurement was aligned with the study goals. According to Broemeling (2014), independent variables maybe blood glucose values, age, educational level, diabetes duration, and income level. On the other hand, cardiovasculardisease risk factors may be measured as dependent variables (Broemeling, 2014).

Data Analysis Plan

Logistic regression was used in examining the association between the risk of cardiovascular events and self-efficacy measures. Logistic regression issued when the level of measurement of the target variable is categorical. In the proposed study, CVD events were defined as yes/no, which indicated that the response variable was a dichotomous categorical variable. The chi-square test of independence was used to examine relevant univariate associations. I used the Statistical Package for Social Sciences (SPSS) Version 21.

Sample Size Calculation for Regression Model

To calculate the sample size, G*power 3.1 was used. Investigators have used G*power to examine the correlation and regression analysis model (Cohen, West, &

Aiken, 2003). To achieve a power of 0.95 and an odds ratio of 1.5, a minimum sample size of 377 was needed to detect statistically significant differences, as shown in Figures 1 and 2.

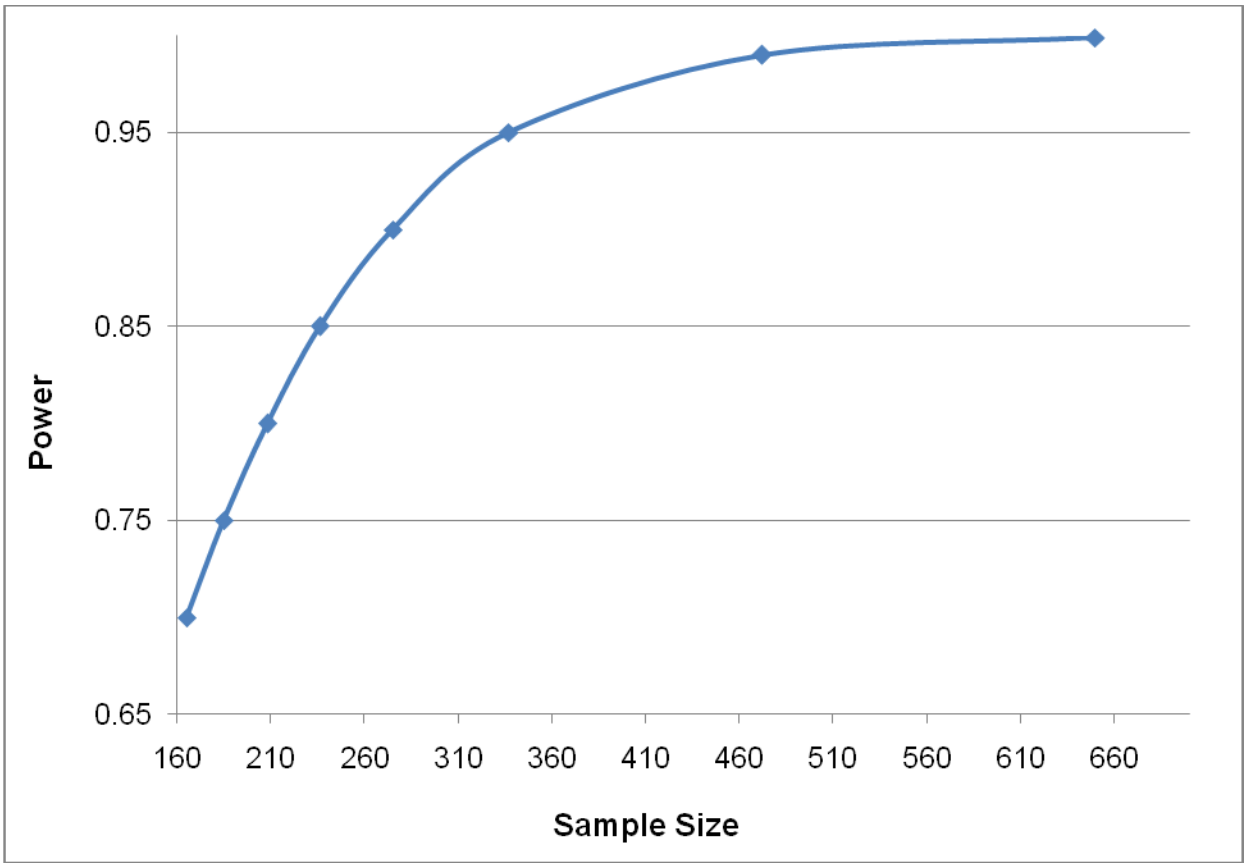

Figure 1.The relationship between sample size and power.

