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Association of Hypertension Perceptions and Antihypertensive Medication Adherence among Black Hypertensive Adults in Primary Care Settings

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ASSOCIATION OF ILLNESS PERCEPTION AND ANTIHYPERTENSIVE
MEDICATIONADHERENCE AMONG BLACK HYPERTENSIVE ADULTS IN
PRIMARY CARE SETTINGS.

A DISSERTATION

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN NURSING

THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT HOUSTON

CIZIK SCHOOL OF NURSING

BY

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MAY, 2018

The University of Texas Health Science Center at Houston
School of Nursing
Houston, Texas

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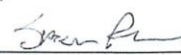
Date

To the Dean for the School of Nursing:

I am submitting a dissertation written by Stella Eke, PhD(c), DNP, RN,FNP-C and entitled "Association of Hypertension Perceptions and Medication Adherence Among Black Hypertensive Adults in Primary care Setting." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Nursing.

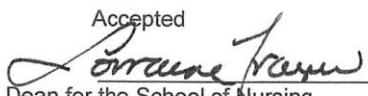

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Abstract

Association of Hypertension Perceptions and Antihypertensive Medication Adherence Among Black Hypertensive Adults in Primary Care Settings.

By Stella Eke, DNP, RN, FNP-C

May, 2018

Black adults with hypertension are more likely to have uncontrolled hypertension and suffer more complications than Whites, partially due to decreased medication adherence among Black patients. Several studies have found that Black adults with hypertension have numerous misconceptions about it and its management; however, few studies have examined hypertension perceptions in relation to antihypertensive medication adherence.

Using the common-sense model of perception and self-regulation of illness as the theoretical framework, this cross-sectional study aimed to investigate the relationship between hypertension perceptions and medication adherence among Black hypertensive adults 35 to 65 years old in primary care settings. It also examined the factor structure of hypertension causal attributions and explores gender differences in hypertension perceptions and medication adherence.

A nonprobability sample of 118 Black hypertensive adults 35 to 65 years old was selected as they presented in four primary care clinics. Instruments included the revised Illness Perception Questionnaire (IPQ-R) and the Hill-Bone Blood Pressure Therapy Compliance Scale.

The sample was middle aged ($M = 53.9$; $SD = 7.9$ years), 52.5% male, and mostly educated, with 51% having a four-year college degree or higher. Using principal components factor analysis, two factors emerged, which explained 40.8% variance in causal attributions: items related to unhealthy lifestyle choices and factors outside the individual's control, and items related to life stressors and known predisposing factors for hypertension. Using multiple regression while controlling for covariates, three IPQ-R subscales (Cyclical Timeline, Consequences, and Emotional Representation) explained 23.9% variance in medication adherence, $F(6, 111) = 5.82$, $p < .001$; however, only Consequences had a significant relationship with medication adherence ($p = .022$). Using ANCOVA, only one of the subscales had a significant gender difference; males had higher ($p = .034$) adjusted mean scores ($M = 16.2$, $SE = .64$.) than females ($M = 14.2$, $SE = .67$) for the perception that hypertension is caused by unhealthy lifestyle choices and factors outside an individual's control.

Although these findings could be applied to similar patient populations in primary care, variation in antihypertensive medication adherence is largely unexplained and needs further research. A longitudinal study with a larger sample size could further examine and clarify hypertension beliefs among Black hypertensive adults.

Keywords: Illness perceptions, medication, adherence, Black hypertensive adults.

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Summary of Study

The focus of this observational cross-sectional study was to examine the association between perceptions about hypertension and medication adherence among Black hypertensive adults 35 to 65 years of age in primary care settings. An additional focus was to investigate the causal attributions of hypertension as well as explore any gender differences in hypertension perceptions and medication adherence.

The study was conducted as outlined in the proposal, and the aims, methods, analyses, and results reflect the content of the study proposal. There was no deviation from the proposal. The proposal outlines the specific aims, significance of the problem, proposed methods, and analyses, while the manuscript outlines the execution of the study, outlining the procedures, analyses, results, and discussion.

Proposal

Introduction

Cardiovascular disease (CVD) remains the leading cause of death in the United States (American Heart Association [AHA], 2015). Furthermore, the AHA (2017a) reported that among Black adults 20 years and older, 46% of males and 47.7% of females have CVD. CVD caused the death of 49,210 Black males and 48,573 Black females in 2014 (AHA, 2017a). Hypertension (HTN) is the leading cause of CVD (Valderrama, Gillespie, & Mercado, 2013). Among non-Hispanic Blacks aged 20 years and older, 45% of males and 46.3% of females have hypertension (AHA, 2017b). Uncontrolled hypertension is considered an important risk factor for coronary heart disease, stroke, congestive heart failure, end-stage renal disease, and peripheral vascular disease (AHA, 2017a; Sulainman et al., 2009). Compared with Whites, Blacks develop hypertension earlier, have higher average blood pressure and poorer blood pressure control, causing Blacks with hypertension to have 1.3 times greater rate of nonfatal stroke, 1.8 times greater rate of fatal stroke, 1.5 times greater rate of heart disease death, 4.2 times greater rate of end-stage kidney disease, and 50% higher frequency of heart failure (AHA, 2015; Go et al., 2014).

Although 80.8% of Blacks are aware of their hypertension, and 71.9% are under treatment, only 43% have their hypertension under control (Valderrama & Gillespie, 2013). Black adults are more likely to be non-adherent to antihypertensive medications or have uncontrolled hypertension than other races (Dickinson & Plauschinat, 2008; Redmond, Baer, & Hicks, 2011; Bosworth et al., 2006). Shaya et al. (2009) reported that Black hypertensive

adults on Medicaid were 50% less adherent to medications than Whites; another longitudinal cohort study among hypertensive Medicaid recipients found that African American patients were less adherent to medications than Whites (55% vs. 61%, $p < .05$) (Dickson & Plauschinat, 2008).

Having a better understanding of the critical factors impeding medication adherence and hypertension among Black hypertensive adults will inform the design of meaningful interventions to curtail the alarming burden of uncontrolled hypertension among Blacks. Factors affecting medication adherence among Black hypertensive adults seem to be multifaceted. A systematic review by Lewis (2012) explored several factors theorized by researchers to impact medication adherence among Blacks, including healthcare system, nature of hypertension as an often-non-symptomatic disease, treatment complexity, presence of other comorbidities, and patient-related issues. Furthermore, numerous qualitative studies have found that Black adults have misconceptions about hypertension (Ogedegbe et al., 2004; Lukoschek, 2003; Wilson et al., 2002), but only a few studies have explored the relationship between these misconceptions and medication adherence (Heckler et al., 2008; Heurtin-Roberts & Resisin, 1990).

The main objective of the current study is to explore whether there is an association between hypertension perceptions and medication adherence among Black hypertensive adults after controlling for certain factors that affect medication adherence and illness perceptions and, furthermore, to investigate participants' perceptions about causes of their hypertension. Additionally, the present study intends to explore whether there are gender differences in hypertension perceptions. Most of the existing knowledge about hypertension perceptions among Black adults is based on studies with majority-

female samples. The long-term goal and research trajectory will focus on designing a theory-based randomized clinical trial using intervention strategies that promote better understanding of hypertension, medication adherence, and blood pressure control among Black hypertensive adults.

The central hypothesis in the present study is that perceptions about hypertension as it relates to disease timeline, controllability, consequences, emotional representation, illness coherence, and cause will be associated with medication adherence among Black hypertensive adults aged 35 to 65 years old being treated for hypertension in primary care settings.

Specific Aims and Hypotheses

Aim #1: To investigate participants' perceptions about causes of hypertension.

Hypothesis #1: Compared to other factors, perception of psychological factors as a cause of hypertension will explain the highest variance in views about the cause of hypertension.

Aim #2: To examine the relationship between medication adherence and hypertension perceptions as related to views about hypertension timeline, controllability, consequences, emotional representation, illness coherence, and cause among Black hypertensive adults 35 to 65 years old, while controlling for depression, educational level, duration of diagnosis, hypertension-related symptom, and severity of hypertension.

Hypothesis #2: There will be a statistically significant relationship between medication adherence and hypertension perceptions.

Aim #3: To explore to what extent hypertension perceptions and medication adherence differ by gender after controlling for confounders.

Background and Significance

When compared to Whites, Blacks develop hypertension earlier, have higher average blood pressure, and have poorer blood pressure control—all of which lead to Blacks with hypertension having a 1.3 times greater rate of nonfatal stroke, 1.8 times greater rate of fatal stroke, 1.5 times greater rate of heart disease death, 4.2 times greater rate of end-stage kidney disease, and a 50% higher frequency of heart failure (Go et al., 2014). In addition, 30-year mortality risk among White hypertensive men was 23.8% compared to 45.2% from Black hypertensive men, and 18.3% for White women compared to 39.5% for Black women (Lackland, 2014). Non-Hispanic Blacks had 90% higher odds of poorly controlled hypertension compared to non-Hispanic Whites, even after controlling for socioeconomic status, gender, age, and other clinical factors (Redmond, Baer & Hicks, 2011). Even though there has been advancement in treatment options for hypertension and other cardiovascular disease risk factors over the years, uncontrolled hypertension remains a public health burden in the United States (Mozaffana et al., 2015; Chobanian, 2015). Furthermore, Chobanian (2015) asserts that evidence has shown that these advanced antihypertensive options are effective in controlling hypertension in anyone, irrespective of race. Nevertheless, only 43% of Black hypertensive adults have their blood pressure under control (Valderrama & Gillespie, 2013).

Studies have noted that even Black hypertensive adults on government-sponsored insurance, such as Medicaid, are less adherent to antihypertensive medication compared to their White counterparts. Shaya et al. (2009) examined predictors of antihypertensive therapy adherence among 568 Medicaid hypertensive patients and found that Blacks were

50% less adherent to medication compared to their White counterparts; additionally, another study by Dickson and Plauschinat (2008) reported a significant difference in medication adherence among Black hypertensive adults compared to Whites (55% vs. 61%; $p < .05$).

The AHA projects cost of medical care for hypertension will increase from \$69.9 billion in 2010 to \$200.3 billion in 2030 (Heidenreich, 2011), while the Center for Disease Control and Prevention ([CDC], 2016) reports that hypertension costs \$48.6 billion yearly. According to the Agency for Healthcare Research and Quality ([AHRQ], 2013), in 2010 direct medical expenditure for hypertension totaled 42.9 billion, with a higher percentage of non-Hispanic Blacks (30.4%) being treated for hypertension than non-Hispanic Whites (26.7%); furthermore, annual expenditure for those treated for hypertension averaged \$733 per adult, while mean expenditure per person with hypertension was \$887 for Blacks, compared to \$679 per person for non-Hispanic Whites.

There is a need for future research to focus on populations with the highest prevalence of uncontrolled hypertension and its complications (Levine et al., 2011). The current study chose to focus on Black hypertensive adults, aged 35 to 65 years, because this is about the age where the onset and prevalence of hypertension is generally high. Although individuals start developing hypertension around middle age, Blacks develop hypertension at an even younger age (CDC, 2016; AHA, 2016). Targeting hypertensive patients within this age group (35 to 65 years) for interventions to improve understanding of hypertension and promote medication adherence will help in forestalling potential

future negative outcomes that could emanate from uncontrolled hypertension among Black hypertensive adults.

The current study is focusing on Black hypertensive adults with a history of primary hypertension for at least 12 months and who have ever been prescribed antihypertensive medication or are currently taking at least one antihypertensive medication. Restricting recruitment to patients within these parameters eliminates the chance for including newly diagnosed hypertensives that have yet to comprehend or adjust to their diagnoses or patients with borderline hypertension who may not have been prescribed medication but are on lifestyle modification instead.

The World Health Organization ([WHO], 2003) defines medication adherence as the extent to which a patient's medication-taking behavior matches with agreed recommendations from a healthcare provider. Medication adherence is further defined as the degree to which a patient follows recommended or prescribed medications by their healthcare providers as it relates to timing, dosing, and frequency (Cramer et al., 2008). According to the WHO (2003), the patient should be considered an active collaborator in their treatment rather than a passive recipient of advice from healthcare providers.

