2020

Health Literacy and Health Beliefs with Adherence to Antihypertensive Medications in an Urban African American Cohort

Karen Ranae Dukes
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral dissertation by

Karen Dukes

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Aaron Mendelsohn, Committee Chairperson, Public Health Faculty
Dr. Vasileios Margaritis, Committee Member, Public Health Faculty
Dr. Cheryl Cullen, University Reviewer, Public Health Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2020

Abstract

Health Literacy and Health Beliefs with Adherence to Antihypertensive Medications in an Urban African American Cohort

Karen Dukes

MBA, University of Phoenix, 2006

BSN, University of Phoenix, 2003

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

February 2020

Abstract

African Americans aged 40 to 65 are more likely to be diagnosed with hypertension, and adherence to prescribed antihypertensive medication regimens is important in controlling their blood pressure levels. The purpose of this quantitative study was to examine the relationship between health literacy and sociodemographic and clinical factors with adherence to antihypertensive medications among African American adults. The theoretical framework for this study was the health belief model. A quantitative research design was used with participants recruited from churches with African American congregations in the city of Detroit. A convenience sampling method was used to obtain a sample of 79 individuals. The inclusion criteria for the study included being African American, from 40 to 65 years of age, and with a diagnosis of hypertension or high blood pressure. The participants completed 4 instruments: Newest Vital Sign, Medication Adherence Self-Efficacy Scale, Beliefs about Medication Questionnaire, and a demographic questionnaire to determine the relationship between health literacy, medication adherence, and beliefs about medication. Kruskall-Wallace ANOVA and bi-nominal regression were used to analyze the data. Most participants demonstrated possibly limited to limited health literacy. The findings indicated medication adherence was not significantly associated with health literacy or specific or general beliefs about medication, but it was significantly related to income. The findings may lead to social change by emphasizing to physicians the need to be aware of the level of their patients' health literacy and to develop strategies to ensure that the patients understand the importance of their antihypertension medications to reduce the effects of the condition.

Health Literacy and Health Beliefs with Adherence to Antihypertensive Medications in an Urban African American Cohort

Karen Dukes

MBA, University of Phoenix, 2006

BSN, University of Phoenix, 2003

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

February 2020

Dedication

This dissertation is dedicated to my mother and my fiancée. They have stood by my side during the years that it has taken me to complete my personal education process. I will be forever grateful to them. I would also like to dedicate this dissertation to all of the people who thought that I would not finish this dissertation process. Their doubts and negativity gave me the inspiration to keep moving forward to completion and I thank them for that.

Acknowledgments

I would like to take this opportunity to thank my dissertation committee for all their help and guidance through the dissertation process. I especially appreciate Dr. Aaron Mendelsohn for his encouragement, motivating comments, and help that he has provided throughout the years I have worked on this project. To my committee, Dr. Vasileios Margaritis and Dr. Cheryl Cullen, thank you for all your help.

To the pastors of the churches that allowed me to collect data and to all the church members who met with me and completed my surveys, a very special thank you.

I would like to acknowledge my dissertation editor and statistician, June Cline. This incredible woman has been my confidant, mentor and at times, authority figure. She has helped me to make it through to the end of my educational process.

I would also like to acknowledge my parents, both my mothers and father, who have given me the strength every step of the way. To my love and soon to be husband, I am forever grateful for your strength in holding me up when I was faltering. During the times I could not see my way through, you were there moving me along, coaching me, and making me strong. I love you for that and so much more. To all my extended family members and friends, your encouragement motivated me to see this project to the end. Thank you all.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Introduction

Hypertension is the single most important modifiable risk factor for cardiovascular disease, with hypertension having several different negative effects on the body. Hypertension is more common in African American adults than in European American or Hispanic American adults (National Heart, Lung, and Blood Institute, 2015). African Americans tend to be diagnosed with high blood pressure (HBP) earlier in life, have higher blood pressure numbers, and are less likely to achieve target blood pressure goals with treatment (National Heart, Lung, and Blood Institute, 2015). Death rates from cardiovascular disease are higher among African Americans and have decreased at a slower rate than among European Americans (Downie et al., 2011). A lower percentage of African Americans (48.9%) have their blood pressure adequately controlled, compared to 59.7% of European Americans (Downie et al., 2011).

For hypertension, limited health literacy has been associated with poor disease-related knowledge, poor medication adherence, and discrepancies in patients' self-reported medication use with their medical record and poor blood pressure control (Osborn, Paasche-Orlow, Bailey, & Wolf, 2011). Over 90 million adults in the United States lack literacy skills needed to function effectively in the current health care environment (Powers, Olsen, Oddone, Thorpe, & Bosworth, 2008). Low health literacy is more common in older patients, those with lower education levels, immigrants, and racial minorities (Powers et al., 2008). Brown and Bussell (2011) found that medication adherence continues to decline even after a catastrophic event, such as a stroke. They

concluded that managing asymptomatic conditions (e.g., hypertension), which is important to prevent possible occurrences of adverse events years later, presents a challenge for medical professionals (Brown & Bussell, 2011). The factors identified as barriers to medication adherence among inner city patients with low socioeconomic status (SES) were high medication costs, a lack of transportation, poor understanding of medication instructions, and long wait times at the pharmacy (Brown & Bussell, 2011).

The purpose of this study was to examine the relationship between medication adherence, health beliefs, and health literacy in a cohort of African American adults diagnosed with hypertension. The information gained from this study could help to inform stakeholders, namely health care practitioners, regarding factors associated with medication adherence in the context of hypertension. Findings of the study may lead to development of strategies for improving adherence (through the promotion of health literacy) to reduce the negative health outcomes associated with uncontrolled hypertension in a vulnerable population (i.e., low SES African Americans).

The sections of this chapter include the background section that provides an overview of the research problem and why it should be studied. The problem statement includes information about the physiology of hypertension along with racial disparities that exist among individuals diagnosed with hypertension. The research questions follow and provide the basis of the research focus. In the theoretical framework section, I present the theory on which the study was predicated and provide the basis for the survey questionnaire that used in this study. In the limitations section, I describe aspects of the study that could affect the generalizability of the findings.

Background

Researchers have examined the reasons why African Americans diagnosed with hypertension may not adhere to their medication regimens. For example, Fongwa, Nandy, Yang, and Hays (2008) identified factors associated with adherence to hypertension treatment among African American women and found that the participants' discussions about hypertension and adherence to treatment fell into three main categories: (a) beliefs about hypertension facilitators, (b) adherence to recommended treatment regimens, and (c) barriers to adherence with recommended treatment regimens. However, Fongwa et al. (2008) only examined African American women and also looked at adherence to the participants' hypertension treatment regimen, not adherence to antihypertension medication. Data collection methods were in the form of a taped group discussion to understand factors associated with hypertensive adherence. The relationship between health literacy and antihypertensive medication was not assessed at all in this study.

Gazmararian et al. (2006) examined the relationship between health literacy and medication adherence among Medicare-managed care enrollees with cardiovascular-related conditions. Gazmararian et al. found that 40% of enrollees had low medication adherence and that health literacy, race/ethnicity, education, and regimen complexity were each related to medication adherence. Although Gazmararian et al. did examine the relationship between health literacy and medication adherence among Medicare-managed care enrollees with cardiovascular-related conditions, there was no specific focus on the African American population. Also, Gazmararian et al. looked at a combination of

conditions, not just hypertension, and the researchers used the S-TOFHLA to test health literacy.

Osborn et al. (2011) recruited hypertensive patients to examine the relationship between health literacy and hypertension in terms of disease knowledge, self-efficacy in disease management, and physical activity as a self-care behavior. Osborn et al. (2011) indicated that 30.3% of patients were classified as having inadequate health literacy skills, and another 8.2% had marginal health literacy. Inadequate health literacy was also associated with older age, current unemployment/retirement status, and a greater number of years living with hypertension (Osborn et al., 2011). Osborn et al. (2011) looked at factors linking health literacy to physical activity and self-reported health in an attempt to validate the Paasche-Orlow and Wolf model. While hypertension was the medical diagnosis of focus, Osborn et al. (2011) did not study the relationship between health literacy and antihypertensive medication adherence.

Hutchison, Warren-Findlow, Dulin, Tapp, and Kuhn (2014) examined the association between health literacy and adherence to low-salt diet practices among individuals with hypertension. Hutchison et al. found no association between adequate health literacy and adherence to a low-salt diet after adjusting for confounding variables. Hutchison et al. addressed the conflicting findings for health literacy in two related areas: chronic illness self-care and nutrition/diet skills. Hutchison et al. focused on the association between health literacy and adherence to low-salt diet practices among individuals with hypertension. These researchers did not examine the relationship between health literacy and antihypertensive medication adherence.

In this study, I addressed the gaps noted in the Fongwa et al. (2008) study by including adult African American men and women ages 40 to 65 in the study, with the problem of poor adherence more pronounced in African American men (Lewis, Schoenthaler, & Ogedegbe, 2012). Higher rates of medication nonadherence for African American men exist in settings where access to care is generally equal regardless of income or race (Lewis et al., 2012). Hypertensive treatment regimens can provide adequate blood pressure (BP) control and reduce cardiovascular-related mortality as well as provide cardiovascular benefits, such as fewer strokes and decreased heart failure events (Grant et al., 2015). I examined hypertensive treatment regimens by focusing on adherence to antihypertensive medication. Although African Americans are prescribed more antihypertensive medications than European Americans, African Americans were more likely to have lower BP control (Grant et al., 2015).

The gaps in the Gazmararian et al. (2006) study were addressed in the present research by narrowing the conditions down to hypertension and using the Newest Vital Sign (NVS) to test for health literacy. The NVS provides information about patients' health literacy and is used to assess patients' understanding of food labels (Warren-Findlow et al., 2014). Hypertensive patients need to have the ability to identify healthy and unhealthy foods, as well as foods that can affect their disease negatively.

The gaps in the Osborn et al. (2011) study were addressed by using the health belief model (HBM). The HBM is used to determine how susceptible individuals perceive themselves as being at risk for other conditions because of their hypertension (Champion & Skinner, 2008). The gaps in the Hutchison et al. (2014) study were

addressed in my study by including African American adult men and women and examining health literacy as it relates to antihypertensive medication adherence.

This study also addressed a gap in the knowledge base regarding factors related to medication adherence in a low SES African American cohort with hypertension. This study was needed to determine the relationship between health literacy and hypertension medication adherence. Results of this study could provide data that can inform clinicians and their patients with hypertension how their behaviors and beliefs affect their decisions to be healthy. Once this understanding has been identified, compliance with antihypertensive medications can improve, and a reduction in the potential of acquiring other comorbidities may be realized.

Problem Statement

African Americans tend to seek medical care only when necessary (Gross, Anderson, Busby, Erith, & Panco, 2013). Patients may have perceived that a need existed to follow the medication regimen and seek medical care only when symptomatic (Gross et al., 2013). At times, home remedies were used to manage health problems instead of prescribed medical care (Gross et al., 2013).

Hypertension is a risk factor for cardiovascular, cerebrovascular, and renal disease and is more frequent among African Americans. Hypertension accounted for a significant portion of racial differences in mortality through excess cardiovascular morbidity (Kressin, Orner, Manze, Glickman, & Berlowitz, 2010). Many patients with hypertension had poorly controlled BP, with African Americans disproportionately represented among this group, even after controlling for comorbidities, such as diabetes and renal disease

(Kressin et al., 2010). Nonadherence to antihypertensive treatment recommendations remains a global problem and promoting patient adherence is necessary to decrease cardiovascular morbidity and mortality (Morisky, Ang, Krousal-Wood, & Ward, 2008). Poor BP control may be due to patient nonadherence to prescribed antihypertensive medication therapy (Hyre, Krousal-Wood, Muntner, Kawasaki, & Desalvo, 2007). In addition, poor medication adherence is associated with increased health care costs and hospitalization rates in the United States (Hyre et al., 2007).

Hypertension control often required patients to engage in multiple complex tasks including medication adherence, frequent medical visits, and diet and lifestyle modifications (Powers et al., 2008). These tasks were more difficult for patients with limited literacy (Powers et al., 2008). People with low health literacy used more health care services; had a greater risk for hospitalization; and used expensive services (e.g., emergency care and inpatient admissions) more often (National Network of Libraries of Medicine [NNLM], 2014). These facts could be problematic for the patient because poor health could have been avoided if they were committed to the medication regimen. Hypertensive individuals with low health literacy were at a greater risk for hospitalization because they consumed a disproportionately high amount of finite health care resources (NNLM, 2014). While most of these patients over-consumed health care resources, their use could be minimized through adequate control of hypertension (NNLM, 2014).

Purpose of the Study

The purpose of this quantitative study was to examine the relationship between health literacy and other factors, including sociodemographic and clinical variables, with

adherence to antihypertensive medications. I describe the rate of medication adherence for antihypertensive treatment among an African American cohort aged 40-65 years. African Americans in this age group were more likely to be diagnosed with hypertension and have medication regimens to control their BP levels (Centers for Disease Control and Prevention [CDC], 2015). The objective of this study involved assessing health literacy and evaluating how health literacy was associated with medication adherence.

Research Questions

RQ1: What is the rate of adherence for antihypertensive medications among an African American cohort with low SES?

RQ2: What is the level of health literacy regarding hypertension among a low SES African American cohort with HBP?

RQ3: What is the relationship between health literacy and antihypertensive medication adherence?

RQ4: Can medication adherence be predicted from health literacy and specific and general health beliefs?

RQ5: What is the relationship between age, gender, lifestyle and clinical factors (polypharmacy), comorbidities (renal failure, type 2 diabetes mellitus) and antihypertensive medication adherence?

Theoretical Framework

The theoretical framework for this study was the HBM. This model's origin began in the early 1950s when it was developed by in the United States Public Health Service to explain why people did not participate in disease detection and prevention

programs (Champion & Skinner, 2008). The model was extended later to study people's responses to symptoms and their behaviors in response to a diagnosed illness, particularly adherence to medical regimens (Champion & Skinner, 2008).

The HBM was composed of four constructs: perceived personal susceptibility to a negative health condition, perceived severity of the condition, perceived benefits of taking action against it, and perceived barriers to taking action against it (Frankish, Lovato, & Poureslami, 2008). The model also incorporated cues to action, such as leaving a written reminder to walk, as elements in eliciting or maintaining patterns of behavior (Grizzell, 2003). Self-efficacy was another construct of the HBM, and it was defined as a person's conviction that they could successfully execute the behavior required to produce the desired outcomes (Bandura, as cited in Champion & Skinner, 2008).

The HBM was used to provide an initial baseline of the participants' views of their personal health status (susceptibility, severity) and how they believed they were caring for their HBP (severity, barriers). The HBM provided insights into how the participants perceived personal benefits and barriers to adhering to an antihypertensive medication regimen. The research questions were written so that the participants' perception of their disease could be gathered in the data collection process and assessed during the data measurement process. A more detailed explanation of this is provided in Chapter 2.

Nature of the Study

The study was a quantitative design using a survey as a method of obtaining initial information. I chose this design to obtain the necessary information to investigate the relationship between hypertension and health literacy. The relationship between the independent variables (sociodemographics, families, and comorbidities) and the dependent variables (hypertension and medication adherence) were also assessed. Key covariates were physician visits, insurance, and available resources. I used the Medication Adherence Self-Efficacy Scale (MASES; Ogedegbe, Mancuso, Allegrante, & Charlson, 2003) to rate adherence (see Gatti, Jacobson, Gazmararian, Schmotzer, & Kripalani, 2009). Health literacy was determined by using the NVS. The quantitative approach provided evidence of the prevalence of each of these relationships. I used a survey approach to describe trends and attitudes or opinions of the participants (Creswell, 2009). The survey questions were based on the HBM and its constructs to answer the research questions. Collinearity could have been a problem due to the relationship between health beliefs and health literacy. To control for this situation, I conducted zero-order correlations to determine the strength of the relationship between these variables.

Definitions

Definitions for the dissertation terms are listed below. These definitions help clarify some words that could potentially be confusing.

Antihypertensive medications: Medications used to decrease the BP when levels are high.

Atherosclerosis: A condition that develops when a substance called plaque builds up in the walls of the arteries, and this buildup narrows the arteries, making it harder for blood to flow through (American Heart Association, 2015b). If a blood clot forms, it can stop the blood flow causing a heart attack or stroke (American Heart Association, 2015b).

Beta blockers: A type of antihypertensive that reduces the heart rate, the heart's workload, and the heart's output of blood, which lowers BP (American Heart Association, 2016b).

Calcium channel blockers: A type of antihypertensive that prevents calcium from entering the smooth muscle cells of the heart and arteries; when calcium enters these cells, it causes a stronger and harder contraction. By decreasing the calcium, the hearts' contraction is not as forceful (American Heart Association, 2016b). Calcium channel blockers relax and open up narrowed blood vessels, reduce heart rate, and lower BP (American Heart Association, 2016b).

Cardiovascular disease: Any disease produced from physiological problems associated with the heart and circulatory system. Heart and blood vessel disease is also called heart disease, and it includes numerous problems, many of which are related to a process called atherosclerosis (American Heart Association, 2015b). Examples of cardiovascular disease include stroke, heart attack, heart valve problems, and an irregular heartbeat (American Heart Association, 2015b).

Chronic kidney disease: Condition in which the kidneys are damaged and cannot filter blood like they should (CDC, 2019). This damage can cause wastes to build up in the body.