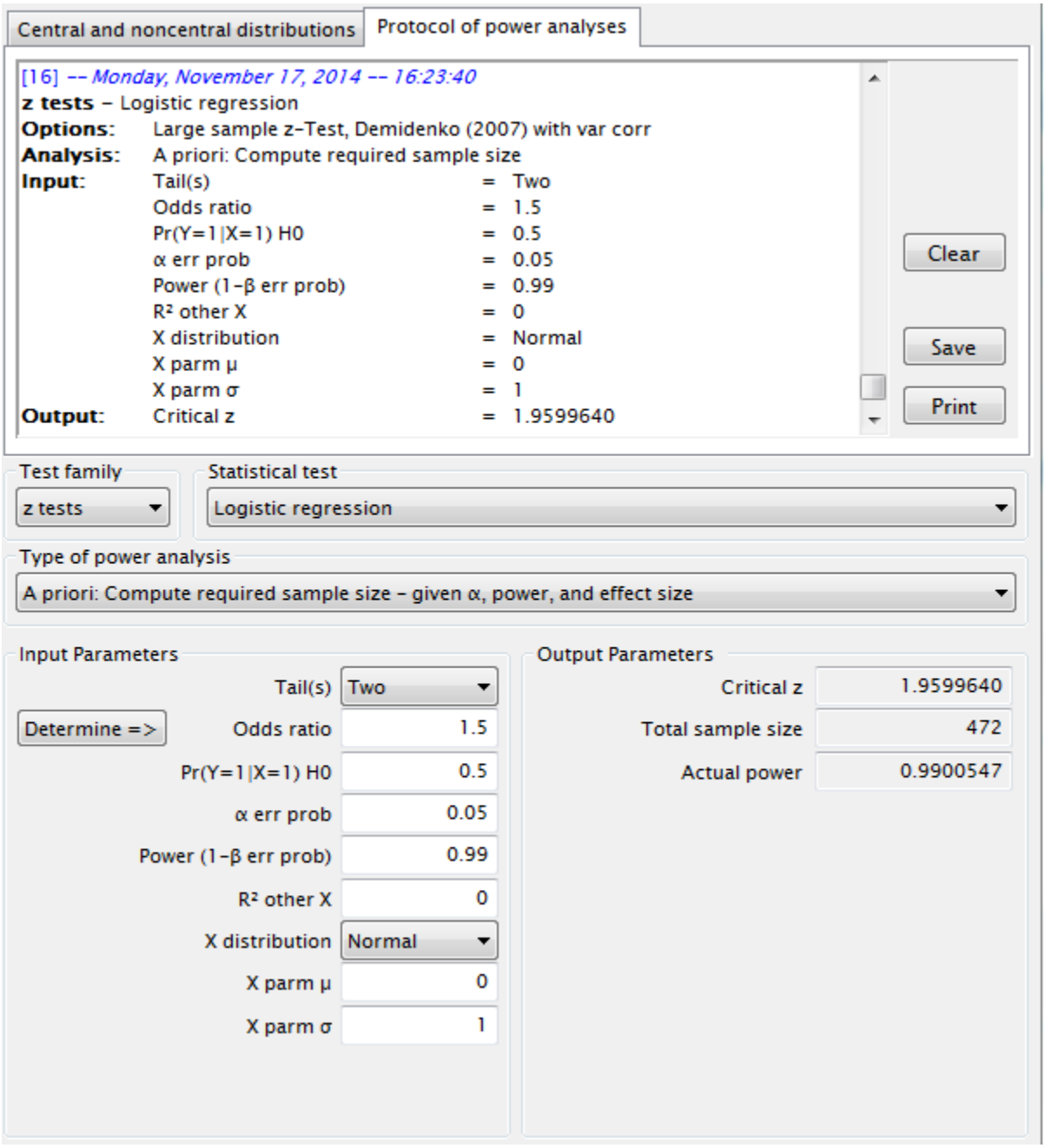

Figure 2.A screenshot of the G*Power utility for computing sample size.

Descriptive Statistics

Descriptive statistics were used to describe and summarize continuous and categorical data. Frequency tables were created for adherence and CVDstatus. Mean and standard deviation were used to describe and summarize data onBMI and age.

Dependent and independent variables are shown in Table 1.

Table 1.

Dependent and Independent Variables

Dependent variable	Independent variable
CVD event	Adherence
	Age
	Diabetes duration
	Educational status
	BMI and Income

Bivariate analyses was used to identify potential correlation between each variable, and multivariable analysis was used to examine the association between CVD risk and independent variables and relevant covariates. Variable and statistical tests are presented in Table 2.

Table 2

Variable Characteristics and Statistical Tests

Dependent Variable		Independent Variables or Potential Cofounding		Statistical Tests
Name	Type	Name	Type	
CVD event	Nominal	Age	Continuous	Logistic regression
		BMI	Continuous	Logistic regression
		Diabetes duration	Continuous	Logistic regression
		Gender	Nominal	Chi-Square
		Race/ethnicity	Nominal	Chi-Square
		Educational status	Nominal	Chi-square
		Income	Continuous	Logistic regression

Threats to Validity

Mellnyk andMorrson (2012) reported that the internal threat to validity plays a significant role in research studies. In using the BFRSS for collecting data, dropout from the study can create bias that may affect the validity of the reported results. The validity of the results of the study may also be affected by the fact that some study participants may not have accurately reported certain behaviors. For instance, subjects may not have reported the amount of exercise they had in the past months. Also, they may not accurately report whether their doctors told them there have diagnosed with diabetes or

not. The impact of the Do Not Call Registry on response rates at the state level may also affect the validity of the BFRSS data besides the fact that the telephone survey is predominantly conducted using subjects that have landline telephones. The BFRSS is noted for its lower response rates among minority populations, women and younger individuals (Schneider, Clark, Radomski, &Lapane, 2012).

Information Bias

Most self-reported data are subject to recall biaswhichmay lead to misclassification. Recall bias results from an inaccurate recall of past exposure (Szklo& Nieto, 2014), and study participants may fail to accurately recall activities they have undertaken when responding to the telephone questionnaire.According to Goodman (2010), the BRFSS used small-area analysis techniques to obtain county prevalence estimates, the county-level reference estimates received from the local data collection. They were discrepancies between the county-level reference estimates because of the existence of small subgroup sample sizes of the county level. The differences in the telephone coverage for each state and sub-population create selection bias in BRFSS data collection (Goodman, 2010).

Ethical Procedures

The states of Missouri and Ohio followed federal procedures for the protection of human research subjects. Also, the states of Missouri and Ohio respect regulation on data collection of personal identifying information (PII) and data security. The study was not involving direct interaction with study participants for collecting data. A secondary data

collected by the BFRSS for the respective states over the indicated years were used.IRB approval both from the Walden University IRB and the respective states appropriate agency IRB obtained before data was accessed for analyses.

Summary

In this chapter, research methods were used to evaluate the correlation between adherence to diabetes management regimens and the risk of CVD were described. Specifically, it was indicated that BRFSS data from the states of Missouri and Ohio were obtained on the relevant variables and description of study design, research questions and hypotheses, and statistical analysis protocol that used in this study was presented. Moreover, a description of the study population and sampling procedures including sample size estimation were presented. Remarks on the validity and reliability of the data from the BFRSS were given and procedures that followed in meeting the ethical considerations that was needed to be taken in conducting the research study by the Walden University was given.

Chapter 4: Results

The purpose of this study was to assess the association between adherence to diabetes management regimens and risk of CVD events among African American men with diabetes using the BRFSS data for the states of Missouri and Ohio. The research questions focused on (a) whether there was a statistically significant association between adherence to the recommended number of annual visits to health care services for general health check and risk of CVD among diabetic African American men,(b) whetherthere was a statistically significant association between adherence to the recommended number of annual visits for HbA1c checkup and risk of CVD among diabetic African American men, and (c) whetherthere was a statistically significant association between reported adherence to the recommended insulin therapyuse and risk of CVD among diabetic African American men.

In this chapter, the results of the data analyses are provided to answer the research questions and address the hypotheses. A brief description of the datasets used in the studyand the results of the descriptive statistical analyses and inferential statistical tests used for answering the research questions are presented. Finally, a summary of the major points covered in the chapter is provided.

The study addressed the following research questions (RQs):

RQ1: Having accounted for relevant covariates such as BMI, age, and education, is there a statistically significant association between reported adherence to the

recommended number of annual visits to health care services for general health checks and risk of CVD among diabetic African American men?

H_{10}: There is no significant association between reported adherence to the recommended number of annual visits to health care services for general health checks and risk of CVD among diabetic African American men.

H_{1A}: There is a significant association between reported adherence to the recommended number of annual visits to health care services for general health checks and risk of CVD among diabetic African American men.

RQ2: Having accounted for relevant covariates such as BMI, age, and education, is there a statistically significant association between reported adherence to the recommended number of annual visits to health care services for HbA1c check and risk of CVD among diabetic African American men?