Medication non-adherence remains a problem among Black hypertensive adults. The reason for medication non-adherence among Blacks seems complex and multifaceted. Individual studies have outlined factors such as poor socioeconomic status, distrust for physicians, racial discrimination, comorbidities, disease-related problems (such as absence or presence of symptoms), complexity of medication regimen, patient-provider communication, depression, and a fatalistic view of hypertension (Greer, 2010; Ndumele et al., 2010; Ogedegbe et al., 2003; Ogedegbe et al., 2004). In addition, a recent

study with a majority-Black-hypertensive-adult sample noted that patient-provider interaction that does not involve the patient or involve patients' sociodemographic needs often leads to poor medication adherence (Schoenthaler, Knafl, Fiscella, & Ogedegbe, 2017). As noted earlier, the most recent systematic review on factors affecting medication adherence among Black hypertensive adults reported that medication adherence or non-adherence was consistently associated with self-efficacy; depression; patient-provider communication and system-related factors; disease-related factors, such as presence or absence of symptoms; and severity of hypertension (Lewis, 2012).

Although several assertions have been made to explain the poor therapy adherence among Black hypertensive patients, the solution to this problem remains difficult and elusive (Kressin, Orner, Manze, Glickman, & Berlowitz, 2010). Most of the existing interventions to address some of these problems have only yielded inconclusive or non-promising results; thus, the need to explore other potential contributing factors, such as illness perception.

Middleton (2009) suggested that the lower rates of adherence to prescribed therapy for hypertension, including exercise, diet, and medication, among Black hypertensive adults may be related to the inaccurate illness perceptions held about hypertension that are not consistent with a biomedical disease model of hypertension. Ross et al. (2004) discussed the effect of illness beliefs on predicting medication adherence, and further reported that patients who do not perceive hypertension to be serious may self-regulate their antihypertensive medications accordingly. The authors further asserted that targeting patients' health beliefs may be important in designing interventions to improve adherence to antihypertensive therapy. A qualitative study with

a sample of 19 African-American, 20 White, and nine Hispanic Veterans Administration patients reported that among other factors, patients' perceptions of the cause, course of hypertension, and experiences of hypertension symptoms were linked with their reports of their self-management behaviors (Bokhour et al., 2012). Furthermore, in a quantitative study by Rajpura and Nayak (2014), with a sample that was made up of 76.9% Whites and 18.8% Blacks, aged 55 years and older, more favorable perceptions of illness were associated with higher medication adherence scores ($p = .001$). Several qualitative studies have reported worrisome levels of misconceptions about hypertension among Black hypertensive adults (Boutin-Foster, Ogedegbe, Ravenell, Robins, & Charlson, 2007; Ogedegbe, Mancuso, & Allegrante, 2004; Schlomann, & Schmitke, 2007; Wilson et al., 2002).

Illness perception is conceptually defined as an individual's beliefs or cognitive understanding about an illness (Leventhal et al., 2003). A deeper understanding of illness perception has been shown to be useful in assessing patients' illness outcomes (Figueria & Alves, 2006; Hagger & Orbell, 2003). When faced by a health threat, an individual cognitively evaluates and tries to make sense of the health threat, after which the individual is likely to develop a coping mechanism that is guided by the level of risk perceived about the illness. These beliefs can be shaped by medical knowledge through interaction with healthcare providers, personal experiences, and/or experiences of others, such as family or friends (Petrie & Weinman, 2006). An individual that holds a misguided perception or understanding about the cause, complications, timeline, controllability/cure, and chronicity of hypertension is likely to be non-adherent to prescribed medications.

The self-regulation of health and illness model, also called the common-sense model (Leventhal, Brissette, & Leventhal, 2003), serves as the theoretical guiding framework for this study. This model emphasizes the role of illness perception in guiding coping behaviors toward an illness, which subsequently affect illness outcomes. The model proposes that in response to a health threat, individuals may develop both parallel cognitive and emotional representations, which in turn give rise to problem-based and emotional-focused coping behaviors (Leventhal et al., 2001). The authors assert that response to illness involves three processes, namely representation, coping, and appraisal.

The model posits that the mental impressions patients attach to the identity (symptoms), duration of illness, illness outcome/consequences, causal factors, and curability guide their coping mechanism toward the illness. When faced with a health threat, the individual tries to develop a cognitively reasoned understanding of the health threat, eventually develops a coping mechanism based on personal mental representation of the illness, and, finally, with time, appraises such coping mechanisms. In this study, the coping behavior of interest is medication adherence versus non-adherence.

If a patient cognitively perceives an illness such as hypertension to be non-life threatening, adherence to medication may be low. Furthermore, when an individual perceives hypertension to be chronic, they may have a different behavioral plan on how to manage or cope with the illness than when it is perceived to be episodic, acute, or temporary.

The self-regulation of health and illness model identifies five constructs of illness representation as follows (Leventhal et al., 2003):

1. Identity/Label (Symptoms)

2. Timeline
3. Consequences
4. Cause
5. Control/Cure

Identity represents the label a patient assigns to personal symptoms or perception of symptoms associated with the illness. Timeline represents the patient's perception of the duration of illness in terms of whether the illness is acute/temporary, chronic, or cyclical in nature. Consequence signifies the level of threat or complications perceived to be associated with the illness. Cause represents perceived etiology of the illness as it relates to external or internal factors or stressors. Finally, Control or Cure represents what the individual thinks about the controllability or curability of the illness by medication, and/or whether he/she can do what is needed to control the disease.

This model fits very well into the present study in that patients with high blood pressure often misconceive the disease as a non-life-threatening illness, especially due to its mostly asymptomatic nature. A misguided view of hypertension may lead to non-adherence behavior with prescribed medication. This is particularly important among Black adults as studies have reported that most Blacks attribute hypertension to stress and often engage in stress-management activities to control hypertension at the expense of medications (Heckler et al., 2008; Heurtin-Roberts, 1990; Rose, Kim, Dennison, & Hill, 2000; Wilson et al., 2002).

This problematic misconception of hypertension due to its mostly asymptomatic nature has led some patients to question their diagnoses of hypertension and the need for treatment for the disease (Schlomann, & Schmitke, 2007). Some patients with

hypertension often adjust their medication based on symptoms, which may be very deceiving since lack of symptoms does not necessarily indicate the absence of elevated blood pressure or hypertension (Schlomann, & Schmitke, 2007)—thus the reason hypertension is called a silent killer.

Literature review on perceptions about hypertension among Black hypertensive adults. A qualitative study with a sample of 93 African-American hypertensive adults reported that a good proportion of patients had nonbiomedical misconceived expectations of their treatment, where 38% expected a cure for their hypertension, 38% did not expect to take their medications for life, and 23% took medications only with symptoms (Ogedegbe et al.2004). Boutin-Foster et al. (2007) conducted a qualitative study among a sample of 60 African Americans with uncontrolled hypertension using structured interviews. This study found that Black adults with family members who had experienced complications from hypertension are more likely to perceive hypertension as a serious disease, and, furthermore, those who experience symptoms from hypertension and have family members with a history of hypertension were more likely to adhere to recommended therapy to control their high blood pressure.

Some Blacks do not perceive hypertension as a disease arising from a pathological process, but rather perceive it to be self-regulating and, thus, requiring no medication or medical treatment. In addition, some view hypertension as an expected adjustment to stressful life events (Lukoschek, 2003; Ogedegbe et al., 2004). A focus group interview of 112 to 128 adherent and non-adherent low SES Black hypertensive adults 30 to 65 years old revealed that some perceived hypertension to be a different disease from high blood pressure, where hypertension can be cured since it is caused by

stress and emotional state, while high blood pressure is caused by “thick blood and arteries” and is not curable (Lukoschek, 2003). Furthermore, hypertension was also perceived as a disease that always has symptoms. Wilson et al. (2002) investigated the lay beliefs about high blood pressure among 167 Blacks, 18 to 74 years old. This study found that some of the participants attributed high blood pressure to eating pork and other foods that were perceived as making “blood travel fast to the head,” while some described high blood pressure as “elevated blood vessels.” In addition, the authors noted that some of the participants had the perception that high blood pressure can be cured with vitamins, garlic, and herbs. In a qualitative study using a sample of 42 Black hypertensive adults 30 to 65 years (66.7% women), Lukoschek (2003) reported that participants believed that hypertension is a separate disease from high blood pressure, where high blood pressure is a physiological disease while hypertension results from emotional or psychological state. Another qualitative study using 47 Black women noted that though hypertension is seen as a serious disease, the cause was attributed to psychological stress (Webb & Gonzalez, 2006).

The literature search revealed that only a few studies have examined the relationship between perceptions of hypertension and medication adherence among Black hypertensive adults. An older study by Heurtin-Roberts and Reisin (1992) assessed the relationship between lay beliefs about hypertension and medication adherence among 60 Black hypertensive women attending a public-hospital-based clinic in New Orleans using field notes, medication diaries, and pill count and found a significant association between illness perception and treatment adherence behaviors ($p = .01$ and $.001$). Participants who perceived the cause of hypertension within the non-biomedical model were more

likely to be non-adherent with their medications compared to those who had biomedical views of hypertension (relative risk = 2.3; 95% CI [1.2-4.4]). Heckler et al. (2008) carried out the most recent study on the impact of perception or common-sense illness beliefs on therapy adherence among 102 Black adult hypertensive patients. This study found that perception of stress as the cause of hypertension correlated ($r = .34$, $df = 100$, $p < .01$) with engaging in stress-reducing behaviors to manage high blood pressure at the expense of medication and lifestyle modifications, while beliefs in the biomedical model of hypertension weakly correlated with medication adherence and lifestyle modifications to control high blood pressure ($r = -.21$, $df = 100$, $p < .05$).

Some intervention studies, with sample sizes ranging from 55 to 1,059, did not directly target hypertension perceptions but instead aimed at improving understanding of hypertension, medication adherence, and blood pressure control or reduction among Black hypertensive adults; these studies have reported mostly non-significant differences in blood pressure control or reduction between the intervention and control groups from baseline to follow-up (Greer et al., 2015; Ogedegbe et al., 2008; Johnson et al., 2011; Roberts et al., 2012; Ogedegbe et al., 2014; Webb, 1980).

There is an obvious gap in knowledge: Though qualitative studies have elicited various levels of misconceptions about hypertension among Black adults, there have not been many quantitative studies exploring the relationship between these misconceptions about hypertension and medication adherence. Most of what is known about hypertension perception among Black adults has been based on qualitative studies with samples that were majority female. As discussed earlier, the most recent study that

explored the association between hypertension perception and medication adherence among Black hypertensive adults was in 2008.

To address this gap in knowledge, the central aim of the present study is to examine the association between hypertension perceptions and medication adherence among Black hypertensive adults 35 to 65 years old being treated for hypertension in primary care settings and to examine whether there will be any gender differences in hypertension perceptions and medication adherence.

Innovation. The present study of the association between hypertension perceptions and medication adherence is the first to focus specifically on Black hypertensive adults 35 to 65 years old in primary care. Recruiting participants from multiple primary care clinics will produce a sample that is not only heterogeneous, but also representative of the population of interest. The findings of the present study will help expand the knowledge-base about the association between hypertension perceptions and medication adherence among this population. Most of what is currently known about hypertension perceptions among Black hypertensive adults have been based solely on qualitative studies. This study will be one of the few studies that examine the association between hypertension perceptions and medication adherence, where hypertension perceptions will be measured quantitatively, allowing for analysis of the relationship between these two variables. The validity of the findings of this study will be enhanced by controlling for most of the important confounding factors known to impact medication adherence and illness perceptions. The present study will also highlight whether there are gender differences in hypertension perceptions and medication adherence. Most of what is known about hypertension perception or its association with medication adherence

among Black adults has been based on studies with samples that were majority female, however, the present study will attempt to recruit a good representation of both genders.

Approach

Research design and setting. This is an observational cross-sectional research design study. A non-probability sampling method will be used in recruiting participants into the study. Potential participants will be recruited concurrently from four primary care clinics in the Houston TX metropolitan area. One clinic is an employee-based primary care clinic, while the other three are internal medicine or family primary care clinics that serve large populations of Black hypertensive adult patients. Recruitment from the clinics will occur in person as the patients present for their regularly scheduled appointments with their healthcare providers. Participants' voluntary participation will be sought by the principal investigator (PI) in the waiting area or lobby of the clinics. Additionally, recruitment flyer will be placed in the lobby and examination rooms of the clinics so that potential participants whose doctors' visits occur when the PI is not present in the clinic will have the opportunity to contact the PI if interested in study participation.