Comorbidity: The occurrence of two or more diseases simultaneously. Comorbidity is associated with worse health outcomes, more complex clinical management, and increased health care costs (Valderas, Starfield, Sibbald, Salisbury, & Roland, 2009). The comorbidities were used to explain the relationship between sociodemographics and clinical factors to antihypertensive medication adherence.

Diabetes: A disease in which blood glucose levels are above normal (CDC, 2015). Most of the food we eat is turned into glucose, or sugar, for our bodies to use for energy (CDC, 2015).

Diuretic: A type of antihypertensive medication that helps the body to rid itself of excess sodium (salt) and water and help control BP (American Heart Association, 2016b). The recipient of this drug is likely to urinate often when taking the medication as prescribed.

Health literacy: The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (NNLM, 2014).

Insulin: A hormone made by the pancreas, an organ that lies near the stomach, to help glucose get into the cells of bodies (CDC, 2015). When a person has diabetes, their body either does not make enough insulin or cannot use its own insulin as well as it should, and this causes sugar to build up in the blood (CDC, 2015).

Stroke: When a blood vessel that feeds the brain gets blocked, usually from a blood clot, and the blood supply to a part of the brain is shut off and the brain cells die (American Heart Association, 2015b). The result will be the inability to carry out some of

the previous functions as before, like walking or talking (American Heart Association, 2015b).

Assumptions

I assumed that the participants would respond truthfully to the questions that were asked on the survey questionnaire. To ensure honest answers, I assured the participants of the confidentiality of their participation in the study. In addition, I analyzed all responses in aggregate; therefore, no individual participant's information were identifiable. Another assumption was that the participants would have a reasonable level of cognition and would be able to understand the various survey questions. I clarified each question as much as possible.

Scope and Delimitations

Antihypertensive nonadherence in a low SES, African American cohort aged 40-65 years was the focus of the research problem. Participants were able to speak and understand English fluently. The results of this study may not be applicable to other persons not eligible for this cohort (e.g., other races). In addition, there is no guarantee that these results are applicable to all African Americans (e.g., those from higher SES backgrounds or low SES African Americans from other communities apart from the one under study of inner city, Detroit, Michigan). In this study, I have only considered adherence to antihypertensive medication therapy. Therefore, results might not be applicable for other medication classes.

The NVS was the instrument I used to measure health literacy. The NVS consists of six items based on an ice cream nutrition label; four items were word problems of

increasing complexity that focused on applied numeracy skills (Warren-Findlow et al., 2014). In addition, two items assessed reading comprehension and application (Warren-Findlow et al., 2014). The NVS scores indicated the likelihood of adequate literacy (Warren-Findlow et al., 2014). This tool could have been difficult for the participants to complete because there were some math calculations involved, and this could be a potential limitation. Participants might not answer questions completely or might skip questions altogether, limiting the ability to score the NVS appropriately.

The MASES was used to measure medication adherence. If these questions were not answered truthfully, the results would not be accurate. The participants completed this scale themselves. The participants were expected to respond to all survey items in this study truthfully without coercion.

To control for interview bias, I used a script to introduce each of the surveys. The survey items were intended to be objective in nature and any response given by me to a question could result in biasing the participant. I developed a list of frequently asked questions to provide standard answers to participants' questions.

Limitations

Several limitations were noted for this study. First, limitations could exist in terms of external validity. This study was based upon African Americans, and the results might not be generalizable to other racial or ethnic groups. In addition, the focus of this study was on antihypertensive medications; thus, adherence to other medication classes and its relationship to health literacy may vary.

Potential bias is another limitation of this research study, and several biases may be present. Selection bias, for example, occurs when subjects are not representative of the population to which the findings are applied (Malone, Nicholl, & Tracey, 2014). To minimize selection bias, I intended to make study participation as minimally burdensome as possible (e.g., data collection limited to critical variables to address the study objectives). Further, I stressed to potential participants the importance of the research and that all answers would be confidential. I also explained that all analyses would be based on aggregate data (i.e., individual-level responses that could be attributed to a given participant would not be shared externally).

Confounding is another source of potential bias in this study. A confounding variable is related to both the outcome variable (medication adherence) and to one or more of the exposure variables, and it is not on the intermediate pathway between a predictor variable and the outcome (Malone et al., 2014). A confounding variable can create an erroneous relationship between two variables or, at the other extreme, can hide or mask a real relationship (Malone et al., 2014). In this study, a confounder can influence the relationship between health literacy and antihypertensive medication adherence. To minimize the impact for confounding, multivariate analyses were used to control for effects of measured and likely confounding variables. Family structure, comorbidities, and multiple medications are examples of variables for which study outcomes were adjusted.

Information bias related to the study participants providing erroneous or incomplete information is another threat to the validity of the study findings. To

minimize information bias, I reminded study participants of the confidentiality of the data and the need to provide honest answers. I used valid, reliable instruments to measure important constructs (e.g., adherence and health literacy) that demonstrated psychometric properties in a variety of patient populations. Furthermore, other questions were designed in a manner to be straightforward, clear, and concise to ensure comprehension of the items for the study participants. I was available to address any problems that the study participants may have had with the study questions.

Recall bias is problematic when patient interviews (or subjective assessments) are used as a primary data sources (Pannucci & Wilkins, 2010), as was the case in this study. The participants reported their histories of hypertension medication use. For this dissertation study, objective questions were asked using valid, reliable tools.

Significance

The results of this study may provide insight into the relationship between health literacy and reasons for nonadherence to a prescribed antihypertensive medication regimen. The information gained from this study could help to inform stakeholders, namely health care practitioners, regarding factors associated with medication adherence in the context of hypertension. It may also lead to strategies for improving adherence (e.g., through promotion of health literacy) in order to reduce the negative health outcomes associated with uncontrolled hypertension in a vulnerable population (i.e., low SES African Americans).

This research could lead to social change through targeted interventions to improve compliance with medication adherence of a vulnerable population. In the long

term, it can help to reduce the cost of health care by decreasing the likelihood of sequelae related to hypertension. The study findings also could help change the perceptions regarding adhering to hypertension medications. The participants could understand the health implications of not taking their hypertension medication. Through increased awareness of the importance of taking the medications and establishing how some perceptions can decrease the chance of a healthy lifestyle, hypertension medication adherence should increase.

Summary

Many African Americans have difficulty adhering to their antihypertensive medication regimen. The primary focus of this chapter was to introduce pertinent areas of the study, their meanings, and how they might relate to the study population and antihypertensive medication adherence. In Chapter 2, I present literature related to the topic.

Chapter 2: Review of the Literature

Introduction

About 70 million American adults have hypertension or HBP and only about half of hypertensive persons have their disease under control (CDC, 2015). Hypertension was a primary or contributing cause of death for more than 360,000 people in the United States in 2013, and direct costs related to the condition are estimated to be approximately $46 billion each year in the United States (CDC, 2015).

There are particularly high rates of hypertension in the African American population. Over 40% of African American men and 47% of African American women have hypertension (American Heart Association, 2013). Compared with other populations, African Americans are more likely to be diagnosed with hypertension, are more likely to have untreated hypertension, and are more likely to suffer adverse clinical consequences from uncontrolled hypertension, including myocardial infarction, heart failure, and chronic kidney disease (Cuffee et al., 2013). Maintaining normal levels of BP reduces morbidity and mortality for hypertensive individuals (Fongwa et al., 2014). However, a lack of proper treatment and nonadherence to hypertension treatment recommendations are some of the reasons for uncontrolled BP, particularly for members of the African American population (Fongwa et al., 2014).

Limited health literacy has been associated with poor disease related knowledge and disease control (Osborn et al., 2011). The way that health literacy impacts health outcomes such as hypertension is not well understood; however, adherence to medications may be related to health literacy (McNaughton, Jacobson & Kripalani,

2014). In addition, health literacy and BP control may be related to factors beyond medication adherence, including demographic variables, lifestyle factors, social support, and the ability to navigate the healthcare system effectively, though these associations require further study (McNaughton et al., 2014). Thus, the purpose of this study was to examine the relationships between health literacy and patient sociodemographics and clinical factors with hypertension medication adherence.

In this chapter, I present the theoretical foundation for the study, a comprehensive review of literature related to the study topic, and a summary and conclusion. The theoretical section includes information on the HBM that will be used to build the research questions and to understand the perceptions of the participants as they relate to having hypertension and adhering to a recommended health regimen. In the literature review, I describe the significance of the study through the interventions that have already been implemented on behalf of the chosen sample population. The summary section concludes the chapter.

Literature Search Strategy

The Walden University Library was the primary library accessed to obtain sources for the literature review. I used the following databases to find current, peer-reviewed articles: Thoreau Multi-Database, ProQuest Central, Cinahl, and Academic Search Complete. Google Scholar was also an effective database when a specific article was needed. The CDC as well as the American Heart Association were also helpful search engines. The key search strategies involved combinations of the following search terms: *African American, adherence, hypertension, medications, anti-hypertensives,*

health literacy, and *(low) socioeconomic status*. I used current peer-reviewed literature (i.e., articles published between 2005 and 2019). Seminal articles on the theoretical framework were included in the literature review also.

Theoretical Foundation

The theoretical framework for this study was the HBM. The HBM was developed in the United States during the mid-20th century by social psychologists in the Public Health Service to explain the widespread failure of people to participate in programs to prevent and detect disease (Champion & Skinner, 2008). The model was extended to study people's responses to symptoms and their behaviors in response to a diagnosed illness, particularly adherence to medical regimens (Champion & Skinner, 2008). The HBM is composed of four constructs: (a) perceived personal susceptibility to a negative health condition, (b) perceived severity of the condition, (c) perceived benefits of taking action against it, and (d) perceived barriers to taking action against it (Frankish et al., 2008). The model also incorporates cues to action, such as leaving a written reminder to walk, as elements in eliciting or maintaining patterns of behavior (Grizzell, 2003). Self-efficacy is another construct of the HBM; it is defined as the conviction that a person can to execute the behavior required to produce the outcomes successfully (Bandura, 1977).

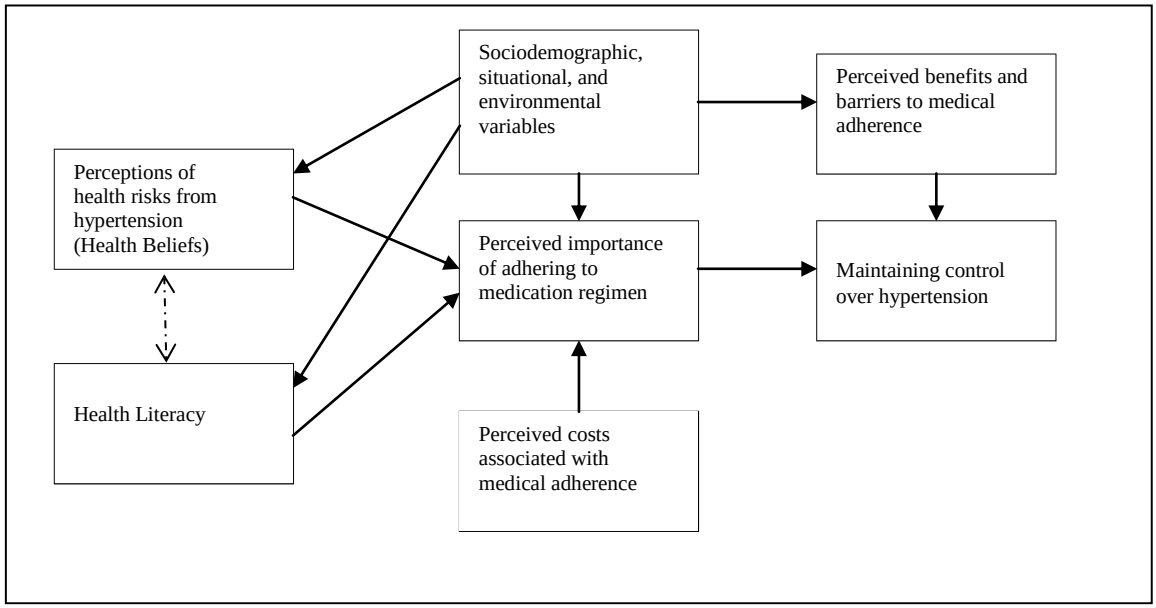

Figure 1. The health belief model for hypertension.

When assessing the relationship between sociodemographics, clinical factors, and comorbidities with antihypertensive medication adherence, the HBM was useful in identifying how these factors are related and the effects of relationships among those factors on antihypertensive medication adherence. According to Champion and Skinner (2008), perception leads to behavior change that can be influenced by the person's beliefs regarding perceived benefits of the various actions available to reduce the disease threat. In addition, a social support system can promote behavior change or it can hinder it. Clinical factors such as polypharmacy can be perceived as a barrier because of the multiple medications that must be taken daily. Comorbidities can be examined in terms of both susceptibility and severity. How the person perceives their susceptibility to getting sicker or acquiring ailments because of nonadherence to hypertensive medication can be identified by using the HBM. Feelings about the seriousness of contracting an illness or

of leaving it untreated include evaluations of both medical and clinical consequences as well as possible social consequences (Champion & Skinner, 2008).

Kressin et al. (2007) used both the health decision model and the HBM to measure racial differences in hypertension medication adherence. Kressin et al., (2007) studied patterns of interactions among patients and their clinicians and beliefs about hypertension by race. Kressin et al. (2007) also examined patterns of antihypertensive medication adherence by race and evaluated whether any racial differences in interactions with clinicians or beliefs about BP were related to observed differences. The health decision model was used to identify covariates. The covariates in this study were factors that affected health decisions, including the people that patients interacted with both personally and interpersonally, their social environment, and health literacy. The HBM was used to assess patients' perception of how taking hypertension medication would make them feel and what their motivation was for adhering to their treatment regimen (Kressin et al., 2007). In terms of medication adherence, African Americans were less adherent and more likely to stop taking the BP medication if it made them feel bad. Healthcare providers for African American participants were more involved in counseling and advising them about their BP. European American healthcare providers were more likely to request a follow-up appointment for BP management. Health care providers were likely to discuss BP management with participants of both races, while only a small percentage of patients reported that providers thoroughly discussed barriers to BP medication adherence. No significant difference was found among the two races in their perceptions of whether their BP was under control.

Perceptions of participants regarding their knowledge about medication adherence and health beliefs were the major focus of this research. As personal health beliefs can influence chronic illness outcomes, I chose the HMB as the theoretical framework for this study. Health literacy was also a focus of this study. Health beliefs also can influence health decisions that are associated with adherence to physician recommendations to manage chronic illnesses, including hypertension.

Health literacy, the ability to understand and act on a physician's instructions, is related to morbidity and mortality from a variety of conditions (Shaw, Huebner, Armin, Orzech, & Vivian, 2009). Understanding the relationship between health literacy and antihypertensive medication adherence can be accomplished using HBM. What the participant believes about the importance of eating healthy, getting antihypertensive medication prescriptions filled, and exercising can reflect health literacy. Ethnic minorities, low-income, and elderly populations typically have lower health literacy (Shaw et al., 2009).

The HBM is premised on how a person views a given disease (e.g., hypertension) and how susceptible he or she feels about the condition getting worse or leading to other health problems. The use of the HBM to assess perceptions of severity is also important to this study. How severe a person perceives their hypertension diagnosis can be helpful in characterizing the relationship between health literacy and antihypertensive medication adherence.

Literature Review Related to Key Variables

The cultural beliefs, religious practices, and lifestyle of African Americans may interfere with hypertension treatment regimen (Scisney-Matlock, et al., 2009). Gross et al. (2013) asserted that African Americans may be influenced by cultural factors as well as a lack of knowledge about hypertension. These beliefs can affect adherence to prescribed hypertension treatment regimens adversely and may influence trust in health care practitioners (Gross et al., 2013). In addition, several factors that contribute to lack of adherence include the asymptomatic nature of hypertension, adverse effects related to medications, occurrence of drug interactions, chronic nature of the disease requiring long-term treatment, medication cost, complexity of regimen, and inadequate provider-patient communication (Hawkshead & Krousel-Wood, 2007).

Hypertension

Hypertension is a chronic illness with few symptoms. Many people may not be aware that they have this condition. In addition to the number of undiagnosed cases, less than 50% of adults with hypertension controlled their BP in 2007–2008 (CDC, 2012). A prediction model indicated that a 10% increase in hypertension treatment adherence could prevent approximately 14,000 deaths per year in the adult population from 25 to 79 years of age (CDC, 2012).

Blood pressure is the force of blood pushing against the walls of blood vessels (American Heart Association, 2016a). BP is assessed based on two measurements, systolic and diastolic, presented as a fraction (e.g., 120/70 mmHg). Systolic BP, numerator of the fraction, is pressure exerted when the heart beats while pumping blood.

Diastolic BP is the denominator and measures the heart is at rest between beats (Medline Plus, 2010). HBP (or hypertension) is diagnosed when the BP, the force of blood pushing against the walls of blood vessels, is consistently high (American Heart Association, 2016a).

Among all health conditions, hypertension accounts for the greatest portion of racial/ethnic health disparities in terms of years of lost life (Hicken, Lee, Morenoff, House, Williams, 2014). Mortality rates attributable to hypertension are roughly 15 deaths per 100,000 people for Caucasian men and women. The mortality rate for African American women is 40 per 100 000 and more than 50 per 100 000 for African American men (Hicken et al., 2014). Economically speaking, if African Americans had the same prevalence rates for hypertension as Caucasian Americans, out-of-pocket health care expenses could decrease by approximately $400 million, $2 billion would be saved in private insurance costs, and $375 million could be saved from Medicare and Medicaid per year (Hicken et al., 2014).