H_{20}: There is no significant association between adherence to the recommended number of annual visits to health care services for HbA1ccheck and risk of CVD among diabetic African American men.

H_{2a}: There is a significant association between adherence to the recommended number of annual visits to health care services for HbA1c check and risk of CVD among diabetic African American men.

RQ3: Having accounted for relevant covariates such as BMI, age, and education, is there a statistically significant association between reported adherence to the recommended insulin therapy use and risk of CVD among diabetic African American men?

H_{30}: There is no significant association between adherence to the recommended insulin therapy use and risk of CVD among diabetic African American men.

H_{3a}: There is a significant association between adherence to the recommended insulin therapy use and risk of CVD among diabetic African American men.

Data Collection and Data Set Preparation

BRFSS datasets from the states of Missouri and Ohio for the years 2008 to 2012 were obtained. The BRFSS datasets were collected using telephone surveys, and participants were asked questions related to several health conditions, including diabetes. The BRFSS questionnaires included demographic information on age, sex, and race/ethnicity. Questions regarding education level, health insurance coverage, BMI, heart disease, diabetes status and duration, and related diabetes management regimens were included. Data for the various years from each state were combined by aligning the variables on which data were collected for each hypothesis stated. Data from both states were combined by concatenating the data using the common variables in each dataset for each year. Missing data were excluded from analyses by the SPSS list wise deletion method.

Descriptive Analysis

I generated descriptive statistical measures on sociodemographic and clinical variables, as shown in Table 3. Frequencies are reported for categorical variables, means, and standard deviations for continuous variables. I used histograms to describe the continuous variables.

Table 3
Descriptive Characteristics of Study Sample

Characteristics	*N*=496	%
Sociodemographic		
Interview year		
2008	86	17.3
2009	78	15.7
2010	109	22.0
2011	88	17.7
2012	135	27.2
Age (N, Mean ± SD)	*494*	61.3 ± 12
Marital status	*496*	
Married/unmarried couple	187	37.7
Divorced/separated	161	32.5
Widowed	52	10.5
Never married	96	19.4
Education level	*494*	
Did not graduate High School	94	19.0
Graduate High School	195	39.5
Attended College or Technical School	126	25.5
Graduate College or Technical School	79	16.0
Income level	*434*	
<$15,000	104	24.0
$15,000 - $24,999	133	30.6
$25,000 - $34,999	69	15.9
$35,000-$49,999	48	11.1
$50,000 or more	80	18.4

Note. HS=high school; TS=technical

school; CU=checkup.

Table 4.

Clinical characteristics

Body Mass Index Category	*478*	
Normal	62	13
Overweight	171	35.8
Obese	245	51.3
Age of diagnosis of diabetes (N, Mean ±	*352*	50.2 ± 13.5

SD)		
Adherence to routine checkups	*489*	
Yes	453	92.6
No	36	7.4
Adherence to ‘A1C’ check ups	*317*	
Yes	133	42.0
No	184	58.0
Taking Insulin	*354*	
Yes	135	38.1
No	219	61.9
Study outcome	*490*	
Having at least one CVD	139	28.4
Having no CVD	352	71.6

Description of the Study Sample

The study sample represented approximately 40% of diabetic patients from the state of Missouri and 60% from the state of Ohio. The sample included pooled BRFSS data for the states of Missouri and Ohio between the years of 2008 to and 2012. The average age of the participants was 61.30 years with a standard deviation of 12. As shown in Table 3, approximately 38% of the participants were either married or living together with a partner. Also, 32.5% were divorced or separated, 10.5% were widowed, and 19% had never been married.In regard to educational status, approximately 19% did not graduate from high school, 39% graduated from high school, 25% attended a college or a technical school, and 16% graduated from college or technical school. In terms of income, approximately 24% earned less than $15,000 a year, and 18% earned 50,000 a

year and above. About 36% were overweight, and 51% were obese, which indicated that only 13% of the participants were neither overweight nor obese.

The age distribution for the sample is shown in Figure 3.

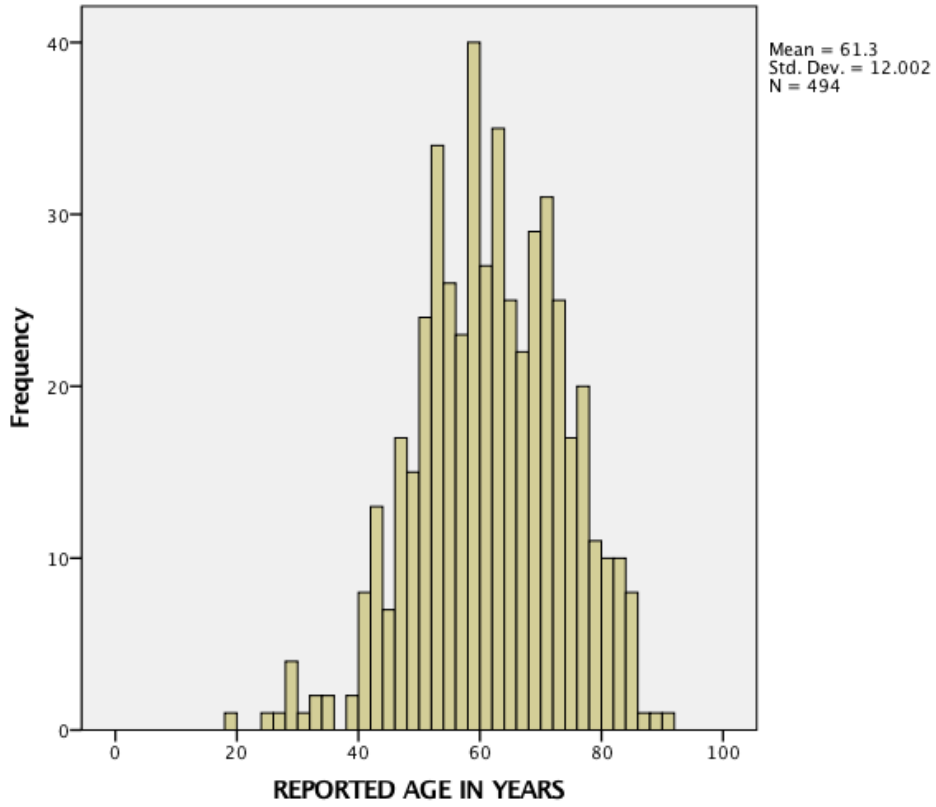

Figure 3. The age distribution of diabetic African American men for the states of Missouri and Ohio, 2008-2012.

The histogram indicated that the distribution of age was slightly skewed to the left. Likewise, the distribution of age among participants at the time of diagnosis with diabetes indicated a slight skew to the left, as show in Figure 4.