The rationale for recruiting from several clinics is two-fold: to recruit a sample that will be representative of the intended patient population and to counteract the chance for low response rate that could occur if recruitment is limited to only one or two sites. Studies have suggested that Blacks tend to be hesitant with participating in research studies due to mistrust for the healthcare system (Scharff et al., 2010; Kennedy, Mathis, & Wood, 2007). In addition to recruiting from multiple sites, other strategies to improve participation include offering compensation; ensuring convenience by completing the questionnaires at the time of already scheduled doctors' appointments; using direct face-

to-face interaction since in-person reassurance increases comfort with the research process (Satia, Galanko, & Rimer, 2005); and offering tangible incentives (Qualls, 2002). Each participant will receive a \$15 gift card to Wal-Mart or Starbucks in appreciation for their time and effort, which should in turn improve response rate. Gift card incentives were found to be one of the predictors of increased survey response rate among African Americans (Liu, & Geidenberger, 2011). Lukoschek (2003) and Heckler (2008) compensated their respective sample of hypertensive Black adults in an amount ranging from \$10 to \$15.

Approval to conduct the study will be obtained from the University of Texas Health Science Center-Houston Institutional Review Board (IRB). Written permission to recruit patients and conduct chart review will be obtained from each of the clinics' management. Consent will be obtained from each participant for participation and chart review. Recruitment is anticipated to last up to three months. Validated instruments will be used to collect data on the dependent variable (medication adherence) and independent variables (illness perceptions), while a short form will be designed to collect demographic data and information about potential confounders. The purpose of the chart review is to verify information about demographic characteristics, confounders, and eligibility criteria.

Sample selection criteria. The sample selection criteria are as follows:

Inclusion Criteria. (a) Self-identified Black adults; (b) males and females, aged 35 to 65 years; (c) diagnosis of primary/essential hypertension (PI will confirm during chart review); (d) duration of hypertension diagnosis for at least 12 months (PI will confirm during chart review); (e) have been prescribed or is taking at least one

hypertensive medication (PI will confirm during chart review); (e) participants must be able to read and write in English.

Exclusion criteria. (a) Potential secondary hypertension as supported by history of sleep apnea, renal artery disease, stenosis, certain cardiovascular diseases, hyperthyroidism, pregnancy, or adrenal gland tumor (pheochromocytoma) upon chart review by PI, (b) severe mental disorder that can hinder comprehension of instructions; (c) refusal to provide informed consent.

Sample size estimation. The estimated sample size was based on multiple regression since both the dependent and independent variables are continuous. Sample size was estimated through power analysis using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007). With an alpha level of .05, power of .80, small effect size of .07 (F^2), and number of predictors as 10 (seven IR subscales plus theorized potential three subscales of the Cause section), the estimated sample size is 115. Even though the estimated sample size is 115, the PI plans to recruit up to 150 respondents to compensate for missing data and to have a reasonable sample size for factor analysis as planned in this study.

No software was identified that can be used to determine sample size for factor analysis. The developers of the IPQ-R questionnaire have recommended that factor analysis can be conducted using a sample size of 85 or more (Moss-Morris et al., 2003). However, some authors have recommended that a sample size of 150, or 10 cases per item to be analyzed, while others recommend a ratio of 5 cases per item (Pallant, 2007). A study that explored the association between illness perception and self-care behavior among Black hypertensive adults, 18 to 65 years, conducted a factor analysis of the 18

causal items of the IPQ-R using a sample of 111, so the present study will use any sample size close to 111 in conducting a factor analysis.

To reach the indicated sample size, the PI estimates that about 500 potential participants may need to be approached and screened. This is only an estimate since the PI will have no prior knowledge of how many patients in the clinic will meet inclusion criteria in this study considering that there will be no chart or record review before data collection. Additionally, most of the clinics are not able to run an accurate report on their patient population to identify the number of patients that are likely to meet inclusion criteria. However, to maximize the chance to recruit a meaningful number of participants on each recruitment day, the PI will ask the clinics to indicate which days and times many patients that are likely to meet inclusion criteria are scheduled, and the PI will be at the clinics on those days.

Instruments.

Illness Perception Questionnaire. Illness (hypertension) perception will be measured using the revised Illness Perception Questionnaire (IPQ-R), a scale that was developed to quantitatively assess patients' perception of illnesses across a range of chronic diseases (Moss-Morris et al., 2002). The questionnaire was developed using the constructs of the common-sense model as the theoretical framework. The IPQ-R consists of two illness perception components, namely Illness Representation (IR) and Causes. The Identity component was not part of the revised IPQ-R, though it was only included for the purposes of psychometric testing (Moss-Morris et al., 2002). This study will survey participants using the hypertension version of this scale.

The IR component of the IPQ-R consists of 38 questions incorporated into seven subscales: Timeline (acute/chronic), Cyclical Timeline (episodic/temporary/unpredictable), Treatment Control, Personal Control, Consequences, Illness Coherence, and Emotional Representations. Timeline (acute/chronic), Consequences, Personal Control, and Emotional Representations are represented by six items on the questionnaire, respectively, while five items represent Treatment Control and Illness Coherence, respectively. Finally, Cyclical Timeline is represented by four items on the questionnaire. Each item is ranked on a Likert-type scale, with responses ranging from 1 (strongly disagree) and 5 (strongly agree). High scores on the respective subscales supports beliefs that hypertension is a chronic illness (Timeline), unpredictable/episodic (Cyclical Timeline), can severely impact quality of life (Consequences), and that it can be controlled by either personal behaviors (Personal Control) or by medical treatment (Treatment Control) (Moss-Morris et al., 2002). The coherence subscale represents good personal understanding of the condition; thus, having a high score on a statement such as, “I have a clear picture or understanding of my high blood pressure,” indicates a good understanding of hypertension. The score from each subscale is summed to get a total for the respective subscales. There is no overall total score for the IPQ-R.

The Cause component of the IPQ-R contains an additional 18 short items, which the developers recommend using as a grouping variable through factor analysis when there is sufficient sample size (85 or more) to identify the respective dimensions of perceptions of cause of an illness, after which the groups can be used as subscales in the analysis (Moss-Morris et al., 2002).

The authors of the IPQ-R tested its validity using principal component analysis (PCA), where seven IR subscales were extracted, each with at least three factor loadings ranging from 0.5 to 0.86 (Moss-Morris et al., 2002). The Cronbach's alpha ranged from .79 to .89 for the IR subscales, and .67 to .86 for the causal items (Moss-Morris et al., 2002). Validity evidence was further explored by a study that aimed to examine the association between hypertension perception and self-care behavior among 111 Black hypertensive adults, 18 to 65 years, and reported Cronbach's alphas ranging from .59 to .83 for the seven IR subscales, where Treatment Control had the lowest internal consistency (Cronbach's alpha .59), followed by Personal Control (.63) and Consequences (.66) (Picket et al., 2014).

The authors of the scale extracted three subscales from the 18 causal attribution items; which include (a) psychological factors, such as stress, and emotions; (b) risk factors, such as heredity, aging, poor medical care, and health behaviors; and (c) immunity, such as pollution, virus or altered immunity. These three causal subscales had Cronbach's alphas ranging from .67 to .86. Additionally, the study by Picket et al. (2014), which used a sample of 111 African Americans, also extracted three causal attribution subscales with acceptable factor loadings, including (a) psychological factors (emotional state, mental attitude, personality, family problems, overwork, or aging); (b) uncontrollable factors, such as germs or viruses, pollution, chance or bad luck, altered immunity, or accidents; (c) biomedical explanation, such as personal behavior, diet or eating habit, stress or worry, or poor medical care. The dimensions of causal attribution from the factor analysis conducted by these respective authors were similar and

consistent with each other except for one item (“stress or worry”), which seemed to overlap between psychological and biomedical dimensions.

The planned factor analysis in the present study would likely extracted similar dimensions. Though the causal attribution subscales by Moss-Morris et al. (2002) demonstrated acceptable reliability with Cronbach’s alpha coefficients ranging from .67 to .86, the sample was general population with respective medical illnesses. However, Pickett et al (2014) used a sample of Black hypertensive adults and identified three meaningful causal subscales, but no reliability testing of these subscales was conducted.

In the present study the PI will test the internal consistency reliability of the IR subscales and the causal attribution subscales. For each subscale a Cronbach’s alpha coefficient of at least 0.70 will be considered acceptable evidence of reliability. However, subscales that have a Cronbach’s alpha less than .7, but not below .6, will be included in the final analysis, but the low internal consistency will be discussed as a weakness or limitation to the study’s finding as it relates to that particular subscale. Any subscale with a reliability coefficient less than .6 will be eliminated, and the final analysis will be conducted without that subscale.

Hill-Bone Blood Pressure Therapy Compliance Scale. The dependent variable “medication adherence” will be measured using the Hill-Bone Compliance to High Blood Pressure Therapy Scale. The questionnaire was designed to assess patient behaviors for three behavioral domains of high blood pressure therapy, including reduced sodium intake, appointment keeping, and medication adherence (Kim, Hill, Bone, & Levine, 2000), however, only the medication subscale will be used in this study since the focus is on medication adherence. The total scale contains 14 items, grouped into three subscales,

of which eight items were related to questions about medication adherence; one prescription-filling adherence question is often used by researchers in addition to the eight medication-taking items. The authors indicated that researchers interested in measuring medication adherence should use the medication-taking subscale alone. Each item on the scale is a four-point Likert type scale (“4” equals “all the time” and “1” equals “none of the time”). The lower the scores, the better the patient’s adherence level. According to the authors, the items are assumed to be additive; thus, when summed, a score of nine on the medication adherence subscale represents “perfect adherence” while a score of 36 denotes “perfect non-adherence.”

Validity of the questionnaire was established through two studies: one that utilized 309 hypertensive Black males 18 to 55 years old and another with 718 Black hypertensive adults 18 years and older; these studies’ Cronbach’s alpha coefficients were .74 and .85 for the total scale, respectively (Kim et al., 2000). In addition, a study with a sample of 80 Black women assessing the relationship between spirituality and medication adherence reported a Cronbach’s alpha of .843 for the medication adherence subscale (Abel & Greer, 2017). A study with a sample of 190 urban Black men reported a Cronbach’s alpha of .77 for the medication adherence subscale of the questionnaire (Kim, Han, Hill, Rose, & Roary, 2003). Eight experts confirmed the content validity of the scale; additionally, construct validity through PCA using varimax rotation extracted three subscales, though factor loading in both study 1 and 2 showed that the medication-adherence subscale possessed the most meaningful loadings. Predictive validity showed that the summed scores of each subscale correlated with blood pressure level and control (Kim et al., 2000).

Demographic data and confounding variables form. A short questionnaire will be designed to collect demographic data including age, gender, health insurance, and employment status. The demographic data form will also be used to collect data about covariate or confounding variables anticipated to impact both illness perceptions and medication adherence, including duration of hypertension diagnosis, educational level, experience of hypertension-related symptoms, severity of hypertension, and history of depression (comorbidity) diagnosed by a healthcare provider. Educational level will be operationally categorized into four levels: “less than high school,” “high school,” “some college or trade school,” and “four-year college or greater.” Gender will be categorized into two options, “male” or “female.” Participants will be asked to state how long they have been diagnosed with hypertension. Severity of hypertension will be categorized into two levels based on blood pressure classification by the Joint National Committee on Prevention, Detection, Evaluation and Treatment of Hypertension ([JNC], 2003): stage 1 = 140-159/90-99; stage 2 = $\geq 160/\geq 100$, where stage 1 will represent mild hypertension, and stage 2 will represent severe hypertension. The average of the past two blood pressure readings will be taken to decide on the severity of blood pressure. Symptoms of hypertension will be categorized as “yes (present)” or “no (absent).” In addition, chart review will be conducted to verify information about demographic characteristics and confounders.

Procedures for data collection. Questionnaires that will be completed include the 56-item Illness Perception Questionnaire, the nine-item Hill-Bone medication adherence questionnaire, and a short (10 items) demographic questionnaire, for a total of 75 items.

Data collection from the four clinics will occur in person, where the principal investigator (PI) will recruit participants as they come to their regularly scheduled appointments with their healthcare providers. Every adult patient of African ancestral origin waiting to see their healthcare providers in the lobby or waiting area of the clinics to see their healthcare providers, will be approached by the PI with the recruitment flyer. Those who indicate interest, meet inclusion criteria, and give informed consent, will be given the questionnaires to complete. Each completed questionnaire will be assigned a study identification number.

In addition, recruitment flyers will be placed in the clinics' lobbies or waiting areas as well as exam rooms, so that patients whose doctors' appointments occur when the PI is not present at the clinics can still contact the PI for participation if interested. The recruitment flyer will contain information about the purpose of the study, inclusion criteria, and procedure, as well as the PI's contact information. The consent form will contain the purpose of the study, benefit, risks, and confidentiality, as well as the PI's contact information.