The prevalence of HBP in African Americans is among the highest in the world. HBP affects more than 40% of African Americans (American Heart Association, 2016a). In addition, African Americans have an earlier onset of hypertension, which is indicative of higher rates of stroke, end-stage renal disease, and congestive heart failure (Lackland, 2014). According to Al Ghurair, Hughes, Simpson, & Guirguis (2012), some patients take only 50% to 70% of the prescribed doses of antihypertensive medications and as many as 50% of patients discontinue their antihypertensive treatment within the first

year. More importantly, over 70% of patients do not achieve target BP levels within the first year.

Fernandez et al. (2008) conducted a pilot study with an aim of testing a lifestyle intervention to decrease BP of elderly African Americans and Latinos over 65 years of age. The pilot study included 35 in the intervention (IC) group and 30 in a wait-list control group (CG). During the 4-month study, participants completed a baseline assessment, a follow-up visit at 6-weeks, and second follow-up visit at 14-weeks. The IC group participants also received eight group behavioral counseling sessions and the control group received the usual treatment. Fernandez et al. found a significant reduction in average systolic BP of 13.0 mmHg for the intervention group and a non-significant reduction in mean systolic BP of 10.6 mmHg for the waitlist control group. Medication adherence improved by 26% for the intervention group, with no change noted for the CG (Fernandez et al., 2008).

The strengths of this pilot study included targeting multiple lifestyle changes, including physical activity, reduced dietary intake of sodium, and increased intake of fruits and vegetables unlike other lifestyle interventions in elderly patients (Fernandez et al., 2008). The study was conducted in a senior based community center where seniors spend time daily and the participants had high attendance rates (Fernandez et al., 2008). Because the study was not a randomized controlled trial and the sample size for the study was small, these issues have been identified as the study's limitations (Fernandez et al., 2008).

Fernandez et al. (2011) conducted a Counseling African American to Control Hypertension (CAATCH) Trial to evaluate the effectiveness of an evidence-based intervention in improving BP control among poorly controlled hypertensive African Americans who receive primary care in Community Health Centers (CHCs). A total of 1,039 hypertensive African Americans who were receiving treatment in 30 community health centers participated in the study. The intervention included interactive computerized hypertension education, home BP monitoring, and monthly behavioral counseling on lifestyle modification (Fernandez et al., 2011). The 4-item Morisky scale was used to assess medication adherence, with health literacy assessed using the Rapid Estimate of Adult Literacy in Medicine (REALM). At baseline, the intervention group scored lower than the usual care group in all of the assessment scales that were used as data collection tools. A strength of the CAATCH Trial was inclusion of participants with uncontrolled hypertension and polypharmacy (Fernandez et al., 2011). Using a majority of African American women in the sample may have made the results less generalizable to African Americans in general (Fernandez et al., 2011). The imbalances in several important baseline patient characteristics between the IC and UC study sites raises concerns of potential threats to the internal validity of study findings (Fernandez et al., 2011).

In a follow-up study, Ogedegbe et al. (2014) reported findings of the study initiated by Fernandez et al. (2011). The general results of the multicomponent intervention to help hypertensive African Americans in 30 community health centers to control their BP were that no statistically significant differences were found between the

intervention and control groups. The authors suggested that additional research is needed to determine which strategies for controlling BP among African Americans are most useful.

Flynn et al. (2013) conducted focus groups of African American patients with hypertension (n = 18) and their family members (n = 12) to elicit their views about factors influencing patients' hypertension self-management. The patients were divided into two groups, patients with controlled hypertension and patients with uncontrolled hypertension. The families were divided into two groups using this same method. Moderators were trained and hired to interview the participants. The interview questions were based on the social cognitive behavioral theory and the PRECEDE-PROCEED Model. PRECEDE is an acronym for, predisposing, reinforcing, and enabling constructs in educational diagnosis and evaluation. The meaning of PROCEED is policy, regulatory, and organizational constructs in educational and environmental development model. This model held that patients' hypertension self-management behaviors were influenced by patient-, family-, clinic-, and community-level factors (Flynn et al., 2013).

Flynn et al. (2013) found that religion, family support, community organization sponsored events, clinic staff support, and the relationship that they have with their physician motivated patients to manage their hypertension (Flynn et al., 2013). Family members felt that they supported the patient in managing his/her hypertension by going to clinic appointments and communicating with the patient's physician outside of clinic visits (Flynn et al., 2013). The barriers that could hinder the family members from supporting the patient were identified as having their own medical conditions to manage

and a lack of knowledge about hypertension (Flynn et al., 2013). The hypertensive patient felt that the difficult changes in lifestyle due to hypertension were barriers. In addition, long clinic wait times, poor knowledge of hypertension and its complications, few neighborhood places to exercise, and insufficient access to fresh produce also were seen as barriers to self-management of hypertension (Flynn et al., 2013).

Health Literacy

Health literacy is the ability to obtain, process, and understand basic health information and services to make appropriate health decisions (United States Department of Health and Human Services [USDHHS], n.d.). Limited health literacy can add to increased use of medical services and more acquired chronic illnesses (NNLM, n.d.). Many barriers have been found for health literacy, such as poor reading, writing, and numeracy skills; limited English proficiency; poor communication between the healthcare professional and patient; cultural beliefs; and social determinants of health (Health Resources and Services Administration [HRSA], 2015). Individuals with a higher likelihood of having limited health literacy skills include the elderly, racial and ethnic minorities (primarily African Americans and Hispanics), high school dropouts, people with low incomes, the unemployed, recent immigrants who do not speak English, and those born in the United States who do not speak English at home (Maybank & Dickson, 2008). Low health literacy has been consistently associated with more hospitalizations; greater use of emergency care; lower receipt of mammography screening and influenza vaccine; poorer ability to demonstrate taking medications appropriately; poorer ability to

interpret labels and health messages; and, among elderly persons, poorer overall health status and higher mortality rates (Berkman et al., 2011).

Health literacy affects patient adherence at each point along the continuum of health care (Osborn et al., 2011). Limited health literacy could influence a patient's navigation skills, self-efficacy, and/or perceived barriers to care (Osborn et al., 2011). During provider-patient interactions, limited health literacy could infringe upon a patient's knowledge, beliefs, and/or level of participation in clinical decision making (Osborn et al., 2011). Limited health literacy could also negatively influence a patient's motivation, problem-solving ability, self-efficacy and, or knowledge required to accurately perform self-care behaviors (Osborn et al., 2011).

Richardson-Ingram and Ivanhov (2013) conducted a study that focused on 121 older African Americans and their ability to make appropriate health decisions based on how they perceive and process health information. Their sample was obtained from African American specific housing communities and churches in Forsyth County, North Carolina. Using a descriptive research design, Richardson-Ingram and Ivanhov (2013) looked at predisposing, reinforcing, and enabling factors that influence health behaviors in the older African Americans. The goal of the study was to examine the relationship between health literacy and older African American adult adherence to antihypertensive regimens. Richardson-Ingram and Ivanhov (2013) used the REALM Survey to measure health literacy and the Hill-Bone Compliance (HBC) Scale was used to measure adherence. The findings indicated that 51% of the participants were not adhering to their antihypertensive regiment (Richardson-Ingram & Ivanhov, 2013). The scores on the

REALM indicated that 32% of the participants scored in the high school range with 68% unable to adequately read or understand health care materials and therefore did not have adequate health literacy levels. While no correlation was found between health literacy and medication adherence, results of a regression analysis provided support that participants who were younger and had health statuses that were poor or fair were less likely to adhere to their medication regimen.

Findlow et al. (2014) conducted a study using the NVS survey to assess health literacy in a clinical setting. The participants in the study were 204 adult patients (65 male and 139 female) diagnosed with hypertension. All of the participants had been diagnosed with hypertension, with some having other chronic illnesses. Their ages ranged from 30 to 84 years. The participants completed the NVS as part of a larger survey. Among participants, 111 were able to complete the six items on the NVS, with 93 partially completing it. Based on their responses, 51.5% of the participants had less than two correct answers and 20.1% had two to three answers correct. These participants were likely to have limited health literacy. The remainder of the participants (28.4%) had more than three answers correct and were thought to have adequate health literacy. BP levels did not differ significantly by the degree of health literacy among the participants. The authors concluded that the NVS can be used in health settings to assess the health literacy of patients. One limitation of the NVS in this study was the number of patients who were unable to complete the math portions.

Medication Adherence

African Americans develop high BP earlier in life than other races with Latinos close behind them. According to the CDC (2015), approximately half of people with high BP have their condition under control. People with limited health literacy skills are more likely to have chronic conditions and are less able to manage them effectively (USDHHS, 2000). Patients who have limited health literacy skills and are diagnosed with high BP, diabetes, asthma, or HIV/AIDS have less knowledge of their illness and its management (USDHHS, 2000). In addition, certain populations, older adults, racial and ethnic minorities, and people with less than a high school degree or GED certificate, are more likely to experience low health literacy (USDHHS, 2000). People with low income levels, non-native speakers of English, and people with compromised health status are likely to experience this same predicament (USDHHS, 2000).

Braverman and Dedier (2009) conducted a study to assess the relationship of antihypertensive medication adherence to sociodemographic, clinical and cognitive characteristics of urban African American adults. A randomized controlled trial was conducted in an effort to assess the effect of a behavioral intervention to improve medication adherence and BP control among African Americans diagnosed with hypertension (Braverman & Dedier, 2009). The researchers used the Medication Event Monitoring System to obtain baseline medication information for a sample of 70 participants. The researchers conducted a baseline computer assisted interview to obtain the sociodemographic, clinical, and cognitive information. Once this information was collected, the researchers assessed the relationship of the above three factors with

medication adherence in the baseline information. The results indicated that the relationship to medication adherence varied by sex and lower educational attainment. Men generally had higher levels of adherence than women (Braverman & Dedier, 2009).

Flynn et al. (2013) examined the effects that family support had on the patient's anti-hypertension medication adherence. Controlled or uncontrolled hypertension was a factor in determining group membership because the way that patients care for themselves is related to their treatment regimen and medication adherence. The clinic staff was a factor in their treatment because the patient identified the clinic staff members as helping by reminding them of appointments and need for prescription refills. Long waits in the clinic to see the physician was considered a barrier for their treatment (Flynn et al., 2013). According to Flynn et al. (2013), many patients appreciated how family members helped prepare meals, attended medical visits, and reminded them to take their medication.

Health Beliefs

If a person believes that a medication is not effective or believes an alternative therapy is more effective, his or her attitudes will be less favorable toward medication and the likelihood of that person taking medication will be lower. Hence, patient beliefs are potentially an important target for persuasive communication interventions aimed at improving medication adherence (Frosch et al., 2008). Negative beliefs can result in unintentional nonadherence, such as forgetting to take medications because they are perceived as unimportant (Gatti, Jacobson, Gazmararian, Schmotzer, & Kripalani, 2009)

Kressin et al. (2007) conducted a research study to assess differences between Caucasian and African American hypertensive patients. The researchers looked at race, self-reported experiences with clinicians, attitudes and beliefs about hypertension and medication adherence with no disparities in BP control among the two races (Kressin et al., 2007). A total of 793 participants, including Caucasians (n = 333) and African Americans (n = 460) from three Veteran's Administration medical centers who had been diagnosed with hypertension (Kressin et al., 2007). A survey assessment tool was used to assess three primary domains that included, patient experiences with providers, patient characteristics including, sociodemographics and health beliefs, and antihypertensive medication. The results of the study demonstrated that health care providers of African American patient were more actively involved in helping them to control their hypertension and to understand the importance of antihypertensive medication adherence (Kressin et al., 2007). The results also showed no difference in antihypertensive medication adherence and race was not significant.

Generally speaking, individual health beliefs and attitudes concerning the effectiveness of treatment, previous experiences with pharmacological therapies, and lack of motivation affect the degree of medication adherence (Brown & Bussell, 2011). Some barriers to medication adherence among inner city patients with low SES were high medication costs, lack of transportation, poor understanding of medication instructions, and long wait times at the pharmacy (Brown & Bussell, 2011).

Wexler et al. (2009) conducted a study as part of a strategy to reduce hypertension disparities within the African American community. The goals of the study were to

understand beliefs and attitudes related to hypertension identify community barriers to treatment and obtain community guidance in the development of educational materials about hypertension control (Wexler et al., 2009). African American participants were used for this qualitative study and focused groups were formed. A discussion guide was used as questions guide during the focus group sessions. Data were analyzed by placing it into sections and identifying each level of influence. The four levels of influence related to the beliefs of African Americans and hypertension included the health system level, community level, family level and individual level. In the health system level, the theme was that of mistrust in the health care system and the fact that current health programs and information specifically for African Americans were difficult to understand.

In regard to hypertension specifically, the community level noted that African Americans have the notion that because several members of their immediate family had already been diagnosed with the disease, they would inevitably get it too. They felt they would be diagnosed with hypertension whether they followed healthy recommendations or not (Wexler et al., 2009). Additionally, home life, unsafe neighborhoods, finances and overall stress was identified as a major contributing factor to hypertension. In the family level, the discussion theme was focused on the traditional cultural food choices of African Americans. Basically, maintaining the diet of high salt and fatty foods, likely will contribute to hypertension. The individual level identified obesity, lack of physical activity, an unhealthy diet, poor understanding of health and the lack of health insurance and access to care. In addition, some neighborhoods do not have grocery stores that sell

fresh fruits and vegetables within walking distance and therefore lack of transportation can be an issue.

Synthesis of the Research

The variables that have an effect on African American patients diagnosed with hypertension include health literacy, hypertension medication adherence. Research has been conducted on each of these variables separately, but no studies were found that combined the three variables and their effect on treatment regimens for hypertension. Health literacy research by Findlow et al. (2014) used the same instrument that will be used in the present study to examine health literacy. The research on health literacy examined the relationship between understanding information on treatment regimens and medications and control of their BP. Researchers (Findlow et al., 2014; Richardson-Ingram & Ivanhov, 2013) found a positive relationship between health literacy and medication adherence. However, these researchers did not include health beliefs in their studies.

Medical adherence was examined in studies by Braverman and Dedler (2009) and Flynn et al. (2013). These studies were concerned with the relationship between socio-demographic variables and medication adherence. Their findings provided support that family support, gender of the patient, and educational attainment (Braverman & Dedler, 2009). According to Flynn et al. (2013), family support was a positive influence for treatment adherence regarding diet, medication, and lifestyle changes needed to control their BP. While these studies examined factors that act as barriers and facilitators for

medical adherence, they did not include health literacy or health beliefs as variables in their studies.

The third variable in this study, health beliefs was the focus of research by Kressin et al. (2007). They studied differences in attitudes and beliefs about hypertension and medication adherence between African American and Caucasian patients. They found no differences in medication adherence between the two groups, but did find that when providers spent time with their African American patients, medication adherence improved. Brown and Bussell (2011) found that that individual health beliefs and attitudes regarding the effectiveness of treatment, experiences with medication, and motivation affected their treatment adherence. Wexler et al. (2009) studied beliefs and attitudes related to hypertension and identify barriers to treatment. African Americans in this qualitative study participated in focus groups to discuss their beliefs about hypertension. They discussed their health beliefs in regard to treatment adherence, but not in regard to the effect of health literacy on controlling their hypertension.

Because these studies did not link the three variables, health literacy, medication adherence, and health beliefs, there is a gap in the literature. The present study will fill the gap in the literature by examining the relationship among these three variables.

African Americans' perceived seriousness of hypertension may be lower than other groups due to the belief that health programs and literature are not understandable from a cultural perspective (Wexler, Elton, Pleister, & Feldman, 2009). Therefore, African Americans have an increased likelihood of having a low perception of the seriousness of and their susceptibility to hypertension. Middleton (2009) concluded that

African Americans perceive hypertension as an episodic condition that is present when they experience symptoms such as “headaches, lightheadedness, fatigue, or heart palpitations” (p. 13). Low adherence rates limit the effectiveness of medical services and can lead to disease exacerbations, hospitalizations, and even death, making low adherence costly from both a health and economic standpoint (Dunbar-Jacob & Schlenk, 1996). African American adults in lower SES populations have particularly low adherence rates (Frosch, Kimmel, & Volpp, 2008; Lee et al., 1996).

Summary and Conclusions

Major themes in the articles identified a significant gap in knowledge of hypertension and health literacy. Participants who were diagnosed with hypertension typically had other chronic illnesses. The research provided evidence that family members play important roles in the participants’ antihypertensive medication adherence. Most often, when family members are involved in patient’s care, the patients are more inclined to take their medication and adhere to the health regimen. Many participants had other comorbidities in addition to hypertension.

African Americans develop high BP more often and at earlier ages than Whites and Hispanics do (CDC, 2015). More African American men than women die from high BP (Hicken et al., 2014). These facts can be related to the lack of knowledge about hypertension and how to care for it. The Patient Protection and Affordable Care Act of 2010, Title V, defined health literacy as the degree to which an individual has the capacity to obtain, communicate, process, and understand basic health information and

services to make appropriate health decisions (CDC, 2015). Several theories can be used to study health literacy within the research population.