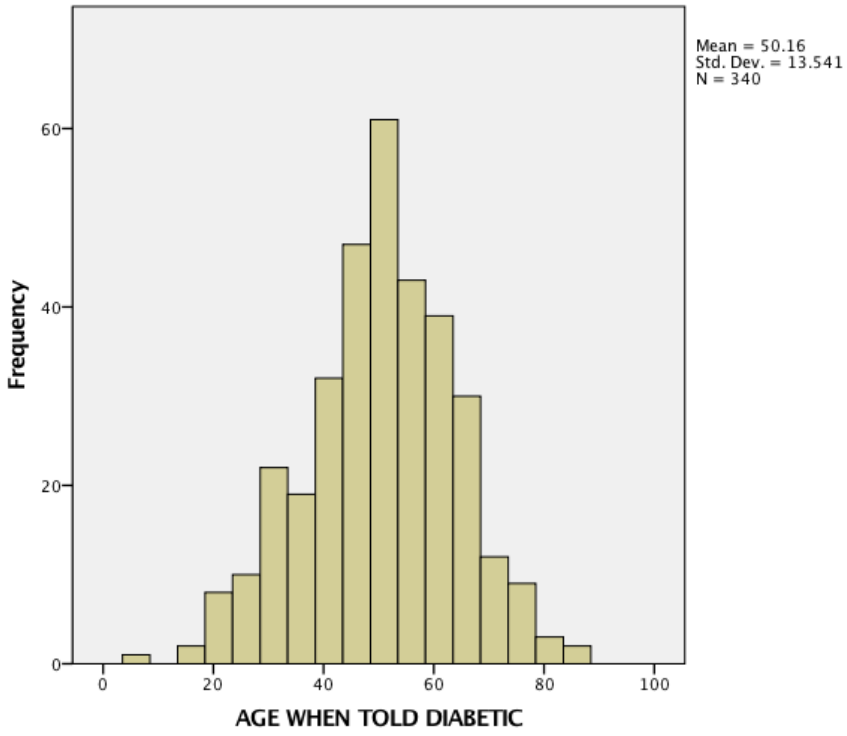

Figure 4.The distribution of age at the time of diagnosis with diabetes for the states of Missouri and Ohio.

Coding of Variables Used to Define Adherence

The dummy variable used for adherence to general health checkups (adh_ghealth) was created from the original variable CHECKUP1 as shown in Table 4. By definition, a person adhered if his or her last visit occurred within a year. The number 7 was used to represent (Don't know/Not sure) and number 9 was used to represent (refused). Also, I used the code 8 to indicate "Never" which was recorded as "Not adherent." According to Zhu, Tu, Rosenman, & Overhage (2014), researchers have used a different time frame to measure adherence in patients who were diagnosed with diabetes, such as 3 months, 6months, or 12 months. Significant improvements in the health outcomes have been

reported elsewhere when diabetic patients adhered to recommended management regimens such as regular HbA1c checkups at 3monthor 6month intervals (Zhu et al., 2014).

Table 5

Frequenciesfor Length of Time inYears Since Last Routine Checkup

Value	Label	Frequency	Percent
1	Within past year	453	91.3
2	Within 2 past years	15	3.0
3	Within past 5 years	9	1.8
4	5 or more years ago	10	2.0
7	Don't Know /Not sure	6	1.2
8	Never	2	.4
9	Refused	1	.2
Total		496	100.0

The "adherence to HbA1c checkups" was the next predictor, and it was referredto as adherent when a patienthad his A1C levels checked by a doctor/nurse at least three times in the last year. Also, the (CHKHEMO3) variable with frequencies was recorded accordingly, as shown in Table 5. Values 1 to 76 indicated the number of times a patient had his A1C levels checked. Codes 88 (none) and 98 (never heard of "A1C" test) were added to the "Not adherent category", as well as Values 1 and 2. Codes 77 (don'tknow/not sure) and 99 (refused) were set to missing. As shown in Table 4a total of 184 individuals (58%) were not adherent to A1C checkups.

Table 6

Frequencies for Time in the Past 12 Months Checked for Glycosylated Hemoglobin

		Frequency	Percent
Valid	1	58	11.7
	2	74	14.9
	3	37	7.5
	4	70	14.1
	5	3	.6
	6	8	1.6
	7	2	.4
	8	2	.4
	12	7	1.4
	15	1	.2
	20	1	.2
	22	1	.2
	76	1	.2
	77	36	7.3
	88	36	7.3
	98	16	3.2
	99	1	.2
	Total	354	71.4
Missing	System	142	28.6
Total		496	100.0

Bivariate Analysis

I conducted the bivariate analysis to evaluate the relationships between socio-demographic variables and CVD. The results of the associations assessed are presented in Table 7.

Table 7

The Association of Socio-demographic and Clinical Variables with the Cardiovascular Disease

	Study groups, n (%)		
Characteristic	HAS NO CVD(N=351)	HAS AT LEAST ONE CVD (N=139)	p-value-
Demographic variables			
Age, *Mean ± SD*	60.33 ±12.3	63.89 ±10.9	.003
Marital status			.541
Married/unmarried couple	129 (36.8)	55 (39.6)	
Divorced/separated	116 (33.0)	43 (30.9)	
Widowed	34 (9.7)	18 (12.9)	
Never married	72 (20.5)	23 (16.5)	
Education level			.021
Did not graduate High School	55 (15.7)	38 (27.5)	
Graduate High School	146 (41.7)	46 (33.3)	
Attended College or Technical School	89 (25.4)	35 (25.4)	
Graduate College or Technical School	60 (17.1)	19 (13.8)	.
Income level			.011
<$15,000	70 (22.9)	33 (27.0)	
$15,000 - $24,999	93 (30.4)	37 (30.3)	
$25,000 - $34,999	41 (13.4)	27 (22.1)	
$35,000-$49,999	34 (11.1)	14 (11.5)	
$50,000 or more	68 (22.2)	11 (9.0)	
Clinical variables			
Body Mass Index Category			.754
Normal	41 (12.2)	20 (14.7)	
Overweight	121 (35.9)	48 (35.3)	
Obese	175 (51.9)	68 (50.0)	
Age when told diabetic, *Mean ± SD*	49.45 ± 13.45	51.81 ± 13.96	.150
Adherence to routine checkups,			.132
Yes	318 (91.6)	130 (95.6)	
No	29 (8.4)	6 (4.4)	
Adherence to ‘A1C’ checkups,			.898
Yes	93 (41.2)	37 (42.5)	
No	133 (58.8)	50 (57.5)	
Taking Insulin,			.395
Yes	90 (36.3)	42 (41.6)	

No	158 (63.7)	59 (58.4)

Note. Values are means (*Mean ± SD) and percentages were indicated. BMI= Body mass index.*

As reported in Table 7, there was no significant association between marital status and CVD diagnosis status (chi-square=2.154, *p*=.541. There was a significant relationship between education level and CVD diagnosis status (chi-square=9. 722, *p*=. 021). In particular, higher levels of education were related to lower risk of CVD as can be seen by a higher percentage of patients that did not graduate from high school in the group with at least one CVD (28%) compared to the group with no CDV (16%). There was a significant relationship between income level and diagnosis status (chi-square=13.069, *p*=.011). The cross tabulation demonstrated that income seems to have a protective effect against CVD.For instance, among those with no CVD, 22%were in the top income bracket ($50K or more) compared to 9% among those with CVD.There were significant differences in the mean age between those people who are diagnosed with CVD and those that haven't been diagnosed. (63.9 vs. 60.3; t=-2.970, *p*=.003).