Any participant who contacts the PI over the phone and indicates interest in participation, will be scheduled to meet with the PI at the clinic during their next scheduled appointment at the clinic for completion of the questionnaires and consent forms. Understandably, there may be a chance that it may not be feasible for the PI to meet with these patients since their next appointment could be in another three months. Even though patients with chronic illnesses such as hypertension are usually seen by their healthcare providers every three to six months, the frequency of visits is often determined by whether patients' hypertension is controlled versus uncontrolled, and by other medical

needs of the patient. These potential participants may have additional visits to the clinics for other medical needs since these are their medical homes.

Privacy will be maintained while interacting with the potential participants in the lobby, and neither the PI nor the participants will engage in any discussion pertaining to a sensitive or private issue in the lobby. Each participant will receive a Walmart or Starbucks gift card worth \$15 at the completion of the questionnaires.

Chart review will be conducted to confirm diagnosis of primary or essential hypertension, duration of hypertension diagnosis, history of depression, and blood pressure reading after the participants have signed consent forms and completed the questionnaires. To conduct chart review, each participant will be asked for their name and date of birth, which will be written on a separate paper with the respondents' study identification numbers. This information will only be needed to identify the respective charts for review on the day the questionnaires are completed and will be shredded before the PI leaves the clinic. After chart review, the participants' completed questionnaires will only retain the respective study identification numbers, and no other form of identifier will be attached to the completed questionnaires. During chart review, the electronic medical record (EMR) for the clinics that are using EMR usually will record patients' hypertension diagnosis as primary/essential or secondary. When not sure, merely clicking on the diagnosis (hypertension) from the list of patients' diagnoses will reveal the ICD-10 (I10) code for essential/primary hypertension. For clinics using paper charts, in the absence of other disease that could cause elevated blood pressure, the handwritten diagnosis of "Hypertension" or "HTN" in the chart by the providers will be assumed to refer to primary/essential hypertension.

Data analysis. All data analysis will be conducted using SPSS software, version 23. Descriptive statistics will be conducted to explore characteristics of the sample. Respective descriptive statistics will be conducted to explore distributions for the continuous independent variables as well as the frequency of the categorical outcome variables. In addition, a univariable analysis will be conducted to check for association between medication adherence and each of the predictor (illness perceptions) variables. Reliability testing will be conducted to check for the reliability of the IPQ-R subscales (IR and Cause subscales) for the current sample. Factor analysis of the causal items will be conducted first to identify the causal attribution subscales; then these subscales will be used in combination with other IPQ-R (IR) subscales to conduct the multiple regression for Aim #2. Multiple regression will be conducted to check whether all or some the IPQ-R subscales predict medication adherence while controlling for covariates.

Aims, hypotheses, and statistical testing.

Aim #1: To explore participants' perceptions about the cause of hypertension.

Hypothesis #1: Among other factors, perception of psychological factors as cause of hypertension will explain the highest variance in views about the cause of hypertension.

Statistical Analysis for Aim #1: Factor analysis will be conducted using the 18 cause perception items of the IPQ-R. Exploratory factor analysis with varimax rotation will be conducted to decipher the cluster of views about the cause of the sample's hypertension. Factors with acceptable factor loadings will be selected and defined. The decision to assign an item to a factor will be based on a priori setting of greater than or equal to .40 for factor loadings and less than or equal to .20 for cross-loadings (Ferguson & Cox, 1993). An acceptable loading for each factor must be at least three items (Watson & Thompson,

2006). Previous studies have identified three meaningful causal attribution factors using the IPQ-R scale (Moss-Morris et al., 2003; Pickett et al., 2014).

Aim #2: To examine the relationship between medication adherence and perceptions about hypertension timeline, controllability, consequences, emotional representation, illness coherence, and cause among Black hypertensive adults 35 to 65 years old, while controlling for depression, educational level, age, duration of hypertension diagnosis, experience of hypertension-related symptom, and severity of hypertension.

Hypothesis #2: There will be a statistically significant positive relationship between medication adherence and hypertension perceptions, where high scores on the subscales of the IPQ-R will be associated with better medication adherence scores.

Statistical Analysis for Aim#2: Multiple regression analysis will be conducted to determine whether IPQ-R subscales (Timeline [acute/chronic], Cyclical Timeline [episodic], Personal Control, Treatment Control, Consequences, Emotional Representation, Illness Coherence, and Cause) will predict medication adherence while controlling for the confounders (hypertension-related symptoms, severity of hypertension, depression, age, educational level, and duration of hypertension diagnosis). All potential confounding variables will be included in the initial model, and nonsignificant ones will be eliminated one at a time, starting with the highest p -value. Only significant confounders ($p < .05$) will be retained.

Aim #3: To explore to what extent hypertension perceptions and medication adherence differ by gender while controlling for confounders.

Statistical Analysis for Aim #3(a): Since illness perception is continuous variable while gender is a categorical variable, ANCOVA will be the most appropriate analysis to

explore gender differences in each of the hypertension perceptions subscales.

Confounders that will be controlled for include educational level, age, and duration of hypertension diagnosis.

Statistical Analysis for Aim #3(b): A second ANCOVA will be conducted to explore to what extent medication adherence differs by gender after controlling for age, number of medications, educational level, and comorbidity (depression).

Limitations. Misclassification of medication adherence or illness perceptions may be one of the limitations of this study due to the use of self-report questionnaires to measure these variables. Self-report questionnaires may lead to participants' overestimation of adherence, recall bias, and likelihood for giving socially acceptable responses (Morisky et al., 2008). Additionally, data collection will involve use of long self-report questionnaires, which may lead to a high rate of missing data, however, the sentences are short, easy to understand, and the questionnaire takes less than 20 minutes to complete. The PI will review the completed questionnaires at time of completion, and each participant will be asked to complete any missing data.

Another limitation of this study is that cause and effect cannot be established with cross-sectional study designs. Conducting factor analysis with a small sample size may also cause the factor structures to be unreliable (Pallant, 2007). One major problem with the proposed procedures is the inability to recruit the estimated sample size; however, the chance for this problem is reduced since recruitment will occur in several clinics.

Despite these limitations, there is value in the knowledge to be gained and the results will inform future longitudinal studies with larger sample sizes.

Another important limitation is the inability to address the impact of acculturation on hypertension perceptions, specifically in terms of the duration a foreign-born participant may have lived in the US. However, the current study's focus is not strictly on a foreign-born sample of hypertensive population. Future study in this area could focus on exploring the association between hypertension perceptions and acculturation among foreign-born hypertensive Black adults residing in the US.

Human Subjects

Approval to conduct this study will be obtained from the University of Texas Health Science Center - Houston Institutional Review Board (IRB). Health Insurance Portability and Accountability Act (HIPAA) guidelines will be maintained throughout the process. Consent will be obtained from participants for participation and chart review. Permission for recruitment will be obtained from each recruitment sites. All signed consent forms will be separated from the completed questionnaires and stored in a different folder in a locked cabinet. The PI will not leave the clinics with any patient-identifying data from participants' charts. No date of birth or name will be recorded on the completed questionnaires; however, the PI will collect participants' names and date of birth for chart review; in addition, the HIPPA consent forms will also contain the participants' names and signature. Any identifier collected from the participants to identify their records for chart review will be shredded in the clinic before the PI departs on each recruitment day. In general, there is minimal risk involved in this study. This study is not anticipated to infringe on participants' rights or cause any harm.

One of the risks that could be associated with this study is breach of confidentiality. To ensure confidentiality, a study identification number will be assigned

to each participant, and data from completed questionnaires will not be linked to with any personal identifiers. Confidentiality will be strictly protected to the extent allowable by law. The principal investigator, dissertation chair, and statistician will have access to questionnaire data or survey responses, and these data will be completely de-identified; thus, participation in the study will not affect participants' care at the clinics.

No patient-identifying information will be included in any publication of the study. Questionnaires and consent forms will be stored in separate folders in a locked cabinet and will be shredded one year after the study is completed.

Another risk is the discomfort that may originate from having to complete several questionnaires with a total of 75 items, however, the sentences are short and easy to understand. Participants will be assured they can take a break or stop the questionnaire at any time if they experience any physical discomfort or fatigue while completing the questionnaires.

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Manuscript

Association of Hypertension Perceptions and Antihypertensive Medication Adherence Among Black Hypertensive Adults in Primary Care Settings.

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Introduction

Hypertension (HTN) is the leading cause of most cardiovascular diseases (Valderrama, Gillespie & Mercado, 2013). Among non-Hispanic Blacks aged 20 years and older, 45% of males and 46.3% of females have hypertension, compared to 34.5% for White males and 32.3% for White females (American Heart Association [AHA], 2017a). Uncontrolled hypertension is considered an important risk factor for coronary heart disease, stroke, congestive heart failure, end-stage renal disease, and peripheral vascular disease (AHA, 2017b; Sulainman et al., 2009). Compared with Whites, Blacks develop hypertension at an earlier age, have higher average blood pressure, and poorer blood pressure control, leading to Blacks with hypertension having 1.3 times greater rate of nonfatal stroke, 1.8 times greater rate of fatal stroke, 1.5 times greater rate of heart disease death, 4.2 times greater rate of end-stage kidney disease, and 50% higher frequency of heart failure (AHA, 2015; Go et al., 2014).

Although 80.8% of Blacks are aware of their hypertension, with 71.9% under treatment, only 36.9 % have their hypertension under control; meanwhile, 79.1% of Whites are aware of their hypertension, with 73.9% under treatment, and 42.9% have controlled hypertension (AHA, 2017c; Valderrama & Gillespie, 2013). Black adults are

more likely to be non-adherent to antihypertensive medications and more likely to have uncontrolled hypertension than other races (Redmond, Baer, & Hicks, 2011; Dickinson & Plauschinat, 2008; Bosworth et al., 2006). Shaya et al. (2009) examined predictors of antihypertensive therapy adherence among 568 Medicaid hypertensive patients and found that Blacks were 50% less adherent to medication compared to their White counterparts. Furthermore, a longitudinal cohort study among hypertensive Medicaid recipients found that African American patients were less adherent to medications than Whites (55% vs. 61%, $p < .05$) (Dickson & Plauschinat, 2008). Non-Hispanic Blacks had 90% higher odds of poorly controlled hypertension compared to non-Hispanic Whites, even after controlling for socioeconomic status, gender, age, and other clinical factors, such as smoking status, sodium intake, and alcohol (Redmond, Baer & Hicks, 2011).

Even with the advancement over the years in treatment options for hypertension and other cardiovascular disease risk factors, uncontrolled hypertension remains a public health burden in the United States (Mozaffana et al., 2015; Chobanian, 2015). Furthermore, Chobanian (2015) asserts that evidence has shown that the new and advanced antihypertensive medication options have been shown to be effective in controlling hypertension in anyone, irrespective of race.

Better understanding of the critical factors impeding medication adherence and blood pressure control among Black hypertensive adults will inform the design and implementation of meaningful interventions to curtail the alarming burden of uncontrolled hypertension among the Black adult population. Factors affecting medication adherence among Black hypertensive adults seem to be multifaceted. A systematic review by Lewis (2012) explored several factors theorized by researchers to

impact medication adherence among Blacks, including healthcare system, nature of hypertension as an often-non-symptomatic disease, treatment complexity, presence of other comorbidities, and patient-related issues.

Many qualitative studies have reported that Black adults have misconceptions about hypertension (Ogedegbe, Mancuso, & Allegrante, 2004; Lukoschek, 2003; Wilson et al., 2002), but only a few studies have examined the relationship between these misconceptions and medication adherence (Heckler et al., 2008; Heurtin-Roberts & Resisin, 1990). There is a need to have a better understanding of perceptions about hypertension held by Black hypertensive adults and the extent to which these perceptions impact medication adherence. The current study focuses on Black hypertensive adults aged 35 to 65 years because this is the age group that has a high incidence and prevalence of hypertension among Black adults. Although individuals start developing hypertension around middle age, Blacks develop hypertension at an even younger age on average (CDC, 2016; AHA, 2016).

The first objective of this study was to investigate perceptions of causal attributions of hypertension among Black hypertensive adults. The second but primary objective of the current study was to examine whether there is an association between hypertension perceptions and medication adherence among Black hypertensive adults 35 to 65 years of age in primary care settings, after controlling for the effects of certain confounders that could also impact hypertension perceptions and medication adherence. Because most of the existing knowledge about hypertension perceptions among Black adults is based on studies with majority-female samples, the third objective was to

explore whether there were gender differences in hypertension perceptions and medication adherence.