The HBM is the model that will be used for this study. According to Champion and Skinner (2008), the HBM has been widely used to explain change and maintenance of health-related behaviors and as a guiding framework for health behavioral interventions. For the dissertation study, the research questions will be based on the constructs of HBM. The constructs include susceptibility, severity, perceived benefits, cues to action and self-efficacy Champion & Skinner (2008). Understand how participants perceive hypertension and adhere to their antihypertensive medication regimen is important.

This study serves to address a gap in the collective knowledge base regarding factors related to medication adherence in a low SES, African American cohort with hypertension. Results of the present study may provide much needed insight into the relationship between health literacy and reasons for non-adherence to a prescribed antihypertensive medication regimen. The information gained from this study could help to inform stakeholders, specifically health care practitioners, regarding factors associated with medication adherence in the context of hypertension. The findings also may lead to strategies for improving adherence (e.g., through promotion of health literacy) to reduce the negative health outcomes associated with uncontrolled hypertension, in a particularly vulnerable population (i.e., low SES African Americans).

This chapter has presented the theoretical framework for the study and research on the key variables, including hypertension, health literacy, medication adherence, and

health beliefs. Chapter 3 provides a discussion of the methodology that is used to collect and analyze the data needed to address the research questions and test the associated hypotheses.

Chapter 3: Methodology

Introduction

I conducted this quantitative study at local churches throughout the city of Detroit. The purpose of this study was multifold. This study addressed a gap in the literature base regarding factors related to medication adherence in an African American cohort with low SES who had been diagnosed with hypertension. Addressing this gap in the literature by examining the relationship between health literacy and adherence to antihypertensive medications was important as the rate of medication adherence for antihypertensive treatment among an African American cohort aged 40 to 65 years was examined. The purpose of this study involved assessing health literacy and how health literacy might be associated with medication adherence in these individuals.

The major sections of this chapter include the methodology section, data analysis section, power analysis section, and the recruitment plan section. I present an explanation of how the sample size was determined in the power analysis section. A step-by-step interpretation of how the researcher plans to analyze the data collected from the data collection process is in the data analysis section. A description of the study's participant recruitment process is found in the recruitment plan. The step-by-step process informed consent process is in the recruitment plan section as well.

Research Design and Rationale

Research Design

Quantitative research is a means for testing objective theories by examining the relationship among variables (Creswell, 2009). These variables in turn can be measured,

typically on instruments so that numbered data can be analyzed using statistical procedures (Creswell, 2009). This dissertation research was a quantitative design involving a cohort of African American participants with a diagnosis of hypertension. Survey questionnaires were used to address the research questions. The survey questionnaires that were used include the NVS (Weiss et al., 2007) to assess health literacy; the MASES (Ogedegbe et al., 2003); Beliefs about Medicine Questionnaire (BMQ; Horne, Weinman, & Jankins, 1999) to measure patients' beliefs about medicines was used to evaluate the extent to which participants were adhering to their treatment regimen. I was present during the data collection to ensure that the participants understood the items on the surveys.

The theoretical foundation for this study was the HBM. It was applied when assessing the relationship between the independent and dependent variables. The HBM was useful in identifying effects these relationships had on antihypertensive medication adherence. The HBM was the basis for framing and answering the research questions developed for this study. Studying perceptions of African Americans regarding hypertension and the susceptibility of developing other comorbidities due to hypertension also were assessed using the HBM. Responses concerning this issue assisted in answering the research question related to the extent to which the participants were adherent in their use of antihypertensive medication.

Variables in the Study

The data collected from NVS (Weiss et al., 2007) were used to assess the study variable of health literacy; the MASES (Ogedegbe et al., 2003) to measure medication

adherence; and BMQ (Horne et al., 1999) to measure patients' beliefs about medicines. In addition, a researcher-developed demographic survey was used to obtain information on the age, gender, comorbidities, and polypharmacy. These variables were used for descriptive purposes. Table 1 presents the variables that were obtained from these instruments.

Table 1

Study Variables

Type of variable	Variable name	Scaling
Independent variable	Health literacy	Continuous
	Income level	Ordinal
	Health beliefs	Continuous
Independent variable, covariate variable	Family support system	Nominal
	Comorbidities (clinical factors)	Nominal
	Polypharmacy	Continuous
	Gender	Nominal
	Age	Continuous
Dependent variable	Antihypertensive medication adherence	Continuous
	Lifestyle (health-related activities, including smoking, alcohol use, exercise habits	Ordinal

Health literacy is a combined score for the NVS (Weiss et al., 2005) and could range from 0 to 6. Higher scores indicated better health literacy, with scores less than 3 indicating limited health literacy. Income level was measured on the demographic survey and was an ordinal variable with participants asked to select an income level category that reflected their annual household income. The BMQ (Horne et al., 1999) measured

four components of health beliefs, general overuse (4 items), general harm (4 items), specific necessity (5 items), and specific concerns (5 items). The scores for the general subscales can range from 4 to 20, with scores for the specific subscales ranging from 5 to 25. The number of comorbidities were used as a continuous variable. The participants were asked to indicate the number of prescribed and over-the-counter medications their doctor suggested they take. The demographic survey was used to obtain information on age as a continuous variable. Gender was a dichotomous variable. Participants were asked to indicate comorbidities in the form of other chronic illnesses for which they were receiving treatment. Adherence was measured using the MASES as a continuous variable, with possible scores ranging from 26 to 78. Lifestyle variables included smoking, alcohol use, and exercise habits. Smoking and alcohol use were self-reported as low, moderate, and high use. Exercise habits were in the form of minutes in a typical week.

Time and Resource Constraints

The study took place at local churches throughout the city of Detroit. The time needed to complete the informed consent process and complete the surveys did not exceed 30 to 45 minutes. I had a sufficient number of surveys for all participants. Time and resource constraints were minimal for this study.

Research Designs Needed to Advance Knowledge in the Discipline

Cuffee et al. (2013) conducted a research study that attempted to determine if reported racial discrimination was associated with medication nonadherence among African Americans with hypertension and if distrust of physicians was a contributing

factor. The TRUST project was conducted at an inner city, safety net setting in Birmingham, Alabama. The objectives of the TRUST study were to examine factors such as discrimination, trust, self-efficacy, access to care, and medication adherence among African Americans with hypertension living in the inner city (Cuffee et al., 2013). The MASES (Ogedegbe et al., 2003) as well as the Experiences of Discrimination Scale and the Hall General Trust Scale were used as measurement tools. After data were obtained, statistical analyses were conducted using ANOVA for continuous variables and chi square tests for categorical variables. The results demonstrated that trust mediated 39% of the association between discrimination and medication adherence (Cuffee et al., 2013).

The research design choice for this dissertation study was consistent with research designs needed to advance knowledge in the discipline as found in the study described above. The quantitative research design was used for this dissertation study because the research was focused on the relationship among variables with antihypertension medication adherence. I used the HBM to address the research questions through survey questionnaires. The variables that were tested are represented in each of the survey questionnaire tools. I used the MASES in this dissertation study to measure antihypertensive medication adherence. I used the NVS as a tool to assess health literacy related to antihypertension medication adherence, and I used the BMQ to assess the beliefs participants had about taking hypertension medication. This type of research design provided the framework for using inferential statistical tests to examine relationships among the variables using a sample. Results of the statistical tests could then be generalized to a larger population.

Methodology

Population

The target population was low income African American adults at least 18 years of age who had been diagnosed with hypertension. According to the CDC (2016), African Americans in this age group were likely to be diagnosed with hypertension. Low income for this study was determined by comparing the annual family income of the participant with the national poverty level for the family size, which was dependent on the number of members in the family (U. S. Census Bureau, 2016). The participants were recruited from churches with large African American congregations in the city of Detroit. According to the CDC, African Americans were more likely to be diagnosed with hypertension than any other ethnic group (CDC, 2010).

Sample

While random sampling was the ideal sampling method for this dissertation, a purposive sampling method was used to obtain a sample of individuals who met the inclusion criteria for the study. A purposive sample is a type of nonprobability (convenience) sampling procedure that is used when the inclusion criteria have been clearly stated (Vogt & Johnson, 2016). The data were collected when the researcher obtained permission from church leaders to conduct the study. After receiving approval from the church pastors, the researcher addressed the congregation at a regular service to discuss the study. She worked with the pastors to determine an acceptable time and location to hold a meeting for prospective participants. To participate in the study, the participants had to meet the inclusion criteria for the study. These criteria included being

African American, from 40 to 65 years of age, and a diagnosis of hypertension or high BP. The exclusion criteria for the sample included having an income higher than the poverty level for their family size, not having been formally diagnosed with hypertension, and being either younger than 40 years or older than 65 years. All participants were expected to be able to comprehend English. A brief demographic form was given to the participant that asked if they had been diagnosed with hypertension, their age and income level. One purpose of this questionnaire was to eliminate participants who did not meet the inclusion criteria for the sample.

The sampling frame included a list of all the potential participants who were African American members of the churches that were included in the study. Church members who were younger than 40 and older than 65 years were excluded from the study. African American patients who did not have hypertension and had a middle- or high-income levels were excluded also.

Power Analysis

To calculate an appropriate sample size, three elements were considered: effect size, alpha level, and the desired power for the statistical analysis. Kelley and Preacher (2012) has defined effect size "as a quantitative reflection of the magnitude of some phenomenon that is used for the purpose of addressing a question of interest" (p. 140). An effect size is a measurement of the sample that is used to augment the results of the inferential statistical tests used to test the hypothesis. Effect sizes are used to describe the extent of differences or relationships in a sample, removing the influences of the sample size. Most inferential tests for statistical significance are based in part on sample size.

Knapp (2016) contended that large sample sizes can result in robust findings. While effect sizes vary depending on the statistical test being used (ANOVA, regression, correlation), the standardized measures are 0 to .20 (small effect), .20 to .50 (moderate effect), and over .50 (large effect; Becker, 2000).

According to Polit (2010), the alpha level is the probability of rejecting a true null hypothesis (Polit, 2010). While alpha levels can range from 0 to +1, the default alpha level in social science research is .05, indicating that researchers are willing to accept that the results of the statistical analyses were by chance 5% of the time (Taylor, n.d.). Alpha levels are set lower in more stringent statistical analyses, such as those in medicine. The probability of failing to reject the null hypothesis when it is false is beta (Das, Mitra, & Mandal, 2016).

Power is the probability of rejecting a false null hypothesis and is estimated as $1.00 - \beta$ (Das et al., 2016). Typically, β is set at .20, indicating that the researcher is willing to accept a false hypothesis 20% of the time. Although power can range from 0 to +1.00, a power of .80 is considered appropriate for an inferential test (Vogt & Johnson, 2016). Power levels greater than .80 provide greater assurance that a correct decision would be made regarding the rejection of the null hypotheses. Although there is not a direct relationship between α and β, there is a trade-off between the alpha level and the power of the analysis. The higher the β is set, the greater a chance of a Type 1 or alpha error (Das et al., 2016).

G*power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009) was used to determine the appropriate sample size for the study. A power analysis determined the sample size that

was needed to achieve a power of .80 and was usually calculated based on the research question that had the highest number of independent variables. According to research from the Institute of Digital Research and Education at the University of California at Los Angles (UCLA; 2017), a medium effect size for multiple regression is .15. The effect size in a correlation or regression study is the correlation coefficient or the amount of explained variance (Ellis, 2010). According to He, Li, and MacGregor (2013), a study of salt reduction on BP had an R^2 of .11. This measure of effect size was used to determine the effect size for the present study. Based on the research questions posed for the study, a multiple linear regression analysis with six predictor variables, a medium effect size of .11, an alpha level of .05, and a power of .80 would require a sample size of 131. Additional participants would increase the power of the analysis. Figure 2 presents a graphical representation of the power analysis.

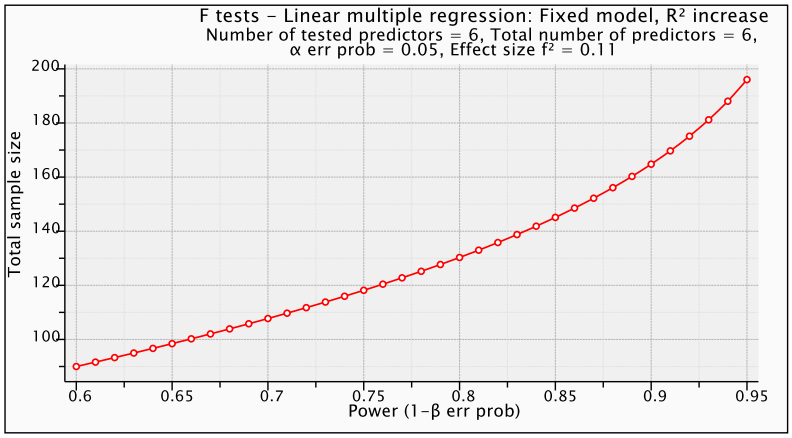

Figure 2: Power analysis.

Recruiting Procedures

Congregants of churches with large African American congregations were asked to participate in the study. These churches were located in urban areas and were open to having research to help African Americans understand medical conditions, such as hypertension, diabetes, prostate cancer, etc. that may affect them. After receiving permission from the pastors of these churches, the researcher addressed the congregation to introduce the study. With permission from the pastors of the included churches, the researcher provided a brief verbal introduction about the purpose of the research, their role as participants in the research, and how the findings might benefit society at large. The pastor indicated a time for interested participants to meet at the church to complete the surveys. Recruitment procedures continued until at least 131 participants had volunteered to be included in the study.

The participants at each church were invited to meet at a time specified by the pastor to sign the informed consent forms and complete the surveys. The informed consent form followed the guidelines established by the Walden University Institutional Review Board (IRB). The researcher distributed two copies of the informed consent form to each participant. The researcher read the informed consent form and answered any questions the participants had regarding their participation in the study. She emphasized that participation was voluntary, and that all information provided by the participants would be confidential. The participants who chose to participate in the study were asked to sign one copy of the informed consent form and return it to the researcher. They were advised to keep the second copy of the informed consent form for their records as it had

contact information for the researcher and the IRB at Walden University. After returning the consent forms to the researcher, the survey packets were distributed to participants. There was no identifying information on the survey and the participants were cautioned to not put their names or other identifying information on the survey. After completing the four surveys, the participants were asked to place them in the envelopes in which they were received. As the participant returned their envelope, the researcher thanked them for their time and effort. All surveys were completed at the church, with no surveys allowed out of the building. This procedure was repeated at each church that had agreed to participate in the study.

Instrumentation and Operationalization of Constructs

Four instruments, NVS (Weiss et al., 2005), MASES (Ogedegbe et al., 2003), Beliefs about Medication Questionnaire (Horne et al., 1999), and a researcher-developed demographic questionnaire were used in this study. With the exception of the researcher-developed demographic questionnaire, all of the instruments had been validated and tested for reliability.

Medication Adherence Self-Efficacy Scale. The MASES (Ogedegbe et al., 2003) was developed to measure medication adherence by African Americans diagnosed with hypertension. The scale includes 26 items that measure medication adherence. The items were generated from interviews the researchers completed with African Americans who were at least 18 years of age and had been diagnosed with hypertension. The instrument was tested for reliability and validity at this stage of development. The final items were selected based on item-to-total correlations (> .05) and kappa coefficients (>

.04). In addition, the researchers completed a review of all eliminated items to determine clinical or practical relevance. Following this analysis, the original 42 items on the scale was reduced to the 26 items on the present scale.

Scoring. The items on the MASES were rated using a 3-point scale indicating how sure the participant would be in taking their medications in different situations. The ratings included 1 for not at all sure, 2 for somewhat sure, and 3 for very sure. In addition, a fourth response category, does not apply, was also included on the scale. The numeric responses to the 26 items were summed to obtain a total score that could range from 26 to 78. For the purpose of this study, the total score obtained by the participant was divided by 26 to create a mean score that reflected the original scale of measurement.

Reliability. The MASES was tested for both internal consistency and stability as measures of reliability (Ogedegbe et al., 2003). A Cronbach alpha coefficient was used to test the MASES for internal consistency. The resultant alpha coefficient of .95 for the 26 items was considered to be evidence of excellent internal consistency as a measure of reliability. Kappa values were used to determine test-retest results on the 26 items as a measure of stability. Kappa values can range from -1 (perfect disagreement) to +1 (perfect agreement), with values greater than +.4 indicating good agreement on the test-retest of the MASES. The Kappa values were generally over .4, indicating the instrument had good stability over time.

Validity. Criterion validity was determined by comparing MASES scores between African American patients with controlled BP and patients whose BP was uncontrolled.

The difference was statistically significant, with patients whose BP was controlled having higher medication adherence scores than those whose BP was not controlled.

Readability. The readability of the MASES was obtained using the Flesch-Kincaid Readability Index. The items on the survey were at a 5.8 grade level, indicating that the survey could read by most individuals who had completed high school.

Newest Vital Sign. Weiss et al. (2012) created the NVS instrument to measure health literacy using a scenario on reading the nutrition label for ice cream. The participants must complete six items regarding the nutrition label. The purpose of this instrument was to test health literacy using an instrument that could be administered easily and not require extensive time either to complete or score. The research was focused on developing a quick and accurate screening test for limited literacy available in English and Spanish (Weiss et al., 2012). They administered both the TOFHLA and the NVS to English and Spanish patients and found that the NVS was suitable for use in a primary health setting (Weiss et al., 2012).