The cross tabulation suggests that having a CVD is positively associated with adhering to routine checkups. However, these differences are not statistically significant (chi-square=2. 263, *p*=. 132). There was no association between adherence to HbA1c checkups and having CVD (chi-square=.049, *p*=.825). Likewise, there was no association between taking insulin and having CVD (chi-square=.855, *p*=.355).

The above bivariate analyses demonstrated that there was no significant association of any of the three predictors with CVD. In order to perform a more thorough analysis, I looked at the relationship between each of the three predictors separately with each of the three cardiovascular diseases: Heart attack, angina or coronary heart disease, and stroke.The cross tabulations performed did not find any significant relationship either.

Table 8
Frequencies of Adherence to Routine Checkups

Adherence to Routine Check- ups

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	non adherent with routine checkups	43	8.7	8.7	8.7
	adherent with routine checkups	453	91.3	91.3	100.0
	Total	496	100.0	100.0	

I observe that there is 8.7 percent for non-adherent with routine checkups compared with 91.3 percent for adherent with routine checkups.

Table 9

The Associations Between Adherence to Routine Checkups and Cardiovascular Disease

			CVD		
			No CVD	At least one CVD	Total
Adherence	non adherent with routine checkups	Count	33	9	42
		% within adherence2	78.6%	21.4%	100.0%
	adherent with	Count	318	130	448

	routine checkups	% within adherence2	71.0%	29.0%	100.0%
Total		Count	351	139	490
		% within adherence2	71.6%	28.4%	100.0%

There were 78.6% of non-adherence patients who have not had a cardiovascular disease compared to 71% among those adherent patients.

Multivariate Analysis

I conducted multivariate analyses to test hypothesis related to the research questions since no significant association was found between the diabetes management regimen variables and CVD. It is important to run the corresponding multivariate models adjusting for the potential confounding variables such as age, education level, and income level.

For research question one, I used a logistic regression model to seek for the association between adherence to the recommended number of annual visits for general health checkup and risk of CVD. The logistic regression does not make the assumptions of the linear regression about normality, linearity, and homoscedasticity; however, collinearity between the independent variables is not desirable. I checked the correlation between education and income (Table 10).

Table 10

Correlation Between Level of Education and Income

Correlations

			COMPUTED LEVEL OF EDUCATION COMPLETED CATEGORIES	COMPUTED INCOME CATEGORIES
Spearman's rho	COMPUTED LEVEL OF EDUCATION COMPLETED CATEGORIES	Correlation Coefficient	1.000	.450**
		Sig. (2-tailed)	.	.000
		N	84085	71760
	COMPUTED INCOME CATEGORIES	Correlation Coefficient	.450**	1.000
		Sig. (2-tailed)	.000	.
		N	71760	71822

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

I conducted univariate analyses to evaluate the relationships between educational level and income. Table 10 demonstrated that there is a moderate positive correlation between education level and income level (r= .450) but not high enough to pose a problem of collinearity (Miles &Shelvin, 2001).

As reported in Table 10, adherence to routine general health check is not a significant predictor of CVD (Wald=.780, p=.377) after adjusting for age, income and education. The coefficient corresponding to those who attended college or technical school was significant at the 10% level. In particular, those who attended college or technical school have almost half the odds of being diagnosed with CVD compared to

those who did not graduate. (OR=.58, *p*=.080). The odds of having a CVD with those in the top income bracket are one third of the odds of having a CVD compared for those in the bottom income bracket (OR=.34, *p*=.010). None of the age group dummies arestatistically significant. The regression is adjusted for age, education, and income. Those people at ages 20 to 40, making<$15,000 and who did not graduate from high school are the reference categories for age, income and education, respectively.

Table 11
The Association Between Adherences to the Recommended Number of Annual Visits for General Health and the Risk of CVD having Adjusted for Age, Education and Income level

Variables[a]	OR	B	SE	Wald	p-value
Adherence to general health	1.49	.400	.453	.780	.377
Age Groups					
20 to 40					
41 to 50	2.04	.712	.837	.724	.395
51 to 60	2.36	.859	.798	1.158	.282
61 to 70	3.44	1.235	.798	2.392	.122
Over 70	2.92	1.070	.802	1.779	.182
Educational Level	.				
Did not graduate HS					
Graduate High School	58	-.547	.313	3.064	.080
Attended College or TS	.80	-.225	.340	.435	.509
Graduate College orTS	.87	-.142	.405	.122	.726
Income Level					
< $15,000					
$15,000 - $24,999	.75	-.286	.297	.924	.336
$25,000 - $34,999	1.31	.273	.342	.635	.425

$35,000-$49,999	.84	-.170	.400	.179	.672
$50,000 or more	.34	-1.090	.426	6.552	.010

Goodness of fit	Chi-square	d.f	p-value.	Cox & Snell R^2	Nagelkerke R2
	24.54	12	.017	.056	.080

Note. HS=high school; TS=technical school.

As reported in Table 11, one can observe that adherence to HbA1c checkups was not significant (p=.40). Therefore, the null hypothesis for H2 was not rejected. Ages over 70 were a significant predictor at a 10% significant level (OR=7.23, *p*=.082) indicating that people older than 70 are more likely to be diagnosed with CVD compared to the youngest group (20 to 40 years of age). Having graduated from high school was also significant with OR lower than 1, indicating that those who graduated from high school were less likely to be diagnosed with CVD compared to those who did not graduate from high school (OR=.344, *p*=.009). In particular, the odds for having a CVD among those who graduated from high school were one third of the odds for those who did not graduate from high school.