Background

The World Health Organization ([WHO], 2003) defines medication adherence as the extent to which a patient's medication-taking behavior matches with agreed recommendations from a healthcare provider. Medication adherence is further defined as the degree to which a patient follows recommended advice or takes medications with the timing, dosing, and frequency prescribed by their healthcare providers (Cramer et al., 2008). According to the WHO (2003), the patient should be considered an active collaborator in their treatment rather than a passive recipient of advice from healthcare providers.

The poor medication adherence and hypertension control among Black hypertensive adults have placed a high burden of morbidity and mortality associated with hypertension on this population as well as posed a serious public health burden. A 30-year mortality risk among White hypertensive men was 23.8%, compared to 45.2% for Black hypertensive men, and 18.3% for White women, compared to 39.5% for Black women (Lackland, 2014). According to the Agency for Healthcare Research and Quality ([AHRQ], 2013), in 2010, direct medical expenditure for hypertension totaled 42.9 billion, with a higher percentage of non-Hispanic Blacks (30.4%) being treated for hypertension than non-Hispanic Whites (26.7%); furthermore, annual expenditure for those treated for hypertension averaged \$733 per adult, while mean expenditure per person with hypertension was \$887 for Blacks compared to \$679 per person for non-Hispanic Whites. The AHA projects the cost of medical care for hypertension will

increase from \$69.9 billion in 2010 to \$200.3 billion in 2030 (Heidenreich, 2011), while the Center for Disease Control and Prevention ([CDC], 2016) reports that hypertension costs \$48.6 billion yearly.

As noted earlier, the reason for medication non-adherence and poor blood pressure control among Blacks seems complex and multifaceted. Individual studies have outlined factors such as poor socioeconomic status, distrust for physicians, racial discrimination, comorbidities, disease-related problems (such as absence or presence of symptoms), complexity of medication regimen, patient-provider communication, depression, and a fatalistic view of hypertension (Greer, 2010; Ndumele et al., 2010; Ogedegbe et al., 2003; Ogedegbe et al., 2004). Additionally, a recent study with a majority-Black-hypertensive-adult sample noted that patient-provider interaction that does not involve the patient or involve patients' sociodemographic needs often leads to poor medication adherence (Schoenthaler, Knafl, Fiscella, & Ogedegbe, 2017). The systematic review by Lewis (2012) on factors affecting medication adherence among Black hypertensive adults reported that non-adherence was consistently associated with self-efficacy; depression; patient-provider communication and system-related factors; disease-related factors, such as presence or absence of symptoms; and severity of hypertension.

Although the poor medication adherence and blood pressure control among Black hypertensive adults have been attributed to numerous factors, the solution to the problem remains difficult and elusive (Kressin, Orner, Manze, Glickman, & Berlowitz, 2010). Most of the existing interventions to address some of these factors have only yielded

inconclusive or non-promising results; thus, the need to explore other potential contributing factors, such as illness perception.

Illness perception is conceptually defined as an individual's beliefs or cognitive understanding about an illness (Leventhal et al., 2003). A deeper understanding of illness perception has been shown to be useful in assessing patients' illness outcomes (Figueiras & Alves, 2007; Hagger & Orbell, 2003). When faced by a health threat, an individual cognitively evaluates and tries to make sense of the health threat, after which the individual is likely to develop a coping mechanism that is guided by the level of risk perceived about the illness. These beliefs can be shaped by medical knowledge through interaction with healthcare providers, personal experiences, and/or experiences of others, such as family or friends (Petrie & Weinman, 2006). An individual who holds a misguided perception or understanding about the cause, complications, timeline, controllability/cure, and chronicity of hypertension is likely to be non-adherent to prescribed medications.

Middleton (2009) suggested that the lower rates of adherence to prescribed therapy for hypertension, including exercise, diet, and medication among Black hypertensive adults may be related to the inaccurate illness perceptions held about hypertension that are not consistent with a biomedical disease model of hypertension. Ross et al. (2004) discussed the effect of illness beliefs on predicting medication adherence, and further reported that patients who do not perceive hypertension to be serious may self-regulate their antihypertensive medications accordingly. The authors further suggested that targeting patients' health beliefs may be important in designing interventions to improve adherence to antihypertensive therapy. A qualitative study with

a sample of 19 African-American, 20 White, and nine Hispanic Veterans Administration patients, reported that among other factors, patients' perceptions of the cause, course of hypertension, and experiences of hypertension symptoms were linked with their reports of their self-management behaviors (Bokhour et al., 2012). A quantitative study by Rajpura and Nayak (2014), with a sample that was made up of 76.9% Whites and 18.8% Blacks aged 55 years and older reported that more favorable perceptions of illness were associated with higher medication adherence scores ($p = .001$).

Conceptual framework. The self-regulation of health and illness model, also known as the common-sense model (Leventhal, Brissette, & Leventhal, 2003) served as the theoretical guiding framework for the present study. This model emphasizes the role of illness perception in guiding coping behaviors toward an illness, which subsequently affect illness outcomes. The model proposes that in response to a health threat, individuals may develop both parallel cognitive and emotional representations, which in turn gives rise to problem-based and emotional-focused coping behaviors (Leventhal et al., 2001). The authors proposed that response to illness involves three processes, namely representation, coping, and appraisal.

The model posits that the mental impressions patients attach to the identity (symptoms), duration of illness, illness outcome/consequences, causal factors, and control/curability guide their coping mechanism toward the illness. When faced with a health threat, the individual tries to develop a cognitively-reasoned understanding of the health threat, eventually develops a coping mechanism based on personal mental representation of the illness, and, finally, with time, appraises such coping mechanisms. In this study, the coping behavior of interest is medication adherence. If an individual

wrongly perceives an illness such as hypertension to be non-life threatening or a disease without consequences (complications), adherence to medication may be low.

The model identifies five constructs of illness representation as follows (Leventhal et al., 2003), namely: (a) Identity/Label (Symptoms); (b) Timeline; (c) Consequences; (d) Cause; and (e) Control/Cure. Identity represents the label a patient assigns to personal symptoms or perception of symptoms associated with the illness. Timeline represents the patient's perception of the duration of the illness in terms of whether the illness is acute/temporary, chronic, or cyclical in nature. Consequence signifies the level of threat or complications perceived to be associated with the illness. Cause represents perceived etiology of the illness as it relates to external or internal factors or stressors. Finally, Control or Cure represents what the individual thinks about the controllability or curability of the illness by medication, and/or whether they can do what is needed to control the disease.

Most patients with high blood pressure often misconceive the disease as a non-life-threatening illness, especially due to its mostly asymptomatic nature. A misguided view of hypertension may lead to non-adherence behavior with prescribed medication. This is particularly important among Black adults as studies have reported that most Blacks attribute the cause of hypertension to stress or other psychologically-based factors and often engage in stress-management activities to control hypertension at the expense of medications (Heckler et al., 2008; Heurtin-Roberts, 1990; Rose, Kim, Dennison, & Hill, 2000; Wilson et al., 2002).

The asymptomatic nature of hypertension has led some patients to question their diagnosis of hypertension and the need for treatment for the disease (Schlomann, &

Schmitke, 2007). Some patients with hypertension often adjust their medication based on symptoms, which may be very deceiving since lack of symptoms does not necessarily indicate the absence of elevated blood pressure or hypertension (Schlomann, & Schmitke, 2007); thus hypertension is called a silent killer.

The literature search revealed that only a few studies have examined the relationship between perceptions of hypertension and medication adherence among Black hypertensive adults. An older study by Heurtin-Roberts and Reisin (1992) assessed the relationship between lay beliefs about hypertension and medication adherence among 60 Black hypertensive women attending a public-hospital-based clinic in New Orleans using field notes, medication diaries, and pill count. Participants who perceived the cause of hypertension within the non-biomedical model were more likely to be non-adherent with their medications compared to those who had biomedical views of hypertension (relative risk = 2.3; 95% CI [1.2-4.4]). Heckler et al. (2008) carried out the most recent study on the impact of perception or common-sense illness beliefs on therapy adherence among 102 Black adult hypertensive patients. This study found that perception of stress as the cause of hypertension correlated ($r = .34$, $df = 100$, $p < .01$) with engaging in stress-reducing behaviors to manage high blood pressure at the expense of medication and lifestyle modifications, while beliefs in the biomedical model of hypertension weakly correlated with medication adherence and lifestyle modifications to control high blood pressure ($r = -.21$, $df = 100$, $p < .05$).

Some intervention studies with sample sizes ranging from 55 to 1,059, did not directly target hypertension perceptions, instead aiming at improving understanding of hypertension, medication adherence, and blood pressure control or reduction among

Black hypertensive adults; these studies have reported mostly non-significant differences in blood pressure control or reduction between the intervention and control groups from baseline to follow-up (Greer et al., 2015; Ogedegbe et al., 2008; Johnson et al., 2011; Roberts et al., 2012; Ogedegbe et al., 2014; Webb, 1980).

There is an obvious gap in knowledge; though qualitative studies have elicited various levels of misconception about hypertension among Black adults, there are very few quantitative studies investigating the relationship between perceptions about hypertension and medication adherence. As discussed earlier, the most recent study that explored the association between hypertension perception and medication adherence among Black hypertensive adults was in 2008.

To address this gap in knowledge, the central aim of the present study was to investigate whether there is an association between hypertension perceptions and medication adherence among Black hypertensive adults 35 to 65 years old being treated for hypertension in primary care settings. Specifically, the purposes of this study were to:

1. Investigate participants' perceptions about causes of hypertension. It was hypothesized that, compared to other factors, perceptions of psychological factors as the cause of hypertension will explain the highest variance in views about the cause of hypertension.
2. Examine the relationship between medication adherence and hypertension perceptions as related to views about hypertension timeline, controllability, consequences, emotional representation, illness coherence, and cause while controlling for depression, educational level, duration of diagnosis, hypertension-related symptoms, and severity of hypertension. It was hypothesized that there

will be a statistically significant relationship between perceptions of hypertension and medication adherence.

3. Explore to what extent hypertension perceptions and medication adherence differ by gender after controlling for confounders.

Methods

Design, setting, and sample. This was an observational cross-sectional research study that used a non-probability sampling method to recruit participants. Participants were recruited concurrently from four primary care clinics in the Houston, Texas metropolitan area. One of the clinics was an employee health clinic affiliated with a university. Thirty-nine percent ($n = 46$) of the participants were recruited from one clinic, followed by another 29.7% ($n = 35$) from the second clinic, and 26.3% ($n = 31$) from the third clinic. Enrollment from the fourth clinic, which was the employee health clinic, was the lowest (5.1%, $n = 6$).

Inclusion criteria. The sample inclusion criteria were: (a) self-identified Black adults; (b) males and females, aged 35 to 65 years; (c) diagnosis of primary/essential hypertension (diagnosis of essential hypertension was confirmed by the principal investigator [PI] during chart review, based on noting a written diagnosis of “essential” or “primary” hypertension or an ICD 10 code (I10) in patients’ charts); (d) duration of hypertension diagnosis of at least 12 months; (e) had been prescribed or was taking at least one hypertensive medication; (e) ability to read and write in English.

Exclusion criteria. The exclusion criteria were: (a) secondary hypertension as supported by history of sleep apnea, renal artery disease, stenosis, certain cardiovascular diseases, hyperthyroidism, pregnancy, or adrenal gland tumor (pheochromocytoma) upon

chart review; (b) severe mental disorder hindering comprehension of instructions; and (c) refusal to provide informed consent.

Sample size estimate. Power analysis estimated sample size at 115 based on power of .80, alpha of .05, and effect size of .07 using multiple regression. The primary purpose of this study was to examine the relationship between illness perception and medication adherence.

Instruments for data collection. Two validated questionnaires in addition to a demographic data form were used in data collection. Participants completed the revised Illness Perception Questionnaire (IPQ-R) (Moss-Morris et al., 2003) and the Hill-Bone Blood Pressure Therapy Compliance Scale (Kim et al., 2000).

Illness Perception Questionnaire. Illness (hypertension) perception was measured using the revised Illness Perception Questionnaire (IPQ-R), a scale that was developed to quantitatively assess patients' perception of illnesses across a range of chronic diseases (Moss-Morris et al., 2002). The questionnaire was developed using the constructs of the common-sense model as the theoretical framework. The IPQ-R consists of two illness perception components, namely: Illness Representation (IR) and Causes. The Identity component was not part of the revised IPQ-R, though it was only included for the purposes of psychometric testing (Moss-Morris et al., 2002). In this study, participants completed the hypertension version of this scale.