Scoring. The participants were asked to read a nutrition label for a pint of ice cream. They answered six questions that required an understanding of the label information. The participants were given one point for each correct answer. The correct answers were summed to obtain a score that can range from 0 to 6, with higher scores indicating greater health literacy. Zero to 1 correct response indicated the participant likely had limited health literacy, with scores from 2 to 3 points providing evidence that participants had possible limited health literacy. Scores of 4 or greater are indicative of adequate health literacy.

Reliability. Weiss et al. (2012) conducted a study in which reliability of the NVS instrument was assessed in terms of internal consistency (Cronbach α) >0.76. Criterion validity was determined by calculating the correlation (Pearson r) between scores on the NVS and the Test of Functional Health Literacy in Adults (TOFHLA; Weiss et al., 2012).

Validity. The NVS was tested for construct validity using bivariate correlations with the REALM and Short Test of Functional Health Literacy in Adults (S-TOFHL; Osborn et al., 2007). The results of Spearman's rho provided evidence of moderate relationships between the NVS with the REALM (r_s = .41) and S-TOFHLA (r_s = .61). These results indicated moderate levels of construct validity. Osborn et al. (2007) tested the NVS for predictive validity using one-way analysis of variance (ANOVA) to test for differences in self-reported knowledge of cholesterol and hypertension, as well as medication adherence between categories of health literacy as measure by the NVS. No statistically significant differences were found between the self-reported measures and the three categories of the NVS, indicating poor predictive validity.

Beliefs About Medication Questionnaire. The Beliefs about Medication Questionnaire (BMQ, Horne et al., 1999) is a tool used to assess patient's beliefs about medication set up on a Likert type scale (AlHewiti, 2014). The BMQ-Specific- assesses the patient's beliefs about their own medications in terms of necessity and concerns and the BMQ-General assesses patient's beliefs about medications in general (AlHewiti, 2014). The responses from the participants about their beliefs and concerns about medications can indicate how strongly they believe that medications prescribed by their physicians are necessary and if medications are useful in controlling illnesses.

Rajpura and Nyak (2014) used the BMQ in a study using a cohort of participants who were at least 55 years of age and had a previous diagnosis of hypertension. Two groups of older adults were recruited. One group was from a senior care center in New York and the other group was attending a social activity on a university campus (Rajpura & Nyak, 2014). Reliability was established using the Cronbach's alpha coefficients for each of the BMQ components. Cronbach's alpha coefficients were .78 for specific concerns, .78 for necessity beliefs, and .89 for general beliefs about medication (Rajpura & Nyak, 2014). These findings provided support that the BMQ had adequate internal consistency as a measure of reliability. This particular study did not mention validity of the BMQ instrument

Threats to Validity

The primary threat to the internal validity of the design is differential dropout of the participants. If too many participants failed to complete the surveys, results might not be representative of the population being studied. Another threat to the validity was response bias. The participants might respond to the survey items in a socially desirable way that did not reflect their true feelings or beliefs. Instead, their responses reflected what they thought the researcher was expecting them to say. These types of responses could cause findings to not be a true representation of the outcomes. The other threats to internal validity, history, maturation, testing, instrumentation, and statistical regression, were not relevant to this type of study as the participants completed the instruments one time.

Statistical conclusion validity is the accuracy of the conclusions about the relationship among variables being studied (Vogt & Johnson, 2011). By using appropriate sampling procedures, having valid and reliable instruments to measure the variables, and instructing the participants to answer the surveys honestly and as they apply to them, the threat of drawing an incorrect conclusion about the relationships among the variables is minimized.

A potential threat to validity was possible collinearity between health beliefs and health literacy. This relationship has been shown to exist in previous research. To control for this potential problem, zero-order correlations were obtained to determine the strength and direction of the relationship between these variables. If collinearity appears to be problematic, the statistical analysis would be modified to allow these variables to address the research questions.

Data Analysis

Data from the surveys were entered into a computer file for analysis using IBM SPSS ver. 24. The data analysis was divided into three sections. The first section used frequency distributions, cross tabulations, and measures of central tendency and dispersion to summarize the demographic characteristics of the sample and provide a profile of the participants. The second section of the data analysis used descriptive statistics, including means, standard deviations, and ranges to provide baseline data on the scaled variables of health literacy and health beliefs. The research questions were addressed by testing the associated hypotheses using Pearson product moment correlations and multiple linear regression analysis. The assumptions of all statistical

tests, especially normality, were assessed. If there was any suggestion of violation of the assumptions, alternative methodologies would be considered, (e.g., non-parametric tests such as Spearman correlation coefficient, Kruskal-Wallis test and logistic regression through dichotomizing the outcome variable instead of using linear regression). All decisions on the statistical significance of the findings were made using a criterion alpha level of .05.

The process for data cleaning and screening for this study involved checking and re-checking all survey questionnaires for appropriateness of completion. In addition, statistical outliers were examined carefully to ensure feasibility in relation to the data collected. When screening data, it was convenient to distinguish four basic types of oddities: lack or excess of data; outliers, including inconsistencies; strange patterns in (joint) distributions; and unexpected analysis results and other types of inferences and abstractions (Van den Broeck, 2005). Table 2 presents the statistical analysis that were used to address each research question.

Table 2

Statistical Analysis

	Research Question	Variables	Statistical Analysis
1.	What is the rate of adherence for antihypertensive medications among African American cohort with low SES	Adherence to antihypertensive medications	Frequency distributions were used to determine the rate of adherence for antihypertensive medications among African American cohort with low SES.
2.	What is the level of health literacy regarding hypertension among a low SES African American	Independent Variable Levels for health literacy Independent Variable	A Kruskal-Wallis one-way analysis of variance was used to test for differences in medication adherence by levels of health literacy. A

Research Question	Variables	Statistical Analysis
cohort with high blood pressure?	Adherence to antihypertensive medications	nonparametric test was used as the distribution of adherence to antihypertensive medication did not meet the assumption of normality.
3. What is the relationship between health literacy and antihypertensive medication adherence?	Level of health literacy Adherence to antihypertensive medications	Spearman rho correlation analysis was used to determine the relationship between health literacy and being adherent or nonadherent for antihypertensive medications.
4. Can medication adherence be predicted from health literacy and specific and general health beliefs?	<u>Dependent Variable</u> Adherence to antihypertensive medications <u>Independent Variables</u> Health literacy Specific health beliefs General health beliefs	A binomial logistic regression was used to determine if health literacy, specific health beliefs, and general health beliefs can be used to predict adherence to antihypertensive medications. Adherence to antihypertensive medications were dichotomized into two groups, high and low, using a median split.
5. What is the relationship between age, gender, income, lifestyle and clinical factors (polypharmacy), comorbidities (renal failure, type 2 diabetes mellitus) is with antihypertensive medication adherence?	<u>Dependent Variable</u> Adherence to antihypertensive medications <u>Independent Variables</u> Age Gender Income Lifestyle and clinical factors Comorbidities	A binomial logistic regression analysis was used to determine which of the independent variables could be used to predict adherence to antihypertensive medications. Adherence to antihypertensive medications were dichotomized into two groups, high and low, using a median split.

Ethical Procedures

After receiving approval from the Walden University Institutional Review Board (IRB approval number 01-17-18-0307143), the researcher reached out to churches with African American parishioners to participate in the study. Those who met the criteria for inclusion in the sample and volunteer to participate in this study were asked to read the

informed consent form and ask questions regarding their role in the study. They were informed about the purpose of the study and be assured that the study meets the ethical guidelines as listed by the university. The participants were treated in such a way that was kind and gentle with the goal of providing them with assurances that they would not be identified in the study.

Both the completed questionnaires and signed informed consent forms were kept in separate locations in a locked file cabinet located in the researcher's home. The questionnaires in manila envelopes were distributed after the informed consent forms have been returned to the researcher. To maintain confidentiality, the participants were instructed to replace the questionnaires in the manila envelopes before returning them to the researcher. The survey responses were entered into a data file for analysis using IBM-SPSS ver. 25.0. The data were stored on a password protected USB drive that was kept in a locked file cabinet in the researcher's home when not in use. All surveys and the informed consent forms were maintained in the locked file cabinet for five years per Walden University IRB guidelines. After this time, they will be shredded to maintain the confidentiality of the participants. The USB drive will be erased at the same time using a shredder program.

Summary

The goal of this research study was to assess the relationship between health literacy and hypertension medication adherences. By utilizing a quantitative design, survey instruments were used to determine participants' knowledge about the importance of medications and adhering to the prescribed regimen. The MASES, the NVS, and the

Beliefs About Medication were completed by each person who volunteered to participate in the study. Their responses were collected and analyzed using Pearson product moment correlations and binomial logistic regression analyses to address the research questions and test the associated hypotheses. The study adhered to ethical standards by using an informed consent form and maintaining the confidentiality of the participants. The results of the data analysis are presented in Chapter 4, with the discussion of the findings, implications for nursing, and recommendations for future study presented in Chapter 5.

Chapter 4: Results

Introduction

Chapter 4 includes the results of the data analysis that were used to describe the sample and address the research questions. The purpose of this quantitative study was to examine the relationship between health literacy and other factors, including sociodemographic and clinical variables, with adherence to antihypertensive medications.

Sample

The data were collected from African Americans at churches in a large metropolitan area that agreed to participate in the study from February 2018, through February 2019. A total of 86 participants agreed to participate in the study. Of this number, seven participants were eliminated as they failed to complete the surveys. The remaining 79 participants were included in the study.

A missing values analysis was completed for the scaled variables, health literacy, medication adherence, and beliefs about medication. The results of this analysis are presented in Table 3.

Table 3

Missing Values Analysis

Scale	Missing Values	Percent Missing
Health literacy	0	0.0
Medication adherence	2	2.5
Beliefs about medication		
Personal beliefs	1	1.3
General beliefs	1	1.3

Two (2.5%) participants did not have a score for the medication adherence scale, with 1 (1.3%) participant not having a score for personal beliefs or general beliefs. The low number of missing values was not expected to have a substantive effect on the outcomes of the analyses used to address the research questions.

Description of the Sample

The participants provided information regarding their personal characteristics. The responses to these questions were summarized using frequency distributions. Table 4 presents results of these analyses.

Table 4

*Frequency Distributions: Personal Characteristics (*N = *79)*

Personal Characteristic	N	%
Age (years; n=71)		
Mean (SD)	56.5 (7.02)	
Median, range	59 (31, 70)	
Gender		
Male	24	30.4
Female	47	59.5
Missing	8	10.1
Educational Level		
Less than high school	2	2.5
High school graduate	5	6.3
GED	1	1.3
Some college	24	30.4
Associate degree	13	16.5
Bachelor's degree	11	13.9
Graduate degree	15	19.0
Missing	8	10.1
Number of People in Household		
1 to 2	44	55.7
3 to 4	23	29.1
5 to 6	7	8.8
More than 6	1	1.3
Missing	4	5.1
Family Income		
Under $15,000	7	8.9
$15,001 to $20,000	2	2.5
$20,001 to $25,000	0	0.0
$25,001 to $30,000	9	11.4
$30,001 to $35,000	2	2.5
$35,001 to $40,000	3	3.8
$40,001 to $45,000	5	6.3
Over $45,000	48	60.8
Missing	3	3.8

The age of the participants ranged from 31 to 70 years, with a mean of 56.5 (*SD* = 7.02) years and median of 59 years. Note that although potential participants were told that the study was intended for persons aged 40 to 65 years, there were 3 persons who volunteered outside of this age range, including 1 person who was under 40 and 2 who

were over 65 years. As these individuals met all other criteria and were close enough to the desired age range, we decided it would be reasonable to keep these individuals in the study. Eight participants did not provide their age on the survey.

The majority of participants (*n* = 47, 59.5%) were female. Twenty-four (30.4%) participants reported their gender as male. Eight participants did not provide a response to this question. The largest group of participants (*n* = 24, 30.4%) had completed some college, with the second largest group (*n* = 15, 19.0%) indicating they had obtained a graduate degree. Eight participants did not provide a response to this question. Forty-four (55.7%) participants reported having one to two people in their households and 23 (29.1%) had three to four people in their households. Four participants did not provide a response to this question. The majority of participants (*n* = 48, 60.8%) reported family incomes greater than $45,000 and 7 (8.9%) participants had family incomes less than $15,000. Three participants did not provide a response to this question.

The participants were asked to provide information about their hypertension. Their responses were summarized using frequency distributions. Results of these analyses are presented in Table 5.

Table 5

*Frequency Distributions: Hypertension Diagnosis (*N = *79)*

Hypertension Diagnoses	N	%
Conditions that could affect hypertension		
Renal failure	1	1.3
Diabetes mellitus	15	19.2
Congestive heart failure	5	6.4
Chronic obstructive lung disease (COPD)	6	7.8
Swelling of legs and ankles	11	14.1
Other	4	5.1
Insurance for Medications		
Yes	67	84.8
No	6	7.6
Missing	6	7.6

The participants had been diagnosed with hypertension for a mean of 15.13 (*SD* = 11.03) years, with a median of 15.00 years. The range of years of diagnosis was from 1 to 47 years. All of the participants were taking medication for their HBP. When asked about other conditions related to their hypertension, 1 (1.3%) participant reported renal failure, 15 (19.2%) indicated they had type 2 diabetes mellitus, 5 (6.4%) had been diagnosed with congestive heart failure, 6 (7.8%) had chronic obstructive lung disease (COPD), 11 (14.1%) had experienced swelling of legs and ankles, and 4 (5.1%) reported other conditions, including poor circulation, high cholesterol, irregular heartbeat, and hypothyroidism. When asked if they had insurance for their medications, the majority (*n* = 67, 84.8%) reported yes. Six participants did not provide a response to this question.

Research Questions

Five research questions were developed for this study. Where inferential statistical analyses were used to address the research questions, a criterion alpha level of .05 was used to determine statistical analyses.

RQ1: What is the rate of adherence for antihypertensive medications among African American cohort with low SES?

Four items on the MASES were used to measure medication adherence. The respondents were asked to indicate how confident they were that they could carry out tasks associated with medication adherence. The frequency distributions for these four items are presented in Table 6.

Table 6

Frequency Distributions: Medication Adherence (N = 79)

	Not at all sure		Somewhat sure		Very sure		Does not apply	
Medication adherence	n	%	n	%	n	%	n	%
Fill prescriptions whatever they cost	8	10.4	13	16.9	51	64.6	5	6.3
Make taking medications part of routine	1	1.3	7	9.1	66	85.7	3	3.9
Always remember to take blood pressure medications	3	3.9	10	12.7	60	77.9	4	5.2
Take blood pressure medication for rest of life	7	6.5	16	20.8	49	63.6	5	6.5

For each of the four items, participants indicated they were very sure they could fill prescriptions whatever they cost (n = 51, 64.6%), make taking medications part of

routine (*n* = 66, 85.7%), always remember to take BP medications (*n* = 60, 77.9%), and take BP medication for the rest of their life (*n* = 49, 63.6%). The fewest participants indicated they were not all sure they would fill their prescriptions whatever the cost (*n* = 8, 10.4%), make taking medications part of routine (*n* = 1, 1.3%), always remember to take BP medications (*n* = 3, 3.9%), and take BP medication for the rest of their life (*n* = 7, 6.5%). Based on their responses, it appears the participants in the study were somewhat confident that they would be adherent with medications to control their high BP.

RQ2: What is the level of health literacy regarding hypertension among a low SES African American cohort with HBP?

The participants completed the NVS scale that measured health literacy. This instrument uses a scenario on reading the nutrition label for ice cream. The participants use the nutrition label to answer five questions. Their answers were scored to obtain a total score ranging from 0 to 1. Table 7 presents the results of this analysis.

Table 7

*Frequency Distributions: Correct Responses on the NVS (*N *= 79)*

Number Correct	N	%
None	8	10.1
One	9	11.4
Two	18	22.8
Three	19	24.1
Four	13	16.5
Five	12	15.2
Total	79	100.0

The largest group of participants (*n* = 19, 24.1%) answered three items correctly, with 18 (22.8%) providing correct answers to two items. Eight (10.1%) had no correct answers, and 12 (15.2%) answered all five items correctly. The responses were categorized into three groups (limited health literacy, possibly limited health literacy, and adequate health literacy), using the protocol developed by Weiss et al. (2012). Table 8 presents the frequency distribution by category.

Table 8

*Frequency Distributions: Literacy Categories (*N = *79)*

Literacy Categories	N	%
Limited health literacy	17	21.5
Possibly limited health literacy	37	46.8
Adequate health literacy	25	31.6
Total	79	100.0

The largest group of participants (*n* = 37, 46.8%) were categorized has having possible limited health literacy, with 17 (21.5%) classified as having limited health literacy. Twenty-five (31.6%) participants had adequate health literacy.

A one-way analysis of variance (ANOVA) was planned to determine if medication adherence differed among the three categories of health literacy. Prior to completing the one-way ANOVA, an explore procedure from IBM-SPSS was used to determine the assumption of normality and linearity were not met. The skewness for medication adherence was = -.99 (*SE* = .276), which produced a *z* value of 3.58 ($p < .05$),

indicating that medical adherence was not normally distributed. Instead of using the one-way ANOVA, a one-way Kruskal-Wallis one-way analysis of variance was used to test the difference in medication adherence by level of health literacy. The results of this analysis is presented in Table 9.