Table 12
Logistic Regression for Reported Adherence to the Recommended Number of Annual Visits for HbA1c Check Predicting Risk of CVD, Controlling for the Effects of the Patient's Age, Education and Income Level

Variables[a]	OR	B	SE	Wald	p-value
Adherence to A1c checkups	.78	-.249	.298	.696	.404
Age Group					
20 to 40					
41 to 50	1.51	.409	1.204	.115	.734
51 to 60	3.55	1.267	1.126	1.265	.261
61 to 70	5.16	1.640	1.127	2.118	.146
over 70	7.23	1.978	1.136	3.032	.082
Educational Level					
Did not graduate HS					
Graduate High School	.34	-1.068	.408	6.838	.009
Attended College or TS	.58	-.538	.441	1.492	.222
Graduate College or TS	.55	-.593	.488	1.475	.225
Income Level					
< 15,000					
$15,000 - $24,999	.69	-.372	.415	.805	.370
$25,000 - $34,999	2.01	.696	.444	2.451	.117
$35,000-$49,999	1.40	.335	.506	.439	.507
$50,000 or more	.54	-.618	.552	1.253	.263

Goodness of fit	Chi-square	d.f	p-value.	Cox & Snell R^2	Nagelkerke R2
	30.77	12	.002	.106	.152

Note: HS=high school; TS=technical school.

Table 13

Logistic Regression for Reported Adherence to Recommended Insulin Therapy Predicting Risk of CVD, Controlling for the Effects of Patient's Age, Education and Income Level (Hypothesis 3) Respectively

Variables[a]	OR	B	SE	Wald	p-value
Taking insulin	.77	-.263	.275	.917	.338
Age Group					
20 to40					
41 to 50	1.01	.009	.918	.000	.992
51 to 60	1.63	.491	.849	.335	.563
61 to 70	2.64	.971	.843	1.324	.250
over 70	2.76	1.017	.853	1.421	.233
Educational Level					
Did not graduate HS					
Graduate High School	.42	-.877	.365	5.778	.016
Attended College or TS	.64	-.445	.400	1.237	.266
Graduate College orTS	.68	-.386	.459	.706	.401
Income Level					
<$15,000	.				
$15,000 - $24,999	67	-.397	.361	.1.210	.271
$25,000 - $34,999	1.52	.415	.404	1.057	.304
$35,000-$49,999	1.01	.014	.470	.001	.977
$50,000 or more	.37	-1.006	.523	3.698	.054

Goodness of fit	Chi-square	d.f	p-value.	Cox & Snell R^2	Nagelkerke R2
	26.84	12	.008	.083	.119

Note. HS=high school; TS=technical school.

As reported in Table 13, one can observe that taking insulin was not a significant predictor. (p=.338), which leads to acceptance of the null hypothesis for H3. Having graduated from high school wassignificant with an OR of .416 indicating those who graduated from high schoolhave lower odds ofbeing diagnosed with CVD compared to those who did not graduate from high being school (*p*=.016).Finally, the odds of being diagnosed with CVD for people who earned income of $50,000 or more were approximately one third of the odds for those who make less than $15,000 (OR=.37, *p*=.054).

Summary

In this chapter, this studypresented the results of the data analysis for the states of Missouri and Ohio to answer the study research questions. First of all, this study focused on data set preparation by identifying variables in the data set and made observations regarding missing data. For research question1, the logistic regression was used, and there are no assumptions in the linear regression about normality, linearity, and homoscedasticity. However, collinearity between the independent variables is not desirable. I conducted different analyses, such as bivariate and multivariate analyses for the data set. Findings from bivariate analysis demonstrated that there is a significant correlation between education level and having a CVD. (chi-square=9.722, p=.021). I conducted a multivariate analysis to test the hypothesis related to the research questions. For research question 1, the logic regression analysis demonstrated that those who attended college or technical school have almost half the odds of being diagnosed with

CVD compared to those who did not graduate. (OR=.58, p=.080). The odds of having a CVD for those in the top income bracket were one third of the odds of having a CVD compared to those in the bottom income bracket (OR=.34, p=.010). However, in research question 2, ages over 70 were a significant predictor at a 10% significance level (OR=7.23, p=.082) indicating that people older than 70 weremore likely to be diagnosed with CVD compared to the youngest group (20 to 40 years of age). Having graduated from high school was also significant with OR lower than 1, indicating that those who graduated from high school were less likely to be diagnosed with CVD compared to those who did not graduate from high school (OR=.34, p=.009). Furthermore, in research question 3, having graduated from high school was a significant with an OR of .42 indicating who those graduated from high schoolhave lower odds of being diagnosed with CVD compared to those who did not graduate from high being school (p=.016). In chapter five, I will provide an interpretation of study results presented in chapter four based on the study theory and will discuss the strengths and limitations of the study. Recommendations for future research will be provided. I will focus on the aspect of social change implications. Finally, I will make an overview of the study.

Chapter 5: Discussion, Recommendations and Conclusions

In this chapter, I interpret the observed results highlight the study limitations, and describe the implications for social change. I also provide recommendations for further research concluding remarks regarding the overall findings of this study. Individuals with diabetes have a 2 times greater risk of developing cardiovascular disease (CVD) compared to nondiabetic individuals (Laakso, 2010). Adherence to diabetes management regimens may reduce the risk of CVD among individuals with diabetes (Nesto, 2008). However, studies addressing the association between adherence to diabetes management regimens and the risk of CVD among African American men with diabetes are limited. Therefore, this study addressed the association between self-reported diabetes management regimens and the risk of CVD among African American men with diabetes in the states of Missouri and Ohio.

Based on findings from the literature, adherence to diabetes management regimens can help reduce diabetes-related mortality and morbidity among African American men. In this quantitative study, I analyzedsecondary data from the states of Missouri and Ohioand explored (a) whether there was a statistically significant association between reported adherence to the recommended number of annual visits to health care services for general health checks and risk of CVD among diabetic African

American men, (b) whetherthere was a statistically significant association between reported adherence to the recommended number of annual visits to health care services for HbA1c checks andthe risk of CVD among diabetic African American men,and (c) whethertherewas a statistically significant association between reported adherence to the recommended insulin therapyuse andthe risk of CVD among diabetic African American men. The study included a cross-sectional design. Statistical analysis was used to examine the correlation between the independent and dependent variables and to test the hypotheses related to the research questions. Findings indicated a significant relationship between education level and having a CVD (chi-square=9. 722, *p*=. 021). However, findings demonstrated no association between adherence to the HbA1c checkups and having a CVD (chi-square=. 049, *p*=. 825).

Interpretation of the Findings

Khunti et al., (2012) reported that diabetes management regimens have been recognized by a number of researchers and health care professionals who work to reduce the prevalence of diabetes in the population. The promotion of self-management is critical in tackling the prevalence of diabetes in patients. Patients who adhere to HbA1c management regimens, control their weight, and manage their diabetes disorders are more likely to improve their quality of life than people who do not maintain these practices (Khunti et al., 2012).

Bivariate analysis was conducted to evaluate the relationships between sociodemographic variables and CVD. I used a chi-square test for categorical variables and the student's *t*test for continuous variables. Also, I evaluated the relationship between

the three main predictors, (adherence to general checkups, HbA1c, and insulin predictors) and CVD using the chi-square test. The bivariate analyses demonstrated no significant association between any of the three predictors and having a CVD.