The IR component of the IPQ-R consists of 38 questions incorporated into seven subscales, namely Timeline (acute/chronic), Cyclical Timeline (episodic/temporary/unpredictable), Treatment Control, Personal Control, Consequences, Illness Coherence, and Emotional Representations. Timeline (acute/chronic),

Consequences, Personal Control, and Emotional Representations are represented by six items on the questionnaire, while five items represent Treatment Control and Illness Coherence. Finally, Cyclical Timeline is represented by four items on the questionnaire. Each item is ranked on a Likert-type scale, with responses ranging from 1 (strongly disagree) to 5 (strongly agree). High scores on the respective subscales supports beliefs that hypertension is a chronic illness (Timeline), unpredictable/episodic (Cyclical Timeline), can severely impact quality of life (Consequences), and that it can be controlled by either personal behaviors (Personal Control) or by medical treatment (Treatment Control) (Moss-Morris et al., 2002). The Coherence subscale represents good personal understanding of the condition; thus, having a high score on a statement such as, “I have a clear picture or understanding of my high blood pressure,” indicates a good understanding of hypertension. The score from each subscale is summed to get a total score for the respective subscales. The higher the score, the stronger the beliefs or views about that dimension. There is no overall total score for the IPQ-R.

The Cause component of the IPQ-R contains an additional 18 short items, which the developers recommend be used as a grouping variable through factor analysis when there is sufficient sample size (85 or more) to identify the respective dimensions of perception of cause of an illness, after which the groups can be used as subscales in the analysis (Moss-Morris et al., 2002).

The validity of the IPQ-R was demonstrated through principal component analysis, through which seven IR subscales and three causal attribution factors were identified (Moss-Morris et al., 2002). The Cronbach’s alpha ranged from .79 to .89 for the IR subscales and .67 to .86 for the causal items (Moss-Morris et al., 2002). Validity

was further tested by a study that examined the association between hypertension perception and self-care behavior among 111 Black hypertensive adults, 18 to 65 years, and a reported Cronbach's alpha ranging from .59 to .83 for the seven IR subscales, where Treatment Control had the lowest internal consistency (Cronbach's alpha .59), followed by Personal Control (.63) and Consequences (.66) (Pickett et al., 2014).

Hill-Bone Blood Pressure Therapy Compliance Scale. The dependent variable “medication adherence” was measured using the Hill-Bone Compliance to High Blood Pressure Therapy Scale. The questionnaire was designed to assess patient behaviors for three behavioral domains of high blood pressure therapy, including reduced sodium intake, appointment keeping, and medication adherence (Kim, Hill, Bone, & Levine, 2000); however, only the medication subscale was used in this study since the focus was on medication adherence. The total scale contains 14 items, grouped into three subscales, of which eight items were related to questions about medication adherence; additionally, one prescription-filling adherence question is often used together with the eight medication-taking items by researchers. Each item on the scale is a four-point Likert type scale (“4” equals “all the time” and “1” equals “none of the time”). The lower the scores, the better the patient's adherence level. According to the authors, the items are assumed to be additive and when summed; thus, a score of nine on the medication adherence subscale represents “perfect adherence” while a score of 36 denotes “perfect non-adherence.”

Validity of the questionnaire was established through two studies: one utilized a sample of 309 hypertensive Black males 18 to 55 years old, while the other study used 718 Black hypertensive adults 18 years and older; the studies' respective Cronbach's

alpha coefficients were .74 and .85 for the total (Kim et al., 2000). In addition, a study with a sample of 80 Black women assessing the relationship between spirituality and medication adherence reported a Cronbach's alpha of .843 for the medication-adherence subscale (Abel & Greer, 2017). A study with a sample of 190 urban Black men reported a Cronbach's alpha of .77 for the medication-adherence subscale of the questionnaire (Kim, Han, Hill, Rose, & Roary, 2003). Validity through PCA using varimax rotation extracted three subscales, though factor loading in both study 1 and 2 showed that the medication-adherence subscale possessed the most meaningful and acceptable factor loadings. Predictive validity showed that the summed scores of each subscale correlated with blood pressure level and control (Kim et al., 2000).

Evidence of instruments reliability in present study. Reliability testing was conducted to evaluate evidence of internal consistency of the IPQ-R subscales and the Hill-Bone Blood Pressure Therapy Adherence Scale for the present study. After reverse coding the negatively worded items on the IPQ-R questionnaire as recommended by the developer (Moss-Morris et al., 2002), total scores were calculated for each of the seven subscales of the IR in addition to the two subscales extracted from the causal attribution items, making the total subscales from the IPQ-R questionnaire nine. Each of these subscales was subjected to a reliability testing. Most of the subscales demonstrated strong evidence of internal consistency reliability with a Cronbach's alpha greater than .7 (Timeline = .86, Cyclical Timeline = .83, Consequences = .79, Illness Coherence = .83, Emotional Representation = .83, Non-Biological Causal Views = .78, Psycho-Biological Causal Views = .75). Two subscales that had slightly lower internal consistency were Personal Control and Treatment Control, with Cronbach's alpha coefficients of .68 and

.66, respectively. These two subscales had the lowest internal consistency (Personal Control = .63, Treatment Control = .59) in another study (Pickett et al., 2014).

Reliability testing of the Hill-Bone Medication Adherence Scale showed the instrument demonstrated a strong internal consistency with a Cronbach's alpha of .82. A Cronbach's alpha greater than .70 is acceptable evidence of reliability (Leech, Barrett, & Morgan, 2015; Pallant, 2007).

Demographic data and confounding variables form. A short questionnaire was designed to collect demographic data including age, educational level, health insurance, and employment status. The demographic data form was also used to collect data about covariate or confounding variables anticipated to impact both illness perceptions and medication adherence, including duration of hypertension diagnosis, educational level, experiencing worrisome hypertension-related symptoms (yes or no responses), number of blood pressure medications, severity of hypertension, and history of depression (comorbidity) diagnosed by a healthcare provider. History of depression was based on a "yes or no" responses as well as verified through chart review and noting prescribed depression medications. Severity of hypertension was categorized into two stages based on blood pressure classification by the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of Hypertension ([JNC], 2003): stage 1 = 140-159/90-99 and stage 2 $\geq 160/\geq 100$, where stage 1 represents mild hypertension, and stage 2 represents severe hypertension. For the purposes of this study, blood pressure readings below 140/90 were considered normal, thus creating a third category in this study. Blood pressure readings recorded in each participants' chart during two separate doctor's visits were averaged and used in categorizing severity of hypertension. The two

blood pressure readings or doctors' visits were generally three months apart. For most of the participants, the two blood pressure measurements used were from the readings in the chart on the day of data collection and the readings from the prior visit, three months before.

Procedures. Participants were approached in the clinics' lobbies by the PI with the recruitment flyer as they presented for their regular medical appointments with their healthcare providers. Furthermore, the PI verbally explained the study and allowed each participant time to ask questions. Individuals who agreed to participate were asked to complete the questionnaires after signing consent. The questionnaires were mostly self-administered; three to four participants asked their accompanying family members or the PI to read the questions and response options to them while they verbally indicated which options they chose. Each participant received a \$15 gift card upon completion of the questionnaires. A chart review was conducted at the end of each recruitment day to gather information about the number of medications participants were taking for their blood pressure, blood pressure readings, duration of hypertension, and any documented history of depression, as these data served as covariates in the analyses. Additionally, diagnosis of essential or primary hypertension or presence of secondary hypertension were confirmed through chart review. Most of the data on the duration of hypertension was based on the participants' report since patients' medical records do not often have the most reliable information about when the patient was diagnosed with hypertension, unless the diagnosis was initially established at that clinic. The PI is an experienced family nurse practitioner in active practice, thus possessing the clinical knowledge to comprehend information and data in participants' charts, including diagnoses, diagnosis

codes, and class of medications used for hypertension and/or other cardiac conditions as well as for depression and/or other mental health disorders.

Statistical analyses. All data analyses were conducted using IBM's Statistical Package for Social Sciences (SPSS) software, version 24. The sociodemographic characteristics of the sample and distributions of the continuous variables were examined with descriptive statistics. Univariable analyses were conducted to check for associations of medication adherence with each of the predictor (illness perceptions subscales) variables and potential confounding variables. Reliability testing was conducted to examine the internal consistency of the IPQ-R subscales (IR and Cause subscales) for the current sample as well as for the outcome variable (medication adherence).

To address the first aim of this study, a principal component factor analysis with varimax rotation was conducted using the 18 causal items of the IPQ-R to identify the sample's causal attribution dimensions, after which the extracted subscales were used in combination with other IPQ-R (IR) subscales to conduct the multiple regression analysis in Aim #2. Conducting a factor analysis with the present sample became important because the samples used by existing studies that conducted previous factor analysis on the causal items of the IPQ-R were somewhat different from the present sample. The first factor analysis was by the developer of the scale (Moss-Morris et al., 2002) using a sample of adults with various medical illnesses but did not explicitly indicate the racial demographics of the sample; in addition, the sample was recruited from Europe. Another study by Pickett et al. (2014) conducted principal component factor analysis using a sample of Black hypertensive adults 18 to 65 years with lower educational level than the present sample and who were recruited from shopping malls, public housing apartments,

and community clinics. Recruitment for the present study was more structured, with diagnosis of essential or primary hypertension was verified through chart review; additionally, over half of the sample had a four-year college degree or higher. These two previous studies did not provide explicit explanation or steps on how factor selection decisions were made.

In the present study, the decision to assign an item to a factor was based on a priori criteria of factor loadings greater than or equal to .40 and for items cross-loading high into two factors; if the difference between the loadings was less than or equal to .20, the item was retained and assigned to the factor with the higher or highest loading; but if the difference was less than .20, the item was not assigned to any factor (Ferguson & Cox, 1993). An acceptable loading for each factor was at least three items (Watson & Thompson, 2006).

To address the second but primary aim of the study, a multiple regression was conducted to test the relationships between medication adherence and perceptions about hypertension timeline, controllability, consequences, emotional representation, illness coherence, and cause among Black hypertensive adults 35 to 65 while controlling for the covariates (age, educational level, and experience of hypertension-related symptoms) that demonstrated acceptable correlation with the dependent variable (medication adherence).

Preliminary univariable analyses were conducted to ensure that assumptions of multiple regression were not violated (linearity, normal distribution, and uncorrelated errors). Initial descriptive analyses conducted on the dependent variable (medication adherence) revealed evidence of high kurtosis (3.202; $SE = .442$) or skewed distribution of scores; thus this variable was subjected to a natural log transformation, leading to a

more normal score distribution with a Kurtosis score of .213 ($SE = .442$). Next a univariable analysis was conducted using Pearson correlation coefficients to examine the relationship between the dependent variable (medication adherence) and the nine subscales of the IPQ-R (Timeline, Cyclical Timeline, Consequences, Illness Coherence, Emotional Representation, Lifestyle and Uncontrollable Causal Views, Psycho-Biological Causal Views, Personal Control, Treatment Control).

Only two subscales of the IPQ-R had statistically significant positive correlation with medication adherence: Cyclical Timeline ($r = .246, p = .007$) and Emotional Representation ($r = .179, p = .05$); however, at the recommendation of the statistician, variables with a non-significant statistical correlation (greater than .05 but less than .1) with medication adherence were retained to be included in the model in order to prevent premature elimination of predictor variables that could potentially make a significant contribution to the variance in the multiple regression model. For this reason, the Consequences subscale, which had a negative relationship with medication adherence ($r = -.159, p = .085$), was retained for inclusion in the model. In total, only three out of the nine IPQ-R subscales were included in the multiple regression model.

Univariable analyses were conducted to evaluate the correlation between each of the covariates (depression, educational level, age, duration of hypertension diagnosis, experience hypertension-related symptoms, and severity of hypertension) and the dependent variable (medication adherence). Using Pearson correlation coefficients, age was found to have a significant negative correlation with medication adherence ($r = -.260, p = .004$). The older one is, the lesser their score on medication adherence—meaning the older one is, the more adherent they are since a lower score on medication adherence

connotes better adherence to medication. Using independent sample *t*-tests, there was a statistically significant association between experience of worrisome hypertension-related symptoms and medication adherence scores ($t(116) = 3.06, p = .003$). Those experiencing worrisome hypertension symptoms had higher mean scores on medication adherence ($M = 2.6, SD = .26$) than those not experiencing worrisome hypertension-related symptoms ($M = 2.4, SD = .24$). This result indicates that those who experienced worrisome hypertension symptoms had worse medication adherence than those that did not experience worrisome hypertension symptoms. Furthermore, using an independent sample *t*-test, history of depression did not affect medication adherence scores ($p = .089$). Using the one-way ANOVA, educational level was found to have a statistically significant relationship with medication adherence ($p = .007$). The less education one has, the higher their scores on medication adherence, meaning they are less adherent. No statistically significant relationships were found between number of hypertension medications, duration of hypertension and severity of hypertension and medication adherence; thus these covariates were not included in the initial multiple regression model.