Table 9

One-Way Kruskal-Wallis ANOVA: Medication Adherence by Health Literacy Categories

Level of health literacy	M	SD	df	H	P	η^2
Limited	1.89	.77				
Possibly limited	2.03	.83	2	8.21	.016	.08
Adequate	2.51	.42				

The results of the one-way Kruskal Wallis ANOVA produced a statistically significant result for the comparison of medication adherence by level of health literacy, H (2) = 8.21, p = .015, η^2 = .08. The associated effect size of .08 was small, indicating that the result had little practical significance. To determine which of the groups were differing, mean scores for medical adherence was compared among the three levels of health literacy using pairwise comparisons. Participants with limited health literacy (M = 1.89, SD = .77) had lower scores than those possible limited health literacy (M = 2.03, SD = .83) and those with adequate health literacy (M = 2.51, SD = .42).

RQ3: What is the relationship between health literacy and antihypertensive medication adherence?

The total scores for the NVS and medication adherence were correlated using Spearman rho correlations. The results of this analysis were statistically significant (r_s =

.30, p =.010; data not shown). The positive direction of the correlation indicated that as health literacy scores increased, scores for medication adherence also increased.

RQ4: Can medication adherence be predicted from health literacy and specific and general health beliefs?

During the planning stages of the research, it was decided to test research questions 4 and 5 using multiple linear regression analyses. However, due to the small sample size and failure to meet the assumptions of multiple linear regression analysis, binomial logistic regression was used to determine if medication adherence could be predicted from health literacy and specific and general health beliefs. Prior to conducting the analysis, medication adherence was dichotomized using the median score of 2.32. Scores lower than 2.32 were considered low and those above 2.32 were categorized as high. Results of this analysis are presented in Table 10.

Table 10

Binomial Logistic Regression Analysis: Medication Adherence with Health Literacy and Health Beliefs

Predictor	B	SE	OR	95% CI		Wald statistic	p
Health literacy	.29	.16	1.34	.97	1.85	3.18	.075
Beliefs about medication	.54	.41	1.71	.19	1.71	1.69	.194
General beliefs about medication	.18	.47	1.20	.48	2.98	.15	.702

Note. $\chi 2$ (3) = 5.54, p = .137

The three predictor variables, health literacy, personal beliefs about medication, and general beliefs about medication, that were used in the binomial logistic regression equation were not statistically significant predictors of medication adherence (χ^2 (3) = 5.54, p = .137). Based on these findings, it does not appear that health literacy and personal and general beliefs about medication were predictors of medication adherence.

RQ5: What is the relationship between age, gender, lifestyle and clinical factors (polypharmacy), comorbidities (renal failure, type 2 diabetes mellitus) and antihypertensive medication adherence?

A binomial logistic regression was used to determine if selected demographic variables could be used to predict medication adherence. The demographic variables included in the analysis are age, gender, family income, years since diagnosis, diagnosis, congestive heart failure, COPD, swelling of legs and ankles, and insurance for medications. Prior to conducting the analysis, medication adherence was dichotomized using the median score of 2.32. Scores lower than 2.32 were considered low and those above 2.32 were categorized as high. Table 11 presents results of this analysis.

Table 11

Binomial Logistic Regression Analysis: Medication Adherence Demographic Variables

Predictor	B	SE	OR	95% CI		Wald statistic	p
Age	.04	.06	.54	.93	1.17	.54	.462
Gender	.19	.79	.06	.26	5.73	.06	.812
Family income	.93	.42	2.54	1.12	5.78	4.93	.026
Years since diagnosis	-.02	.05	.98	.90	1.07	17	.681
Type 2 diabetes	-.06	.89	.94	.17	5.31	.01	.942
Congestive heart failure	25.54	23177.94	.00	.00	---	.00	.999
Chronic obstructive lung disease	1.65	2.67	.19	.03	35.76	.38	.536
Swelling of legs and ankles	3.09	2.64	.05	.12	8.10	1.37	.242
Insurance for medications	3.74	2.34	.02	.43	2.36	2.57	.110

Note. $\chi^2(9) = 19.31$, $p = .023$.

The results of the binomial logistic regression used to determine if medication adherence could be predicted from demographic variables was statistically significant, ($\chi 2(9) = 19.31$, $p = .023$One predictor variable, family income, was a statistically significant predictor of medication adherence (*OR* = 2.54, $p = .026$, CI = 1.12, 5.78). This result indicated that participants with high family incomes were 2.54 times more likely to have high medication adherence. The remaining predictor variables were not statistically significant.

Summary

In Chapter 4 the results of the data analysis were presented. A total of 86 participants agreed to be in the study, with data from 79 African Americans diagnosed

with hypertension included in the data analysis. The mean age of the participants was 56.49 (*SD* = 7.02) The majority of the participants (*n* = 47, 66.2%) were female, with the largest group reporting that they had completed some college (*n* = 24, 33.9%). Most of the participants (*n* = 44, 58.6%) had from 1 to 2 people living in their households, with 48 (63.3%) participants indicating family incomes greater than $45,000. All participants had been diagnosed with hypertension, with 15 (19.2%) indicating they had diabetes mellitus and 11 (14.1%) reporting they had swelling of legs and ankles. Sixty-seven (91.8%) had insurance to help pay for medications.

The first research question was in regard to the rate of adherence for antihypertensive medications among African American cohort with low SES. The majority of participants were very sure that they would fill their prescriptions whatever they cost (*n* = 51, 64.6%), make taking medications part of routine (*n* = 66.85.7%), remember to take their BP medications (*n* = 60, 77.9%), and take BP medications for the rest of their lives (*n* = 49, 63.6%).

The level of health literacy was determined by the NVS scores. The scores could range from none to five, with higher scores indicating better health literacy. The results of this analysis indicated that 17 (21.5%) of the participants had limited health literacy, 37 (46.8%) had possibly limited health literacy, and 25 (31.6%) had adequate health literacy. The scores for medication adherence were compared by health literacy categories using a Kruskal-Wallis one-way analysis of variance. The results were statistically significant, indicating a difference in medication adherence by health literacy levels. Individuals with adequate health literacy differed significantly from those with limited and possibly

limited health literacy. No statistically significant differences were found on medication adherence between those with limited and possible limited health literacy.

The third research question examined the relationship between health literacy scores and medication adherence using Pearson product moment correlation. The result was statistically significant, indicating that individuals who had higher scores for health literacy also had higher scores for medication adherence.

The fourth research question used a binomial logistic regression analysis to determine if health literacy and specific and general beliefs about medication could be used to predict medication adherence. The results indicated that it does not appear that health literacy and personal and general beliefs about medication were predictors of medication adherence.

The fifth research question was used to determine if demographic characteristics of the participants were statistically significant predictors of medication adherence. While the binomial logistic regression analysis did not produce statistically significant results, one predictor variable, family income was a significant predictor. Families with higher income levels were more likely to have higher scores for medication adherence. The discussion and interpretation of these findings, along with implications and suggestions for future research are presented in Chapter 5.

Chapter 5: Discussion

Introduction

The purpose of this quantitative study was to examine the relationship between health literacy and other factors, including sociodemographic and clinical variables, with adherence to antihypertensive medications among adult African Americans diagnosed with hypertension. Medication adherence for antihypertensive treatment among this subgroup of the population had not been previously explored in the scientific literature despite the high prevalence of hypertension in this group, particularly relative to persons of other races and age groups (CDC, 2016). The data collection process took place at nine African American churches in the city of Detroit. Congregants who volunteered to be in the study were asked to complete the NVS survey that measures health literacy and the MASES that measures medication adherence. Congregants were also asked to complete the Beliefs About Medication survey to assess how important they perceived the need to take their prescribed antihypertensive medication.

Key Findings of the Study

The key finding of this study was that more than half of the African Americans in the sample (88.4%) had possibly limited and limited health literacy. Although the participants appeared to be adherent with their medications, health literacy continues to be positively related to medication adherence and health beliefs. This finding provided support that individuals who had higher scores for health literacy were more likely to have higher scores for medication adherence.

The majority of participants were very sure that they would fill their prescriptions whatever they cost (*n* = 51, 64.6%), make taking medications part of routine (*n* = 66.85.7%), remember to take their BP medications (*n* = 60, 77.9%), and take BP medications for the rest of their lives (*n* = 49, 63.6%). The fewest participants indicated they were not all sure they would fill their prescriptions whatever the cost (*n* = 8, 10.4%), make taking medications part of routine (*n* = 1, 1.3%), always remember to take BP medications (*n* = 3, 3.9%), and take BP medications for the rest of their lives (*n* = 49, 63.6%).

Demographic variables were used as independent variables in a binomial logistic regression analysis. Although logistic regression analysis did not produce statistically significant results, one predictor variable, family income, was a statistically significant predictor. Families with higher income levels were more likely to have higher scores for medication adherence.

Interpretation of Findings

The first research question was designed to examine self-reported adherence to medication for hypertension. The participants responded to four items on the MASES that reflected how confident they were that they could fill prescriptions whatever the cost, make taking medications part of a routine, remember to take BP medications, and take BP medication for the rest of their lives. The majority of the participants (85.7%) were very confident that they could adhere to their medication regimen for hypertension. Mayo-Gamble and Mouton (2017) reported that the older African Americans in their study were more likely to be adherent to their medications. This study differed from the

present study as it was not limited to hypertension, but open to anyone who was taking medication on a regular basis. Their participants were likely to continue their medications, not miss doses, taking them as prescribed, and not stopping them.

According to previous research, nonadherence to antihypertensive treatment recommendations is a global problem, with medication adherence an essential part of decreasing the negative effects of hypertension, including decreasing the incidence of cardiovascular morbidity and mortality (Morisky et al., 2008). The participants generally were aware they would have to take the medications for the remainder of their lives, which was different than the study by Brown and Bussell (2011). In their study, Brown and Bussell found that medication adherence continued to decline even after a catastrophic event, such as a stroke.

While none of the reviewed literature discussed the cost of medication, most participants indicated they would continue the medication regardless of the cost. As a construct for the theoretical framework for this study, self-efficacy is defined as people's conviction that they could successfully execute the behavior required to produce the outcomes (Bandura, as cited in Champion & Skinner, 2008). Self-efficacy related to medication adherence is associated with knowledge that taking medication has to be done as part of a routine.

Poor BP control may be due to patient nonadherence to prescribed antihypertensive medication therapy (Hyre et al., 2007). However, participants in the current study indicated they are confident that they could adhere to their high BP medication and would likely have some control over their hypertension. Only 1 (1.3%)

and 7 (9.1%) participants indicated they were either not at all sure or somewhat sure that they could make taking their medications as part of their daily routine. They appear to be aware of the problems associated with nonadherence and were committed to controlling their condition to maintain their health.

The HBM can be used to obtain an initial baseline of participants' perceptions of their hypertension (susceptibility, severity) and their beliefs about medication adherence. The HBM can be used by providers to understand how their patients perceive personal benefits and barriers associated with adherence to their antihypertensive medication regimen. The participants in this study were confident that they would remain on their medication regimen for hypertension because they were able to balance their beliefs about medication with their desire to maintain a healthy lifestyle.

The participants completed the NVS to determine their level of health literacy. The participants were given one point for each correct answer. The correct answers were then summed to obtain a score that could range from 1 to 6, with higher scores indicating greater health literacy. Weiss et al. (2012) established cut points for the NVS:

- Zero to 1 correct response indicated the participant likely had limited health literacy.
- Scores from 2 to 3 points provided evidence that the participants had possible limited health literacy.
- Scores of 4 or greater were indicative of adequate health literacy.

After scoring the scale, participants were divided into three groups, limited health literacy (*n* = 17, 21.5%), possibly limited health literacy (*n* = 37, 46.8%), and adequate health literacy (*n* = 25, 31.6%).

Participants with low levels of health literacy may not be able to understand how to care for their high BP and why they are given specific medications to control their condition (Mahrous, 2015). During provider-patient interactions, limited health literacy could infringe upon a patient's knowledge, beliefs, and/or level of participation in clinical decision making (Osborn et al., 2011). Low health literacy is more common in older patients, those with lower education levels, immigrants, and racial minorities (Powers et al., 2008). Limited health literacy could also negatively influence a patient's motivation, problem-solving ability, self-efficacy, and/or knowledge required to perform self-care behaviors accurately (Osborn et al., 2011).

A study by Findlow et al. (2014) was used to determine health literacy among individuals diagnosed with hypertension. The study results indicated that 51.5% of the participants had limited health literacy, with 20.1% having possibly limited health literacy, and 28.4% having adequate health literacy. While the Findlow et al. study did not differentiate their participants by race, the race of participants in the present study was African American. In the present study, the three literacy levels were used to determine differences in antihypertensive medication adherence. The results were statistically significant, with participants who had adequate health literacy having higher scores for medication adherence than those with limited and possibly limited health literacy. These findings provided support that participants with adequate health literacy

were more likely to adhere to their antihypertensive medication regimen than participants with the other two levels of health literacy. In contrast, the Findlow et al. (2014) study found no differences in BP levels by health literacy level.

Most studies on health literacy used other scales, such as the S-TOFHLA or REALM. Drawing comparisons among the different measures of health literacy is difficult. A study of older African American patients participated in a study of health literacy using the REALM (Mayo-Gamble & Mouton, 2017). The researchers found that the majority of participants (67.1%) had adequate health literacy, with 32.9% having limited or low health literacy (Mayo-Gamble & Mouton, 2017). Their results differed from the present study; although both studies used African American patients, participants in the present study generally were younger, ranging in age from 31 to 70 years, whereas the mean age of participants in the Mayo-Gamble & Mouton (2017) study was 64 (*SD* = 10.3) years.

The third research question was used to examine the relationship between health literacy and antihypertensive medication adherence. I used total scores for NVS and the MASES in a correlation analysis. Statistically significant results in a positive direction indicated that participants who had higher health literacy tended to be more adherent with their antihypertensive medications. The results of this analysis supported previous research that examined the relationship between understanding information on treatment regimens and medications and control of their BP. Gazmararian et al. (2006) examined the relationship between health literacy and medication adherence among Medicare-managed care enrollees with cardiovascular-related conditions. Gazmararian et al. found

that 40% of enrollees had low medication adherence and that health literacy, race/ethnicity, education, and regimen complexity were related to medication adherence. Gazmararian et al. looked at a combination of conditions, not just hypertension, and the researchers used the S-TOFHLA to test health literacy. Health literacy was a significant indicator for predicting medication adherence. Similar to findings by Gazmararian et al, health literacy in the present study was a significant indicator of medication adherence.

Unlike the present study, Richardson-Ingram and Ivanhov (2013) found no relationship between health literacy and medication adherence. Using the REALM Survey to measure health literacy and the Hill-Bone Compliance (HBC) Scale was used to measure adherence, Richardson-Ingram and Ivanhov (2013) found at 51% of their participants were not adherent to their antihypertensive regiment. Similar to the present study, the scores for the REALM showed that 68% of the participants lacked adequate health literacy to read and comprehend health care materials.

Brown and Bussell (2011) in conducting a medical review of literature found factors that were related to medication adherence. These factors included individual health beliefs and attitudes concerning the effectiveness of treatment, previous experiences with pharmacological therapies, and lack of motivation. Other barriers to medication adherence among individuals with low SES were high medication costs, lack of transportation, poor understanding of medication instructions, and long wait times at the pharmacy (Brown & Bussell, 2011).

Medication adherence and health literacy are important factors in health beliefs. Many participants in the present study had limited health literacy that could affect their

medication adherence. If they do not understand reasons for taking specific medications, they may not be willing to use the medicine. Doctors need to discuss medications with their African American patients, explaining the purpose, possible side effects, and costs with them. Through this discussion, patients can understand the need to be adherent with their anti-hypertensive medications.

A binomial logistic regression analysis was used to determine if antihypertensive medication adherence could be predicted from health literacy and specific and general health beliefs. BMQ was used to examine how the respondents felt about their medication regimen. The BMQ is comprised of two sections: the BMQ-Specific and the BMQ-General. Health literacy emerged as a statistically significant predictor of antihypertensive medication adherence, recoded as a dichotomous variable. As health literacy increased, medication adherence also increased. Neither general or specific health beliefs about medication were statistically significant predictors of medication adherence. While each participant has his/her own health beliefs that pertain to his/her medicines, those beliefs did not affect medication adherence.

In a previous study, Kressin et al. (2007) used both the health decision model and the HBM to measure racial differences in hypertension medication adherence. Kressin et al. (2007) examined patterns of antihypertensive medication adherence by race and evaluated whether any racial differences in interactions with clinicians or beliefs about BP were related to observed differences. The covariates in this study were factors that affected health decisions, including the people that patients interacted with both personally and interpersonally, their social environment, and health literacy. The HBM

was used to assess patients' perceptions of how taking hypertension medication made them feel and their motivation for adhering to their treatment regimen (Kressin et al., 2007). In terms of medication adherence, African Americans were less adherent and more likely to stop taking the BP medication if it made them feel bad, which was congruent with the cost-benefit segment of the HBM. Cost in this instance is the human and monetary cost of medication, while the benefits are improved health outcomes.