A likely reason whythere was no significant association between any of the three predictors and having a CVD is due to the lack of synchronicity between the predictors and the outcome CVD. The variable CHECKUP1, used to measure adherence to general health checkups, referred to "time since last time routine checkup." It was, therefore, being used to measure the current or most recent reported adherence of the patient. In a similar fashion, the variable CHKHEMO3, used to measure adherence to HbA1c checkups, was indicating adherence in the past 12 months. The third predictor, taking insulin, was used to measure whether a patient was taking insulin at the time of the survey. However, the variables used to measure theoutcome "having at least a CVD"were computed from the following three categories: "ever diagnosed with heart attack", "ever diagnosed with angina or coronary heart disease," and "ever diagnosed with a stroke". Ideally to determine whether patient adherence can predict risk of having a cardiovascular disease, one should measure patients' adherence later in their lives and see if better adherence leads to better cardiovascular outcomes in later life. This can only be done with longitudinal data, which were not feasible in this study.

The results demonstrated no significant association between marital status and diagnosis witha CVD (chi-square=2.154, p=.541). However, there was a significant relationship between education level and having a CVD (chi-square=9. 722, p=. 021).In particular, higher levels of education were related to lower risk of CVD and the highest

percentage of patients that did not graduate from high school in the group with at least one CVD (28 percent) compared to the group with no CDV (16 percent). There was also a significant relationship between income level and diagnosis status (chi-square=13.069, *p*=.011). The cross tabulation demonstrated that income seems to have a protective effect against CVD. Among those with no CVD, 22% were in the top income bracket ($50K or more) compared to 9 percent among those with CVD.

The results of cross tabulation analysis indicated that having a CVD was positively associated with adhering to routine checkups;however, these differences were not statistically significant (chi-square=2. 263, *p*=.132). The purpose of this study was to assess the association between perceived or self-reported diabetes management regimens and the risk of CVD among African American diabetic menin the states of Missouri and Ohio. The statistical tests conducted in the study did not provide evidence to support this association. Because this study was focused only on two states, having a larger sample size mayhave provided more power to detect significant differences. Also, additional studies could focus on different races/ethnicities, ages, and genetic factors related to diabetes.Marshall (2005) reported that African Americans have a genetic predilection for efficient storage of. In addition, African Americans have a genetic predisposition to suffer from type 2 diabetes, but they also have a higher rate of insulin resistance (Marshall,2005). My study didnot include the genetic factors for diabetes. This could explain why adherence to insulin treatment was not a significant predictor in my study.Major factors that may have influenced the results included genetics, and lifestyle.

Also, a potential problem with self-reported diabetes management may have influencedthe results of the study.

For research question one, I used a logistic regression model to seek for the association between adherence to the recommended number of annual visits for general health checkup and risk of CVD. The logistic regression does not make the assumptions of the linear regression about normality, linearity, and homoscedasticity; however, collinearity between the independent variables is not desirable. I checked the correlation between education and income.

Adherence to routine checkups was not a significant predictor of CVD (Wald=.780, *p*=.377) after adjusting for age, income, and education. The coefficient corresponding to those who attended college or technical school was significant at the 10% level. In particular, those who attended college or technical school had almost half the odds of being diagnosed withCVD compared to those who did not graduate. (OR=.579, *p*=.080). Those in the top income bracket had one third the odds of having a CVD compared to those in the bottom income bracket (OR=.336, *p*=.010). None of the age group dummies werestatistically significant. The regression was adjusted for age, education, and income. People ages 20 to 40, making<$15,000 and who did not graduate from high schoolwere the reference categories for age, income, and education, respectively.

The results from the logistic regression analysis for Research Question 2 demonstrated that adherence to HbA1c checkups was not significant (p=.40). Therefore, the null hypothesis for H2 was accepted. Age over 70 was a significant predictor at a 10% significance level (OR=7. 225, p=.082) indicating that people older than 70 are more likely to be diagnosed with CVD compared to the youngest group (20 to 40 years of age). Having graduated from high school was also significant with OR lower than 1, indicating that those who graduated from high school were less likely to be diagnosed with CVD compared to those who did not graduate (OR=.344, p=.009). In particular, the odds of having a CVD among those who graduated from high school where one third the odds for those who did not graduate from high school.

The results from the logistic regression analysis for Research Question 3 indicated that taking insulin was not a significant predictor (p=.338). Therefore, the null hypothesis for H3 was accepted. Having graduated from high school was significant with an OR of .416, indicating who those graduated from high schoolhad lower odds of being diagnosed with CVD compared to those who did not graduate from high being school (p=.016). Finally, the odds of being diagnosed with CVD for people who earned $50,000 or more were approximately one third the odds for those who made less than $15,000 (OR=.366, p=.054).

There have been limited research studies on diabetes management and its association with cardiovascular diseases among African American men. Major causes that may create statistically insignificant results unlike other studies reported in the literature include different genetics and lack of lifestyle data in this study. Gavin (2004)

reported that most diabetes-related deaths were due to cardiovascular disease, so health programs focused on diabetes management programs should also address coronary heart disease risk factor reduction and should promote glycemic control in diabetes patients.Also, it is important to focus on predictors such as adherence to HbA1C visits and insulin treatment (Gavin,2004). I could have controlled for diet and exercise and for any additional treatment the patient was taking to manage high blood pressure. In addition, looking at the HbA1c-related checkups and insulin treatment may not have been enough to predict whether a patient was more likely to have a cardiovascular event. My study would, therefore, have benefited from the inclusion ofdata related to lifestyle changes such as diet and exercise as well data related to history of diabetes and current treatment to manage high blood pressure. Another reason that may explain why my study results were statistically insignificant is that specific genetic factors among African American were not included in my study.

Marshall (2005) noted that African Americans have a genetic predisposition to suffer from diabetesand also have a higher rate of insulin resistance. This may be a reason why adherence to insulin treatment was not a significant predictor in my study. Also, health disparities create a major problem among African Americans. According to Marshall (2005), racial and ethnic minorities in the United States receive a lower quality of health care, regardless of socioeconomic status, insurance coverage, age, or comorbity conditions.For instance, a study of Medicare beneficiaries found that African Americans diabetic patients were less likely to have HbA1c measurements, lipid testing, and ophthalmological visits compared with Caucasian diabetic patients (Chin, Zhang,

&Merrell, 1998). It appears that the study of diabetes management and risk of cardiovascular disease in the African American male population needs to beexpandedtoinclude lifestyle changes such as diet and exercise information as well as data about treatment to manage high blood pressure(Gavin,2004). Gemell (2007) demonstrated that HbA1c was not significantly associated with diabetes self-management and adherence to medication.