Finally, individual ANCOVA analyses were conducted to explore gender differences in medication adherence and illness perception scores among the nine IPQ-R subscales. Potential effects of certain covariates were controlled for during ANCOVA for the IPQ-R subscales that demonstrated significant correlations with any or all the covariates at $p < .05$ for the IPQ-R subscales that had no significant correlation with any of the covariates. ANCOVA was conducted without controlling for any covariates since the aim is to explore gender differences in scores.

Univariable analyses was conducted to evaluate the correlation between the respective dependent variables (the nine IPQ-R subscales) and each of the covariates to be controlled for in ANCOVA (age, educational level, and duration of hypertension) since ANCOVA requires that each of the covariates should be significantly correlated with the dependent variable (Pallant, 2007). Homogeneity of regression slopes, which requires that the relationship between the covariate and the dependent variable for the grouping variable (gender) is the same (an assumption of ANCOVA), was tested (Pallant, 2007). For the IPQ-R subscales that had no significant correlation with any of the covariates, ANCOVA was conducted without controlling for any covariates to explore gender differences in scores.

Results

Sample characteristics. The PI approached a total of 200 participants from four primary care clinics over a ten-week period for recruitment into the study. Ten participants who met inclusion criteria declined participation due to outright non-interest, being in a hurry, or complaint that study questionnaire was too long. Seventy participants did not meet inclusion criteria due to age lower than 35 or greater than 65 years, history of hypertension less than one year, or having no history of hypertension. A total of 120 participants signed consent and completed study questionnaires, however, upon chart review, two participants were excluded due to history of sleep apnea or renal artery disease. Finally, data from a total of 118 participants were included in the analyses.

Table 1 depicts the descriptive statistics for the continuous variables, while **Table 2** depicts the sample's categorical demographic characteristics. The total sample size was 118. Participants were middle aged ($M = 53.9$ years; $SD = 7.88$ years), and males made

up 52.5% ($n = 62$) of the sample. Participants were generally educated; with 51% having a four-year degree or higher; with only 1.7% ($n = 2$) having less than a high school education.

Duration of hypertension ranged from 1 to 40 years ($M = 10.09$; $SD = 7.43$). Overall, 42% ($n = 50$) had normal systolic blood pressure ($SBP < 140$; 34.7% [$n = 41$]), had mild or stage 1 hypertension ($SBP 140$ to ≤ 159), while 22.9% ($n = 27$) had severe (stage 2) systolic hypertension ($SBP \geq 160$ mm Hg), with 8.5% ($n = 10$) having severe diastolic hypertension ($DBP \geq 100$ mmHg).

Thirty-seven (31.4%) of the sample experienced worrisome hypertension-related symptoms. Only 16.1% ($n = 19$) had a history of depression. Most (91.5%, $n = 108$) of the sample indicated they have health insurance that pays for their medications and doctors' visits. The sample was mostly (69.5%, $n = 82$) employed with only 13.6% ($n = 16$) indicating they were retired.

Descriptive statistics for the IPQ-R subscales are included in **Table 1**. Items for both the illness representation (IR) and the causal subscales of the IPQ-R were scored on a 5-point Likert scale with scores ranging from 1 (strongly disagree) to 5 (strongly agree) and summed to obtain subscale scores. The varying number of items in each subscale was considered in evaluating and comparing the strength of respondents' perceptions across the subscales by dividing each of the subscale scores by the number of items, resulting in the average item response for the subscale on a scale of 1 to 5. The sample agreed that that hypertension can be controlled through personal endeavor (Personal Control: $M = 4.1$) and by prescribed medical treatment (Treatment Control: $M = 4.0$). The sample neither agreed nor disagreed on whether they have a coherent understanding

of their hypertension (Illness Coherence: $M = 3.8$), that hypertension is caused by a combination of psychological and biomedical risk factors (Psycho-Biomedical Causal Views: $M = 3.3$), that hypertension is a burden on their lives (Consequences: $M = 3.0$), and is a chronic condition (Timeline, : $M = 3.1$). The sample, however, disagreed that hypertension is unpredictable (Cyclical Timeline: $M = 2.8$), that factors related to unhealthy lifestyle choices and uncontrollable factors (Lifestyle and Uncontrollable Causal Views: $M = 2.2$), or that hypertension instigates emotional reactions (Emotional Representation: $M = 2.6$).

Table 1

Continuous Variables: Descriptive

		Minimum	Maximum	Mean	Standard Deviation
Age	118	37	65	53.85	7.881
HTN Duration (Years)	118	1	40	10.09	7.433
Timeline	118	6	30	18.28	5.6
Cyclical Timeline	118	4	20	11.4	3.9
Consequences	118	9	26	16.97	3.9
Personal Control	118	14	30	24.8	3.5
Treatment Control	118	12	25	20	3.1
Illness Coherence	118	8	25	19.2	3.9
Emotional Representation	118	6	30	15.6	4.87
Lifestyle and Uncontrollable Causal Views	118	7	27	15.2	5.09
Psycho-Biomedical Causal Views	118	7	35	23.02	5.34
Medication Adherence	118	9	27	12.1	3.44

Table 2

Categorical Demographic Variables

	Variable	Frequency	Percent
Gender	Male	62	52.5
	Female	56	47.5
Education	Less than high school	2	1.7
	High school	20	16.9
	Some college or trade school	36	30.5
	Four-year college or higher	60	50.8
Average Systolic Blood Pressure	140 – 159 (mild)	41	34.7
	160 or greater (severe)	27	22.9
	Less than 140 (normal)	50	42.4
Average Diastolic Blood Pressure	90 - 99 (Mild)	23	19.5
	100 or greater (severe)	10	8.5
	Less than 90 (normal)	85	72
Experience Worrisome HTN Symptoms	Yes	37	31.4
	No	81	68.6
Depression History	Yes	19	16.1
	No	99	83.9
Health Insurance	Yes	108	91.5
	No	10	8.5
Employment Status	Employed	82	69.5
	Unemployed	20	16.9
	Retired	16	13.6

Hypertension causal attributions. The first objective of this study was to explore the sample's perceptions about cause of hypertension. The hypothesis was that perception of psychological factors as cause of hypertension will explain the highest variance in causal attributes of hypertension among other factors.

To examine this aim and hypothesis, the 18 causal items of the revised Illness Perception Questionnaire (IPQ-R) were subjected to a principal component factor analysis (PCA) in SPSS. Prior to conducting the analysis, the adequacy of the data for factor analysis was evaluated. The Kaiser-Meyer-Olkin value was .73, which exceeds the recommended value of .6 (Kaiser, 1970, 1974 as cited by Pallant, 2007), while Bartlett's Test of Sphericity was statistically significant ($p = .000$).

The initial PCA without rotation identified five causal factors with eigenvalues greater than one. These factors were further examined with PCA with varimax rotation, which extracted five components with eigenvalues greater than one, explaining 17.8%, 17.5%, 9.9%, 7.8% and 7.9% of the variance respectively, with an approximate cumulative total of 63% of the variance explained. However, the scree plot suggested a somewhat weak break after the third component. Upon evaluation of the rotated component matrix of the five-factor solution, while also examining factor loadings, cross-loadings, and number of items loading on each factor, only three factors met the study's a priori criteria for factor retention; however, this three-factor solution had a large number of items with high cross-loadings on different factors. To further evaluate these three factors, another PCA with varimax rotation was conducted specifying a fixed three-factor solution. The three-factor solution had eigenvalues exceeding one, explaining 18.9%, 17.7%, and 13.1% of variance causal attributions respectively, with a cumulative 49.7%

of variance explained. However, the rotated component matrix revealed many cross-loadings that did not meet the set a priori criteria for item inclusion into a factor, especially on factor 3, which left factor 3 with less than three items loading high in it. The number of items loading in each factor, in addition to the scree plot that showed a sharp break after the second component suggested that a two-factor solution could be a better representation of the causal attributions of the IPQ-R. A final PCA with varimax rotation specifying a fixed two-factor solution resulted in eigenvalues greater than one. The two factors explained 22.7% and 18.1% of the variance in causal attribution respectively, with a cumulative 40.8% variance explained. Each of these two factors were comprised of seven items with high loadings and only minimal cross-loadings. The rotated component matrix (**Table 3**) revealed that two items (“my mental attitude” and “my emotional state”) cross-loaded high into the two factors and did not meet the criteria to be assigned to any factor; additionally, two items (“ageing” and “chance or bad luck”) did not load high in any factor; thus these four items were not included in the factor assignment.

An oblique rotation with Promax also revealed the same result as the varimax rotation outlined above. The items loading in these two factors provide the most conceptually coherent explanation or representation of the causal views. This result shows that sample’s views about cause of hypertension clustered around two factors, namely:

Factor 1. This factor, Lifestyle and Uncontrollable Causal Views, included smoking, alcohol, accident, personality, altered immunity, pollution in the environment, germs, or viruses. Items that loaded into this factor include items related to unhealthy

lifestyle choices, such as smoking and alcohol use, in addition to factors outside an individual's control, such as personality, pollution in the environment, accident, altered immunity, or germs. Examination of the items loading into this factor seemed to represent factors that are either not associated with hypertension or are not always identified as standard risk factors. Excessive alcohol intake and smoking, though recognized as risk factors for hypertension by the biomedical community (AHA, 2017d), may not be viewed by lay individuals as risk factors for hypertension.

Factor 2. This factor was labeled Psycho-Biomedical Causal Views. Items that loaded into this factor are factors related to life stressors or psychological issues such as stress, overwork, behavior, family problems, and known risk factors for hypertension, such as family history, poor medical care, and diet or eating habits. Known predisposing risk factors for hypertension and stress-inducing items clustered together in this factor. Dietary habits, especially a high-sodium diet, are a very important known risk factor for hypertension (AHA, 2017d). The bulk of the self-care education that healthcare providers often give to hypertensive patients, especially Blacks, relating to diet lies on reducing sodium intake; higher intake of sodium is associated with an increase in blood pressure among Blacks (Wright et al., 2003). This common advice may explain why this item loaded into the second factor with the rest of the known risk factors for hypertension in this sample.

Table 3

Rotated Component Matrix

Variance Explained	22.7%	18.1%
	Component	
Items	1	2
Accident or injury	.812*	-.029
My personality	.757*	.089
Altered immunity	.735*	-.102
Smoking	.666*	.102
Alcohol	.596*	.162
My emotional state	.582#	.396#
Pollution in the environment	.451*	.212
Germ or virus	.420*	-.066
Ageing	.387@	.125
Chance or bad luck	.240@	.096
Stress or worry	-.034	.674*
Overwork	.331	.648*
My own behavior	-.003	.626*
Family problems or worries	.367	.606*
Diet or eating habits	.054	.604*
My mental attitude	.544#	.586#
Poor medical care in my past	.181	.566*
Hereditary—it runs in the family	-.063	.560*

Note.

*: items loaded strongly in factor 1 or 2

#: Items cross-loading in factor 1 and 2 not meeting cross-loading criteria for factor assignment

@: Items loading low on the 2 factors.

Relationship between medication adherence and hypertension perceptions.

The primary objective of this study was to examine whether there is any relationship between medication adherence and perceptions about hypertension timeline, controllability, consequences, emotional representation, illness coherence, and causal attributions among Black hypertensive adults 35 to 65 while controlling for depression, educational level, age, duration of hypertension diagnosis, experience of hypertension-related symptoms, and severity of hypertension. The hypothesis was that there will be a statistically significant relationship between medication adherence and hypertension perceptions, where high scores on the subscales of the IPQ-R will be associated with higher scores on medication adherence.

Three of the IPQ-R subscales were significantly ($p < .10$) positively correlated with medication adherence, including Cyclical Timeline ($r = .246, p = .007$), Emotional Representation ($r = .179, p = .05$), and Consequences ($r = -.159, p = .085$); these were included in the multiple regression model (**Table 4**).