Healthcare providers for African American participants were more involved in counseling and advising them about their BP, while Caucasian healthcare providers were more likely to request a follow-up appointment for BP management. Health care providers were likely to discuss BP management with participants of both races, while only a small percentage of patients reported that providers thoroughly discussed barriers to BP medication adherence. The current study examined specific beliefs about medications and general beliefs about medications. The analysis results were similar to Kressin's (2007) study. Specifically, neither study found that health beliefs were statistically significant predictors of medication adherence, while both studies found that health literacy was important in medication adherence.

According to Wexler, Elton, Pleister, and Feldman (2009), African Americans perceived seriousness of hypertension may be lower than other ethnic groups because of their low levels of health literacy that made reading health-related literature difficult. In addition, Wexler et al. suggested that African Americans were more likely to have health beliefs regarding the seriousness of and their susceptibility to hypertension. Some African Americans think that hypertension is episodic and presents with symptoms such as

"headaches, lightheadedness, fatigue, or heart palpitations" (Middleton, 2009, p. 13). Low antihypertensive medication adherence rates can limit the effectiveness of medical services and lead to disease exacerbations, hospitalizations, and even death, making low adherence costly from both a health and economic standpoint (Dunbar-Jacob & Schlenk, 1996). These findings indicated the importance of health literacy to help change erroneous health beliefs regarding the seriousness of hypertension among the African American community.

The HBM is the model that was used for this study. According to Champion and Skinner (2008), the HBM has been widely used to explain change and maintenance of health-related behaviors and as a guiding framework for health behavioral interventions. For the dissertation study, the research questions were based on the constructs of HBM. The constructs include susceptibility, severity, perceived benefits, cues to action and self-efficacy Champion & Skinner (2008). Understanding how participants perceived hypertension and adhered to their antihypertensive medication regimen is important.

Research questions one and two was used to examine the effects that self-efficacy had on antihypertension medication adherence. The data showed that self-efficacy did not have a significant relationship with antihypertension medication adherence. The third and fourth research questions included the HBM's construct of perceived benefits and susceptibility. These questions examined the importance that participants placed on how adhering to their antihypertension medication regimen would benefit them and how susceptible to other illness would they be if they were not adherent. Research question five included the constructs of both susceptibility and cues to action. In this question, the

participant was asked whether or not they take additional medications due to other comorbidities and clinical factors that has caused them to be on a medication regimen that involved taking several medications throughout the day. Research question five also sought to understand the relationship between age, gender, lifestyle and the above factors. The HBM was used to understand that individuals who had other comorbidities were likely to feel susceptible to acquiring additional health problems if they did not adhere to their prescribed antihypertension regimen. Additionally, did the participant's current medication regimen provide cues to action for their antihypertension medication regimen. The health beliefs model that provided the theoretical framework for this study was not supported in this study. Health literacy continues to be the variable that is most likely to predict medication adherence. Although health beliefs have been shown to be important in regard to antihypertensive medication, levels of health literacy are more likely to drive adherence to medications.

The relationship between age, gender, lifestyle and clinical factors, comorbidities and antihypertensive medication adherence was examined in the fifth research question. Information on comorbidities, such as type 2 diabetes mellitus, congestive heart failure, COPD and swelling of the legs and ankles were included on the survey documents. Results of the binomial logistic regression analysis found that demographic and clinical variables were not statistically significant predictors of antihypertensive medication adherence. While age, gender, lifestyle, and clinical factors did not appear to be related to their adherence to antihypertensive medication regimen, family income was a statistically significant predictor of medication adherence.

Limited research was found that used demographic variables as predictors of medication adherence. One study by Braverman and Dedier (2009) used a randomized controlled trial to assess the influence of behavioral interventions to improve medication adherence and BP control among African Americans diagnosed with hypertension. Their findings indicated that medication adherence varied by sex and educational attainment. Men generally had higher levels of adherence than women (Braverman & Dedier, 2009). The present research provided no evidence of statistically significant relationships between antihypertensive medication adherence with age and gender.

Limitations

The study was limited to African Americans who were attending nine churches in a large metropolitan area. The participants had to have been diagnosed with high BP and be on medication to control their condition. Data collection was found to be more challenging than expected because some ministers were reluctant to ask their parishioners to participate in the study and other churches had small numbers of congregants. As a result, data collection required more than one year to obtain the necessary sample size. Large African American churches had their own health committees and did not allow an outsider to collect data.

Because of the small sample size, the power to make an appropriate decision on the statistical significance of the study may be a limitation. The a priori power analysis indicated that a sample of 131 participants was needed to achieve a power of .80. However, after an extended time for data collection, 79 African Americans participated in the study. The post hoc power analysis indicated that with a sample of 76 participants, the

power was .23. Replicating the study with a sample of 131 participants may provide the necessary power to reject the null hypothesis with more certainty.

The results of the study cannot be generalized beyond African American individuals diagnosed with high BP and who were attending church. The findings may not be applicable to African Americans living in other geographical areas.

The participants completed the NVS to determine their level of health literacy. This instrument required participants read an ingredients label and do simple math to answer the questions. Many participants were unable to complete this instrument because of their limited literacy and math levels. To help them complete the NVS, the researcher read the item and explained what was needed. In addition, low literacy levels may have kept some participants from answering the other surveys.

Participation was voluntary, which may have resulted in a biased sample as individuals with high BP who were not compliant with their medication may not have wanted to participate. A small foam hand exerciser was offered as a token gift along with light refreshments. The participants were assured that their responses would be confidential, and they would not be identified in the study. However, it appears that some church members were suspicious of the research and chose not to be involved. Social desirability also may have been a limitation, with the participants responding to the study answering as they thought the researcher wanted.

Recommendations

The study should be replicated using a larger sample of African Americans drawn from churches, public agencies, and other places with large gatherings of African

Americans, such as health fairs. This research could provide further evidence of the need to help African Americans improve their health literacy to encourage antihypertensive medication compliance. In addition, the study should be replicated to understand what the cost and benefits of adhering to antihypertensive medications are and the adverse reactions of antihypertensive medications and how these reactions affect adherence should be included in this study replication as well.

Because of the low health literacy of participants in the study, a similar research program should be conducted using telephone or face-to-face interviews with research assistants reading the items to the participants instead of having them complete the surveys by reading them. The research assistants could explain the item to the participant if they are unsure of the meaning.

Research is needed to determine the health literacy of individuals with chronic illnesses. The use of a different health literacy scale may provide a better measure of health literacy. By being aware of patients' levels of health literacy, physicians can use different approaches to help their patients understand the importance of taking their medication as directed.

Additional research is needed to examine other factors that may be affecting health literacy. Using a qualitative approach, semi-structured interviews could be conducted to determine why some patients take their antihypertensive medications as directed by their physician and why some patients ignore the doctor and either supplement or forego the use of prescribed medication. The outcomes of this research

could be used to develop a survey that includes reasons why patients are either adherent or nonadherent with their medications.

A longitudinal research study should be used to determine at what point patients move from being adherent with their antihypertensive medications to a point in which they become nonadherent. The reasons for being nonadherent could be that they feel good and do not see the need for the medication, the medications become too costly, or they do not like how the medications make them feel. Using a longitudinal study completed at six-month intervals for a period of three to five years could provide useful information to doctors and pharmaceutical companies.

Social Change Implications

The most important social change implication based on the results of this study is the realization that poor health outcomes in regard to hypertension may be from the low health literacy found among African Americans. This study can help providers to understand that patients diagnosed with hypertension may need educational support when attempting to adhere to an antihypertensive medication regimen. Poor understanding of medication instructions has been identified a barrier to medication adherence among inner city patients with low SES (Brown & Bussell, 2011). This study has demonstrated that health literacy was found to be a significant predictor of hypertensive medication adherence. Low adherence rates limit the effectiveness of medical services and can lead to disease exacerbations, hospitalizations, and even death, making low adherence costly from both a health and economic standpoint (Dunbar-Jacob & Schlenk, 1996). Therefore, ensuring that patients and their families understand how to administer their

antihypertensive medications and are aware the need to adhere to their prescription is important.

African Americans may not perceive hypertension as a serious condition at the same level as other ethnic groups because of their beliefs that health programs and health-related literature are not written from a cultural perspective (Wexler, Elton, Pleister, & Feldman, 2009). African Americans should be given information about their medication regimen in a form that is culturally relevant and at their literacy levels. For example, brochures should include pictures of African Americans and check the readability levels to ensure the words are at a fourth grade reading level.

Conclusion

Hypertension is a risk factor for cardiovascular, cerebrovascular, and renal disease and is more frequent among African Americans (Kressin, Orner, Manze, Glickman, & Berlowitz, 2010). Understanding the importance of adhering to an antihypertensive medication regimen is important for patients, providers, and society. Patients can benefit from the results of this study because improved health literacy can reduce the negative effects of chronic illnesses like hypertension. Providers should be aware that based on this study, health literacy is a strong indicator as to whether or not the patient will take their medication as prescribed. Therefore, providers should implement a process to assess their patient's health literacy level prior to placing them on a prescribed medication regimen. After the patient has begun the prescribed regimen, providers should reassess the patient's progress to create an idea of how the patient is progressing in their medication adherence regimen. The benefits to society from having a population that is

health literate can include reduced medication costs and better health outcomes for African Americans diagnosed with hypertension. An educated society is the best defense against increasing medical costs and poorer health outcomes.

References

AlGhurair, S., A., Hughes, C. A., Simpson, S. H. & Guirguis, L. M. (2012). A systematic review of patient self-reported barriers of adherence to antihypertensive medications using the World Health Organization Multidimensional Adherence Model. *The Journal of Clinical Hypertension, 12*(14), 877-886. doi:101111/j.1751-7176.2012.00699.x

AlHewiti, A. (2014). Adherence to long-term therapies and beliefs about medications. *International Journal of Family Medicine*. Article ID 479596, doi:10.1155/2014/479596

American Heart Association (2013). Statistical fact sheet 2013 update: High blood pressure. Retrieved from http://www.heart.org/idc/groups/heart-public/@wcm/@sop/@smd/documents/downloadable/ucm_319587.pdf

American Heart Association. (2015a). *Understanding blood pressure readings*. Retrieved from http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/AboutHighBloodPressure/Understanding-Blood-Pressure-Readings_UCM_301764_Article.jsp#

American Heart Association. (2015b). *What is high blood pressure*? Retrieved from https://www.heart.org/HEARTORG/Conditions/HighBloodPressure/AboutHighBloodPressure/What-is-High-Blood-Pressure_UCM_301759_Article.jsp#

American Heart Association (2016a). *Statistical fact sheet 2016 update: High blood pressure*. Retrieved from http://www.heart.org/idc/groups/heart-public/@wcm/@sop/@smd/documents/downloadable/ucm_319587.pdf

American Heart Association. (2016b). T*ypes of blood pressure medications.* Retrieved from http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/Types-of-Blood-Pressure-Medications_UCM_303247_Article.jsp

American Psychological Association. (2016). *Age and socioeconomic status*. Retrieved from http://www.apa.org/pi/ses/resources/publications/factsheet-age.pdf

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215. doi:10.1037/0033-295X.84.2.191

Becker, L. A. (2000). *Effect size*. Retrieved from http://www.uccs.edu/lbecker/effect-size.html

Berkman, N. D., Sheridan, S. L., Donahue, K. E., Halpern, D. J., & Crotty, K. (2011). Low health literacy and health outcomes: an updated systematic review. *Annals of Internal Medicine*, *155*(2), 97-107. doi:10.7326/0003-4819-155-2-201107190-00005

Braverman, J., Dedier, J. (2009). Predictors of medication adherence for African American patients diagnosed with hypertension. *Ethnicity & Disease 19*(4) 396-400. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/20073139

Brown, M., T., & Bussell, J., K. (2011). Medication adherence: WHO cares? *Mayo Clinic Proceedings 86*(4), 304-314. doi:10.4065/mcp.2010.0575

Centers for Disease Control and Prevention (2012). Hypertension among adults in the United States, 2009–2010. Retrieved from http://www.cdc.gov/nchs/products/databriefs/db107.htm

Centers for Disease Control and Prevention (2014a). Health literacy. Retrieved from http://www.cdc.gov/healthliteracy/learn/index.html

Centers for Disease Control and Prevention (2014b). High blood pressure facts. Retrieved from http://www.cdc.gov/bloodpressure/facts.htm

Centers for Disease Control and Prevention. (2015). Diabetes home: Basics about diabetes. Retrieved from http://www.cdc.gov/diabetes/basics/diabetes.html

Centers for Disease Control and Prevention. (2019). Chronic kidney disease basics. Retrieved from https://www.cdc.gov/kidneydisease/basics.html

Champion, V., L., & Skinner, S., C. (2008). The health belief model. In K. Glanz, B. K. Rimer, & K. Viswanath. (Eds.). *Health behavior and health education: Theory, research, and practice* (pp. 45-65) San Francisco, CA: Jossey Bass.

Creswell, J. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Cuffee, Y. L., Hargraves, J. L., Rosal, M., Briesacher, B. A., Schoenthaler, A., Person, S., . . . Allison, J. (2013). Reported racial discrimination, trust in physicians, and medication adherence among inner-city African Americans with hypertension. *American Journal of Public Health, 103*(11), e55-e62. doi:10.2105/AJPH.2013.301554

Das, S., Mitra, K., & Mandal, M. (2016). Sample size calculation: Basic principles. *Indian Journal of Anaesthesia, 60*(9), 652-656. doi:10.4103/0019-5049.190621

Downie, D. L., Schmid, D., Plescia, M. G., Huston, S. L., Bostrom, S., Yow, A., . . . DuBard, C. A. (2011). Racial disparities in blood pressure control and treatment

differences in a Medicaid population, North Carolina, 2005–2006. *Preventing Chronic Disease, 8*(3), A55. Retrieved from http://www.cdc.gov/pcd/issues/may/2011/10_0070.htm.

Dunbar-Jacob, J., & Schlenk, E. (1996). Treatment adherence and clinical outcome: Can we make a difference? In R. Resnick & R. Rozensky (Eds.), *Health Psychology through the Lifespan* (pp. 323–343). Washington, DC: American Psychological Association.

Ellis, P. D. (2010). *The essential guide to effect sizes: Statistical power, meta-analysis, and the interpretation of research results*. Cambridge, MA: Cambridge University Press.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*(4), 1149-1160. doi:10.3758/BRM.41.4.1149

Fernandez, S., Scales, K. L., Pineiro, J. M., Schoenthaler, A. M., & Ogedegbe, G. (2008). A senior center–based pilot trial of the effect of lifestyle intervention on blood pressure in minority elderly people with hypertension. *Journal of the American Geriatrics Society, 56*(10), 1860-1866. doi:10.1111/j.1532-5415.2008.01863.x

Fernandez, S., Tobin, J., N., Cassells, A., Diaz-Gloster, M., Kalida, C., & Ogedegbe, G. (2011). The counseling African Americans to control hypertension (CAATCH) trial: Baseline demographic, clinical, psychosocial, and behavioral characteristics. *Implementation Science (6)*100, 1-13. doi:10.1186/1748-5908-6-100

Flynn, S., J., Ameling, J., M., Hill-Briggs, F., Wolff, J., L., Bone, L., R., Levine, D…Boulware, L., E. (2013). Facilitators and barriers to hypertension self-management in urban African Americans: Perspectives of patients and family members. *Patient Preference and Adherence (7)* 741–749. doi:10.2147/ PPA.S46517

Fongwa, M., N., Evangelista, L., S., Hays, R., D., Martins, R., D., Elashoff, D., Cowan, M., J. . . . Morisky, D., E. (2008) Adherence treatment factors in hypertensive African American women. *Vascular Health and Risk Management, 4*(1), 157–166. doi:10.2147/vhrm.2008.04.01.157

Fongwa, M. N., Nandy, K., Yang, Q., & Hays, R. D. (2015). The facilitators of and barriers to adherence to hypertension treatment scale. *Journal of Cardiovascular Nursing*, *30*(6), 484-490. doi:10.1097/JCN.0000000000000206

Frankfort-Nachmias, C., & Nachmias, D., (2008). *Research Methods in the Social Sciences* (7xz ed.). New York, NY: Worth Publishers.

Frankish, J., C., Lovato, C., Y., & Poureslami, I. (2008). Models, theories, and principles of health promotion. In M. V. Kline & R. M. Huff (Eds.), *Health promotion in multicultural populations: A handbook for practitioners and students* (2nd ed.; pp. 57-101). Thousand Oaks, CA: Sage Publications.

Frosch, D. L., Kimmel, S., & Volpp, K. (2008). What role do lay beliefs about hypertension etiology play in perceptions of medication effectiveness? *Health Psychology, 27*(3), 320-326. doi:10.1037/0278-6133.27.3.320

Gazmararian, J. A., Kripalani, S., Miller, M. J., Echt, K. V., Ren, J., & Rask, K. (2006). Factors associated with medication refill adherence in cardiovascular-related diseases. *Journal of General Internal Medicine, 21*(12), 1215-1221. doi: 10.1111/j.1525-1497.2006.00591.x

Gatti, M. E., Jacobson, K. L., Gazmararian, J. A., Schmotzer, B., & Kripalani, S. (2009). Relationships between beliefs about medications and adherence. *American Journal of Health-System Pharmacy, 66,* 657-664. doi:10.2146/ajhp080064

Grant, A., B., Seixas, A., Frederickson, K., Butler, M., Tobin, J., N., Jean-Louis, G., & Ogedegbe, G. (2015). Effect of expectation of care on adherence to antihypertensive medications among hypertensive Blacks: Analysis of the Counseling African Americans to Control Hypertension (CAATCH) trial. *Journal of Clinical Hypertension, 18*(7), 690-696. doi:10.1111/jch.12736.