My findings indicated no significant association between BMI and CVD. This is in direct contrast to the findings of Dudinalet al. (2011), who reported that overweight and obesity were significantly associated with CVD in a graded manner. The reason for the absence of significant association between overweight and obesity and CVD in the current study may be due to the nature of the sample used and the limited number of CVD diagnoses status among the cohort in general.

Significance of Diabetes in African Americans

I examined the relationship between diabetes and cardiovascular disease in African American diabetic men. Signorello et al., (2007) revealed that African American adults are 50% to 100% more likely to develop diabetes than their Caucasiancounterparts. African Americans are less educated and have less access to quality health care and are more likely to develop chronic diseases such as diabetes. Signorelloet al. (2007)confirmed that race/ethnicity and ageweremajor predictors for diabetes.

Study Limitations

As noted in Chapter 1, the study included a number of limitations related to the methodology and design. The cross-sectional study design had potential limitations

besides using secondary data from the BRFSS database. Representativeness of study samples and generalizability of study results is critical for the study. Biases in the analysis may render the study less generalizable. To limit bias in the study. The internal validity has used to reduce all systematic error during data collection stages. Major concerns related bias and confounding were taken into account to minimize the internal threat to validity.Also, external validity concerns, consider in this study to focus on modality of outcome and a correct basis for generalization (Zaccai, 2003). Quality control measures help reduce the risk of information bias. Missing data create limitations, but missing data were automatically excluded from analyses through the SPSS list wise deletion method. Another limitation is that there were limited observations between variables. The BRFSS data are known to have limitations such as higher levels of noncoverage due to the use of telephone surveys, particularly among people on low incomes, people in rural areas, people without a high school diploma, and people in poor health.

The BRFSS does not include all the populations in the surveys. Approximately 5% of the population cannot be reached by telephone,and accessis varied by states and regions. The lack of phone responses may have created bias due to under sampling of the population without a telephone.

Recommendations

This study included secondary data from the BRFSS database for the states of Missouri and Ohio to examine the association between adherence to diabetes management regimens and the risk of CVD among African American diabetic men.

Ievaluated the relationship between CVD and educational status, age, race, and income level. I conducted different tests such as cross-tabulation analysis, bivariate analysis, multivariate analysis, and multiple regression analysis.

Studies that evaluated the association between adherence to diabetes management regimens and the risk of CVD among minority populations, such as African American men, are limited.According to Treadwell et al. (2010), immediate attention and action is required to address the health problems of African American men, specifically when it comes to diabetes and obesity. There is little systematic community-based intervention that focuses on alleviating the problem of diabetes and quality of life of African American men. There is a need to establish community-based intervention that promotes the prevention of disease in African American men. A number of challenges create barriers when addressing the issues in men's health, such as high rates of uninsured African American men, limited access to low-cost medical care and limited funding in research for African American men (Treadwell et al. 2010).

I would recommend further research from randomized controlled studies thatfocus on adherence to self-care management andstudies that are evaluated the association between adherence to diabetes management regimens and the risk of CVD among African American men and more variables should be included to allow a significant association in the studies.

Implications for Social Change

The social change implication of this study is that socioeconomic factors such as educational status and income are important determinants of the risk of CVD in diabetic

African American men. This suggests the importance of taking into account socioeconomic factors, such as educational status and income when planning and implementing diabetes management regimens so as to reduce the risk of CVD among diabetic African American Men. Results can also be used for promoting the importance of diabetes self-care in preventing CVD among the target population. The Walden University social change mission is aligned with this proposed study. One of the main missions of the University is to promote social opportunities to all students by offering action plans, strategies and skills that can used to help improve the population's quality of life and health outcomes. This study will offer a lot of opportunity to make a worthwhile social change in the community by implementing health intervention strategies that work toward the goal of reducing morbidity and mortality in the population (Walden University,2011). Such strategies should target the most vulnerable groups, in which, according to this study,patients who did not graduate from high school are in the bottom income bracket.Few studies have evaluated the relationship between the adherence to diabetes management regimens and the risk of CVD among minority populations. Even if studies have evaluated the direct impact and risk factors related to diabetes and CVD in the minority community, diabetes disorders are still prevalent. Fortunately, intervention strategies can be implemented to overcome some of the barriers that are related to the management of diabetes among African American Men. The help of a number of health organizations and researchers, such as the American Diabetes Association and "Healthy People 2020" can increase diabetes research among minority population. The prevalence of mortality and morbidity have beenreduced and the health

outcomes and quality of life of the population have improved and the findings of this study have significant importance for the implication of social change.Diabetes management regimens and promotion to reduce HbA1c is crucial for the public health. Health care professionals and researchers should communicate with subjects on the best ways to manage diabetes disorders to maintain the glucose level and to reduce the prevalence of diabetes in the community. It is important to conduct more in depth studies that are focused on diabetes management and the association with cardiovascular diseases among African American men to understand the statistically significant results of the study. Also, this could include the extent to which the pharmaceutical and medical community can come up with more effective treatments that will work with the genetic and environmental factors that particularly affect the African American community.

Conclusion

Proper management regimens for diabetes can improve the quality of life of people who develop diabetes in the United States population. Behavior and lifestyle changes have proven to be effective in the management of diabetes and tend to improve health outcomes. This study addressed the gap that exists in diabetes management regimens and major health impacts that are related to diabetes, including but not limited to amputations, kidney diseases, diabetes retinopathy, and cardiovascular disease. Important recommendations to manage diabetes include maintaining a healthy weight, exercising regularly, monitoring blood glucose levels, healthy dieting, reducing stress and taking recommended medications for glycemic control (Logue et al., 2013). To benefit from diabetes management regimens, people who have been diagnosed with

diabetesshould adhereto certain interventions, such as medication, exercise, self-monitoring blood glucose, and adherence to recommended number of HbA1c checkups per year (Crowley etal., 2013). My study was conducted to address the gap in research as pertains to these management regimensin diabetic African American men. Specifically, my study assessed if(a) there is a statistically significant association between reported adherence to the recommended number of annual visits to health care services for general health check and risk of CVD among diabetic African American men(b) whetherthere is a statistically significant association between reported adherence to the recommended number of annual visits to health care services for HbA1c check and risk of CVD among diabetic African American men,and (c) whetherthereis a statistically significant association between reported adherence to the recommended insulintherapyuse and risk of CVD among diabetic African American men.This study demonstrated that there was a significant association between income and risk of CVD.Also, low educational attainment was associated with risk of CVD. However, this study did not find a statistically significant association between adherence to diabetesmanagement regimens and risk of CVD in diabetic African Americans men based on BFRSS data from the states of Missouri and Ohio. Well powered studies that assess the associations between diabetes management regimens and risk of CVD in a longitudinal setting are warranted.

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