Grizzell, J. (2003). *Behavior change theories and models.* Retrieved from http://www.cpp.edu/~jvgrizzell/best_practices/bctheory.html#Health Belief Model

Gross, B, Anderson, E. F., Busby, S., Erith, K. H., & Panco, C., E. (2013). Using culturally sensitive education to improve adherence with antihypertension regimen. *Journal of Cultural Diversity, 20*(2), 75-79. Retrieved from http://tuckerpub.com/jcd.htm

Hawkshead, J., & Krousel-Wood, M. A. (2007). Techniques for measuring medication adherence in hypertensive patients in outpatient settings. *Disease Management & Health Outcomes, 15*(2), 109-118. doi:10.2165/00115677-200715020-00006

He, F. J., Li, J., & MacGregor, G. A. (2013). Effect of longer term modest salt reduction on blood pressure: Cochrane systematic review and meta-analysis of randomised trials. *BMJ, 346*, f1325. doi:10.1136/bmj.f1325

Hicken, M., T., Lee, H., Morenoff, J., House, J., S., & Williams, D., R. (2014). Racial/ethnic disparities in hypertension prevalence: Reconsidering the role of chronic stress. *American Journal of Public Health 104*(1), 117–123. doi:10.2105/AJPH.2013.301395

Horne, R., Weinman, J., & Hankins, M. (1999). The beliefs about medicines questionnaire: The development and evaluation of a new method for assessing the cognitive representation of medication. *Psychology and Health, 14*(1), 1-24. doi:10.1080/08870449908407311

Hutchison, J., Warren-Findlow, J., Dulin, M., Tapp, H., & Kuhn, L. (2014). The association between health literacy and diet adherence among primary care patients with hypertension. *Journal of Health Disparities Research and Practice, 7*(2), 109-126. Retrieved from http://digitalscholarship.unlv.edu/cgi/viewcontent.cgi?article=1203&context=jhdrp

Hyre, A., D., Krousal-Wood, M., A., Muntner, P., Kawasaki, L., & Desalvo, K., B. (2007). Prevalence and predictors of poor antihypertensive medication adherence in an urban health clinic setting. *Journal of Clinical Hypertension, 3*(9), 179-186. doi:10.1111/j.1524-6175.2007.06372

Institute for Digital Research and Education (2017). *How is effect size used in power analysis?* Retrieved from http://www.ats.ucla.edu/stat/mult_pkg/faq/general/effect_size_power/effect_size_power.htm

Kelley, D., & Preacher, K. J. (2012). On effect size. *Psychological Methods, 17*(2), 137-152. doi:10.1037/a0028086

Knapp, H. (2016). *Practical statistics for nursing Using SPSS*. Thousand Oaks, CA: Sage Publications.

Kressin, N., R., Orner, M., B., Manze, M., Glickman, M., E., & Berlowitz, D. (2010). Understanding contributors to racial disparities in blood pressure control. *Circulation: Cardiovascular Quality and Outcomes, 3*, 173-180. doi:10.1161/CIRCOUTCOMES.109.860841

Kressin, N., R, Wang, F., Long, J., Bokhour, B., G., Orner, M., B., Rothendler, J. . . . Berlowitz, D., R. (2007). Hypertensive patients' race, health beliefs, process of care, and medication adherence. *Journal of General Internal Medicine 22(6),* 768–774. doi:10.1007/s11606-007-0165-9

Lee, J. Y., Greene, P. G., Douglas, M., Grim, C., Kirk, K. A., Kusek, J. W., ... Whelton, P. K. (1996). Appointment attendance, pill counts, and achievement of goal blood pressure in the African American Study of Kidney Disease and Hypertension Pilot Study. *Controlled Clinical Trials, 17*(4), S34-S39. doi:10.1016/S0197-2456(97)82680-3

Lewis, L., M., Schoenthaler, A., M., & Ogedegbe, G. (2012). Patient factors, but not provider and health care system factors, predict medication adherence in

hypertensive Black men. *Journal of Clinical Hypertension, 4*(14), 250-255. doi:10.1111/j.1751-7176.2012.00591.x

Mahrous, F. M. (2015). Factors affecting compliance of hypertensive patients toward therapeutic regimen. *Life Science Journal, 12*(10), 62-69. Retrieved from http://www.lifesciencesite.com/lsj/life121015/007_29369life121015_62_69.pdf

Malone, H., Nicholl, H., & Tracey, C. (2014). Awareness and minimization of systematic bias in research. *British Journal of Nursing, 5*(23). 279-282. Retrieved from http://info.britishjournalofnursing.com/

Maybank, K. A., & Dickson, T. (2008). Breaking down health literacy barriers: Another piece of the puzzle to eliminate health disparities in diabetes and improve outcomes. AOA Health Watch. Retrieved from http://www.cecity.com/aoa/healthwatch/jun_08/print5.pdf

Mayo-Gamble, T. L., & Mouton, C. (2018). Examining the association between health literacy and medication adherence among older adults. Health communication, 33(9), 1124-1130. doi:10.1080/10410236.2017.1331311

McNaughton, C., D., Jacobson, T., A., & Kripalani, S. (2014). Low literacy is associated with uncontrolled blood pressure in primary care patients with hypertension and heart disease. *Patient Education and Counseling 96*, 165–170. doi: 10.1016/j.pec.2014.05.007

Middleton, J. L. (2009). A proposed new model of hypertensive treatment behavior in African Americans. *Journal of the National Medical Association, 101(1),* 12-17. doi:10.1016/S0027-9684(15)30805-1

Morisky, D. E., Ang, A., Krousel-Wood, M., & Ward, H. J. (2008). Predictive validity of a medication adherence measure in an outpatient setting. *The Journal of Clinical Hypertension, 10*(5), 348-354. doi: 10.1111/j.1751-7176.2008.07572.x

National Heart, Lung, and Blood Institute. (2015). Description of high blood pressure. Retrieved from http://www.nhlbi.nih.gov/health/health-topics/topics/hbp

National Institutes of Health. (2010). Blood pressure numbers: What they mean. *Medline Plus, 1*(5) Retrieved from https://magazine.medlineplus.gov/pdf/MLP_ Winter_2010.pdf

National Network of Libraries of Medicine (n.d.). Health literacy. Retrieved from: https://nnlm.gov/outreach/consumer/hlthlit.html#Prevalence_of_Low_Health_ Literacy

Ogedegbe, G., Mancuso, C. A., Allegrante, J. P., & Charlson, M. E. (2003). Development and evaluation of a medication adherence self-efficacy scale in hypertensive African-American patients. *Journal of Clinical Epidemiology*, *56*(6), 520-529. doi:10.1007/s10865-007-9118-3

Ogedegbe, G., Tobin, J. N., Fernandez, S., Cassells, A., Diaz-Gloster, M., Khalida, C., . . . Schwartz, J. (2014). Counseling African Americans to Control Hypertension (CAATCH): cluster randomized clinical trial main effects. *Circulation, 129*(20), 2044–2051. doi:10.1161/CIRCULATIONAHA.113.006650

Osborn, C. Y., Paasche-Orlow, M. K., Bailey, S. C., & Wolf, M. S. (2011). The mechanism linking health literacy to behavior and health status. *American*

Journal of Health Behavior 35(1), 118-128. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3085858/

Osborn, C. Y., Weiss, B. D., Davis, T. C., Skripkauskas, S., Rodrigue, C., Bass, P. F., & Wolf, M. S. (2007). Measuring adult literacy in health care: performance of the newest vital sign. *American Journal of Health Behavior, 31*(1), S36-S46. Retrieved from https://www.ingentaconnect.com/content/png/ajhb/2007/00000031/A00100s1/art00006

Pages-Puigdemont, N., Mangues, M. A., Masip, M., Gabriele, G., Fernández-Maldonado, L., Blancafort, S., & Tuneu, L. (2016). Patients' perspective of medication adherence in chronic conditions: a qualitative study. *Advances in Therapy, 33*(10), 1740-1754. doi:10.1007/s12325-016-0394-6

Pannucci, C., J., & Wilkins, E., J. (2010). Identifying and avoiding bias in research. *Plastic and Reconstructive Surgery, 26*(2), 619–625. doi:10.1097/PRS.0b013e3181de24bc

Polit, F. (2010). *Statistics and data analysis for nursing research*. Upper Saddle River, NewJersey: Pearson Education.

Powers, B., J., Olsen, M., K., Oddone, E., Z., Thorpe, C., T., & Bosworth, H., B. (2008). Literacy and blood pressure do healthcare systems influence this relationship? A cross-sectional study. *BioMed Central:Health Services Research, 8,* 219. doi:10.1186/1472-6963-8-219

Rust, C. F., Davis, C., & Moore, M. R. (2015). Medication Adherence Skills Training for African-American Breast Cancer Survivors: The Effects on Health Literacy,

Medication Adherence, and Self-Efficacy. *Social Work in Health Care, 54*(1), 33-46. doi:10.1080/00981389.2014.964447

Saounatsou, M., Patsi, O., Fasoi, G., Stylianou, M., Kavga, A., Economou, O., ... & Nicolaou, M. (2001). The influence of the hypertensive patient's education in compliance with their medication. *Public Health Nursing, 18*(6), 436-442. doi:10.1046/j.1525-1446.2001.00436.x

Scisney-Matlock, M., Bosworth, H. B., Giger, J. N., Strickland, O. L., Harrison, R. V., Coverson, D., ... & Ogedegbe, G. (2009). Strategies for implementing and sustaining therapeutic lifestyle changes as part of hypertension management in African Americans. *Postgraduate medicine, 121*(3), 147-159. doi:10.3810/pgm.2009.05.2015

Shaw, S., J., Huebner, C., Armin, J., Orzech, K., & Vivian, J. (2009). The role of culture in health literacy and chronic disease screening and management. *Journal of Immigrant Minority Health 11,* 460–467. doi 10.1007/s10903-008-9135-5

Taylor, C. (n.d.). *What level of alpha determines statistical significance?* Retrieved from http://statistics.about.com/od/Inferential-Statistics/a/What-Level-Of-Alphadetermines-Statistical-Significance.htm

U. S. Census Bureau. (2016). *Poverty threshold for 2015*. Retrieved from http://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html

U.S. Department of Health and Human Services. (2000). Quick Guide to Health Literacy Fact Sheet: Health Literacy and Health Outcomes. Retrieved from: http://health.gov/communication/literacy/quickguide/factsliteracy.htm

U.S. Department of Health and Human Services Office of Disease Prevention and Health Promotion. (n.d.). America's Health Literacy: Why We Need Accessible Health Information. Retrieved from: https://health.gov/communication/literacy/issuebrief/#adults

U.S. Department of Health and Human Services Office of Health Resources and Services Administration (2015) Retrieved from: http://www.hrsa.gov/advisorycommittees/bhpradvisory/actpcmd/Reports/twelfthreport.pdf

Valderas, J., M., Starfield, B., Sibbald, B., Salisbury, C., & Roland, M. (2009). Defining comorbidity: Implications for understanding health and health services. *Analysis of Family Medicine, 7*(4), 357–363. doi:10.1370/afm.983

Van den Broeck, J., Cunningham, S. A., Eeckels, R., & Herbst, K. (2005). Data cleaning: detecting, diagnosing, and editing data abnormalities. *PLoS Medicine*, *2*(10), e267. doi:10.1371/journal.pmed.0020267

Vogt, W. P., & Johnson, R. B. (2016). *The Sage dictionary of statistics & methodology: A nontechnical guide for the social sciences*. (5th Ed.). Thousand Oaks, CA: Sage Publications.

Warren-Findlow, J., Hutchison, J., Patel, P., Dulin, M., Tapp, H., & Kuhn, L., (2014). Assessing health literacy of hypertensive patients in a primary care setting using a

self- administered questionnaire. *Journal of Health Care for the Poor and Underserved (25)4* 1833-1843. doi:10.1353/hpu.2014.0187

Weiss, B. D., Mays, M. Z., Martz, W., Castro, K. M., DeWalt, D. A., Pignone, M. P., ... & Hale, F. A. (2005). Quick assessment of literacy in primary care: the newest vital sign. *The Annals of Family Medicine, 3*(6), 514-522. doi:10.1370/afm.405

Wexler, R., Elton, T., Pleister, A., & Feldan, D. (2009). Barriers to blood pressure control as reported by African American patients. *Journal of The National Medical Association, 101*(6), 597-603. Retrieved from http://search.proquest.com./docview/214028518/fulltextPDF/A2EBDB639281408APQ/17?accountid=14925

Appendix A: Instruments

Medication Adherence Measure for Hypertension Control

You indicated that you are taking medication for your high blood pressure. Individuals have identified several issues regarding their medication-taking behavior and we are interested in your experiences. There is no right or wrong answer. Please answer each question based on your personal experience with your high blood pressure medication.

	Please circle the correct answer.	
1. Do you sometimes forget to take your blood pressure pills?	No	Yes
2. People sometimes miss taking their medications for reasons other than forgetting. Think over the past two weeks, were there any days when you did not take your blood pressure medicine?	No	Yes
3. Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?	No	Yes
4. When you travel or leave home, do you sometimes forget to bring along your blood pressure medicine?	No	Yes
5. Did you take your blood pressure medicine yesterday?	No	Yes
6. When you feel like your blood pressure is under control, do you sometimes stop taking your medicine?	No	Yes
7. Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure treatment plan?	No	Yes
8. How often do you have difficulty remembering to take all your medications? **(Please circle the correct number**. Never/rarely 0 Once in a while 1 Sometimes 2 Usually 3 All the time 4		

Beliefs about Medication Questionnaire

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please indicate your agreement with each of the following statements by placing a checkmark in the appropriate column.	1	2	3	4	5
1. It is difficult for me to take my medicines in exactly the way my doctor told me					
2. My medicines disrupt my life					
3. Having to take medicines worries me					
4. I sometimes worry about becoming too dependent on my medicines					
5. My medicines are a mystery to me					
6. I sometimes worry about the long-term effects of my medicines					
7. My medicines are powerful					
8. I would like to change my present treatment					
9. I would like to change my present treatment					
10. My life would be impossible without my medicines					
11. My health in the future will depend on my medicines					
12. I can cope without my medicines					
13. Without my medicines I would be very ill					
14. I am in control of my medications					
15. My medicines protect me from becoming worse					
16. My medicines are effective					
17. My health at present, depends on my medicines					
18. Without medicines, doctors would be less able to cure people					
19. Newer medicines are more effective than older ones					
20. Most medicines are addictive					

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please indicate your agreement with each of the following statements by placing a checkmark in the appropriate column.	1	2	3	4	5
21. People who take medicines should stop their treatment for a while every now and again					
22. Medicines only work if they are taken regularly					
23. Medicines do more harm than good					
24. Medicines are not natural remedies					
25. All medicines are poisons					
26. It is better to do without medicines					
27. Natural remedies are safer than medicines					
28. Stronger medicines are more dangerous than weaker medicines					
29. Medicines are a necessary evil					
30. Doctors place too much trust in medicines					
31. If doctors had more time with patients thy would prescribe fewer medicines					
32. There is a big difference between a medicine and a drug					
33. The medicine you get is more important than the doctor you see					
34. Doctors use too many medicines					
35. Most medicines are safe					

The Newest Vital Sign

Nutrition Facts	
Serving Size	½ Cup
Servings per container	4
Amount per serving	
Calories 250	Fat Cal 120
	%DV
Total Fat 13g	20%
Sat Fat 9 g	40%
Cholesterol 28mg	12%
Sodium 55 mg	2%
Total Carbohydrate 30g	12%
Dietary Fiber 2g	
Sugars 23g	
Protein 4g	8%

*Percent Daily Values (DV are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Ingredients: Cream, Skim Milk, Liquid Sugar, Water, Egg Yolks, Brown Sugar, Milkfat, Peanut Oil, Sugar, Butter, Salt, Carrageenan, Vanilla Extract

Question and Answer Score School for the Newest Vital Sign

The information is on the back of a container of a pint of ice cream.
1. If you eat the entire container, how many calories will you eat?- _____ calories
2. If you are allowed to eat 60 g of carbohydrates as a snack, how much ice cream could you have? □ 1 cup (or any amount up to 1 cup) □ Half the container
3. You doctor advise you to reduce the amount of saturated fat in your _____ grams diet. You usually have 42 g of saturated fat each day, which includes 1 serving of ice cream. If you stop eating ice cream, how many grams Of saturated fat would you be consuming each day?
4. If you usually eat 2500 calories in a day, what percentage of your _____ calories Daily value of calories will you be eating if you eat one serving?
Pretend you are allergic to the following substances: penicillin, peanuts, latex gloves, and bee stings
5. Is it safe for you to eat this ice cream? □ Yes □ No
6. If No, why not?

Demographic Survey

Age _____

Gender

□ Male

□ Female

Educational Level

□ Less than high school

□ High school graduate

□ GED

□ Some College

□ Associate Degree

□ Bachelor Degree

□ Graduate Degree

Have you been diagnosed with high blood pressure? □ Yes □ No

When were you diagnosed (year) _____?

Are you on any medications to control your blood pressure? □ Yes □ No

If Yes, please list them below:

_____

_____

_____

_____

_____

Do you have prescription drug insurance to help pay for your medications?

□ Yes □ No