Table 4

Correlation between IPQ-R subscales and medication adherence

Independent Variables	Medication Adherence (Dependent Variable)
Timeline	$r = -.071; p = .446$
Cyclical Timeline	$r = .246; p = .007^*$
Consequences	$r = -.159; p = .085^*$
Personal Control	$r = -.130; p = .161$
Treatment Control	$r = -.058; p = .536$
Illness Coherence	$r = -.058; p = .534$
Emotional Representation	$r = .179; p = .053^*$
Lifestyle and Uncontrollable Causal Views	$r = .081; p = .381$
Psycho-Biomedical Causal Views	$r = .092; p = .321$

Note. *IPQ-R subscales with statistical correlation with medication adherence at $p < .1$

Hierarchical multiple regression was conducted to examine the ability of the three IPQ-R subscales (Cyclical Timeline, Emotional Representation, and Consequences) to predict levels of medication adherence while controlling for age, educational level, and experience of worrisome hypertension-related symptoms. The covariates (educational level, age, and experience of worrisome hypertension symptoms) were entered in step 1 (model 1), which explained 18.1% of variance in medication adherence. After entering the three predictor variables (Cyclical Timeline, Consequences, and Emotional Representation) in model 2, the model (**Table 5**) together explained a total of 23.9% variance in medication adherence, $F(6, 111) = 5.821, p < .001$. The three predictor variables (Cyclical Timeline, Consequences, and Emotional Representation), explained an additional 5.8% of variance in medication adherence after controlling for age, educational level, and experience of worrisome hypertension symptoms, R^2 change = .058, F change (3, 111) = 2.84, $p = .041$. In the final model, only age (beta = -.190, $p = .033$), educational level (beta = -.232, $p = .007$), and Consequences (beta = -.203, $p = .022$) made significant statistical contribution to the variance in medication adherence (**Table 5**). Of the three IPQ-R subscales entered in the model, only Consequences demonstrated a significant statistical relationship with medication adherence. The result indicates that the stronger the sample believes that hypertension has consequences, the lesser their scores on medication adherence (meaning higher adherence).

Table 5

Multiple regression: Model summary and coefficients

Change Statistics									
Model	R	R ²	Adjusted R ²	Std. Error of the Estimate	R ² Change	F Change	df1	df2	Sig. F Change
2	.489 ^b	.239	.198	.22615	.058	2.838	3	111	.041**

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	β	t	Sig.
2	(Constant)	3.158	.225		14.008	.000
	Age	-.006	.003	-.190	-2.158	.033*
	Educational Level	-.072	.026	-.232	-2.724	.007*
	Experience Worrisome HTN Symptoms	-.069	.049	-.128	-1.402	.164
	Cyclical Timeline	.010	.006	.149	1.657	.100
	Consequences	-.013	.006	-.203	-2.327	.022*
	Emotional representation	.006	.005	.120	1.308	.194

Note. ** Level of model 2's statistical significance ($p < .05$) when the three IPQ-R subscales were added into the model.

*Variables that individually significantly predicted medication adherence.

Overall model significance: $p = .000^c$

Gender difference in hypertension perceptions and medication adherence.

Individual ANCOVA was conducted to test for gender differences using each of the nine IPQ-R subscales as dependent variables while controlling for covariates when applicable. Age had a significant statistical correlation with Timeline, Cyclical Timeline, Treatment Control, Personal Control, and Psycho-Biomedical Views (**Table 6**) and thus was controlled for in their respective analyses. Duration of hypertension had a significant statistical relationship with Timeline, Illness Coherence, and Personal Control (**Table 6**) and was controlled for during the analyses. Educational level had a statistically significant correlation with Treatment Control (**Table 6**) and thus was controlled for in the analysis.

Table 6

Correlation between IPQ-R subscales and covariates for ANCOVA

Variable	Age	Duration of Hypertension	Education Level
Timeline	$r = .200, p = .030^*$	$r = .218; p = .018^*$	$F = .400; p = .753$
Cyclical Timeline	$r = -.218; p = .018^*$	$r = -.049; p = .598$	$F = .932; p = .428$
Consequences	$r = .002; p = .980$	$r = .093; p = .316$	$F = .980; p = .405$
Personal Control	$r = -.222; p = .016^*$	$r = -.179; p = .052^*$	$F = 1.656; p = .181$
Treatment Control	$r = -.190; p = .040^*$	$r = -.147; p = .111$	$F = 2.732; p = .047^*$
Illness Coherence	$r = -.167; p = .070$	$r = -.185; p = .045^*$	$F = .287; p = .834$
Emotional Representation	$r = -.128; p = .168$	$r = -.077; p = .406$	$F = .155; p = .926$
Lifestyle and Uncontrollable Causal Views	$r = .056; p = .547$	$r = .083; p = .371$	$F = .244; p = .865$
Psycho-Biomedical Views	$r = -.234; p = .011^*$	$r = -.085; p = .359$	$F = .983; p = .403$

Note. * Covariates with statistically significant ($p < .05$) correlation with the respective IPQ-R subscales

The final objective of this study was to explore to what extent hypertension perceptions (Aim 3a) and medication adherence (Aim 3b) differ by gender, while controlling for certain confounding variables. Aim 3a sought to explore gender differences on the scores of the IPQ-R subscales while controlling for educational level, age, and duration of hypertension diagnosis.

Homogeneity of regression slopes, an assumption of ANCOVA that requires that the relationship or interaction between the covariate and the dependent variable for each group (gender) to be the same, was conducted (Pallant, 2007) (**Table 7**). This test was only conducted between the IPQ-R subscales and the covariates they demonstrated significant statistical correlation with; those IPQ-R subscales without any significant correlation with any covariates did not undergo homogeneity testing.

Table 7

Homogeneity of regression slopes: Interaction

Variable	Gender * Age	Gender * Hypertenion Duration	Gender * Education
Timeline	$F = .103; p = .749$	$F = .605; p = .438$	N/A
Cyclical Timeline	$F = .017; p = .898$	N/A	N/A
Personal Control	$F = .953; p = .331$	$F = .078; p = .780$	N/A
Treatment Control	$F = 1.803; p = .182$	N/A	$F = 2.431; p = .122$
Psycho- Biomedical Causal Views	$F = .158; p = .692$	N/A	N/A
Illness Coherence	N/A	$F = .578; p = .449$	N/A
Consequences	N/A	N/A	N/A
Emotional Representation	N/A	N/A	N/A
Lifestyle and Uncontrollable Causal Views	N/A	N/A	N/A

As **Table 8** depicts, individual ANCOVA analyses showed no statistical significant gender differences in Timeline ($p = .532$) and Personal Control ($p = .625$) scores while controlling for age and duration of hypertension, or in Cyclical Timeline ($p = .517$) and Psycho-Biomedical Causal Views ($p = .145$) scores while controlling for age. Furthermore, no statistically significant gender differences in Treatment Control scores while controlling for age and educational level ($p = .734$); and no significant statistical gender difference in Illness Coherence scores while controlling for duration of hypertension ($p = .578$).

Additionally, individual ANCOVA was conducted for Consequences, Emotional Representation, and Lifestyle and Uncontrollable Causal Views without controlling for any covariates since these three IPQ-R subscales demonstrated no significant statistical correlations with any of the covariates of interest (age, hypertension duration, and educational level). There were no statistically significant gender differences in Consequences or Emotional Representation scores, but there was a statistically significant gender difference in Lifestyle and Uncontrollable Causal Views scores (**Table 8**). Compared to females ($M = 14.196$), males had a significantly higher adjusted mean score ($M = 16.183$, $p = .034$) on the perception or belief that hypertension is caused by factors related to a combination of poor lifestyle choices, such as smoking and alcohol use, and uncontrollable factors, such as immunity, germs, accidents, and pollution in the environment.

Table 8

Adjusted mean scores and standard error: Gender differences in hypertension

perceptions (nine IPQ-R subscales):

Variable		Mean Score	Std. Error	95% CI		Sig.	Variables Controlled for
				Lower Bound	Upper Bound		
Timeline	Male	18.596 ^a	.713	17.184	20.008	$p = .532$	Age and HTN Duration
	Female	17.937 ^a	.751	16.449	19.425		
Cyclical Timeline	Male	11.215 ^a	.495	10.235	12.196	$p = .517$	Age
	Female	11.690 ^a	.522	10.657	12.723		
Personal Control	Male	24.946 ^a	.437	24.080	25.813	$p = .625$	Age and HTN Duration
	Female	24.631 ^a	.461	23.718	25.544		
Treatment Control	Male	20.095 ^a	.395	19.313	20.877	$p = .734$	Age & Education
	Female	19.895 ^a	.416	19.070	20.719		
Psycho-Biomedical Causal Views	Male	23.705 ^a	.669	22.380	25.030	$p = .145$	Age
	Female	22.256 ^a	.705	20.859	23.652		
Illness Coherence	Male	19.031 ^a	.489	18.063	20.000	$p = .578$	HTN Duration
	Female	19.429 ^a	.515	18.410	20.449		
Consequences	Male	16.813	.502	15.818	17.807	$p = .645$	None
	Female	17.150	.528	16.104	18.196		
Emotional Representation	Male	15.484	.622	14.252	16.715	$p = .799$	None
	Female	15.714	.654	14.418	17.010		
Lifestyle and Uncontrollable Causal Views	Male	16.183	.637	14.921	17.445	$p = .034^*$	None
	Female	14.196	.670	12.869	15.524		

Note. * Variable(s) with statistically significant ($p < .05$) gender difference in mean scores.

For Aim 3b, ANCOVA was conducted to evaluate whether there was any gender difference in medication adherence scores while controlling for age, number of medications, educational level, and comorbidity (depression). Age was not included as a covariate in this analysis as the interaction between age and gender was significant ($p = .007$), which violates the assumption of homogeneity of regression slopes (Leech, Barrett, & Morgan, 2015; Pallant, 2007). Additionally, “number of hypertension medications” taken was not included because the univariable analysis showed it had no significant statistical correlation with the outcome variable (medication adherence). The result showed that there was no statistically significant difference between genders in medication adherence scores after controlling for depression and educational level (**Table 9**).

Table 9

Gender differences in medication adherence: Test of between-subjects effects

Source	Type III Sum of Squares	<i>df</i>	Mean Squared	<i>F</i>	Sig.	Partial η^2
Corrected Model	.673 ^a	3	.224	3.766	.013	.090
Intercept	25.444	1	25.444	427.154	.000	.789
Education	.488	1	.488	8.187	.005	.067
Depression History	.092	1	.092	1.546	.216	.013
Gender	.012	1	.012	.197	.658*	.002
Error	6.791	114	.060			
Total	722.296	118				
Corrected Total	7.464	117				

Note. * Non-statistically significant gender difference in medication adherence scores

Discussion

The present study first sought to investigate the factor structure of hypertension causal attribution among Black hypertensive adults aged 35 to 65 years. The second but primary objective was to examine whether there is an association between hypertension perceptions and medication adherence among Black hypertensive adults after controlling for the effects of certain confounders, and the final objective was to explore gender differences in hypertension perceptions and medication adherence.

Hypertension causal attributions. First, the factor structure of causal attributions of hypertension was tested. Two factors of hypertension causal attribution were identified. The first factor was labeled “Lifestyle and Uncontrollable Causal Views,” while the second factor was labeled “Psycho-Biomedical Causal Views.” These two causal attribution subscales demonstrated acceptable internal consistency reliability.

The hypothesis was that psychological attribution of cause of hypertension would explain the highest variance in causal attributions, however, the Lifestyle and Uncontrollable Causal View as the cause of hypertension explained more variance (22.7%) in causal attribution of hypertension than the Psycho-Biomedical View, which explained 18% of variance. The results showed that items related to psychological factors as a cause of hypertension clustered together with known hypertension predisposing risk factors. Based on the a priori factor selection criteria used in this study, the IPQ-R causal attributional component can be considered as two conceptually meaningful subscales for middle-aged Black adults with hypertension who have access to primary care, but studies to replicate this in other samples are recommended.

Though Lifestyle and Uncontrollable Causal Views explained the highest variance in causal hypertension attribution among this sample, on a 1 (strongly disagree) to 5 (strongly agree) scale, the mean subscale score for the Psycho-Biomedical Causal View was higher than the mean score for Lifestyle and Uncontrollable Causal View subscale. The sample neither agreed nor disagreed that a combination of psychological/life stressors and known hypertension risk factors caused their hypertension; however, the sample disagreed that hypertension is caused by a combination of unhealthy lifestyle choices and factors outside their control.

In contrast with the present study, Pickett et al. (2014) used a sample of 111 Black hypertensive adults and extracted five factors and reported that psychological or life stressor related items loaded together into the same factor and explained the most variance. This was followed by views that hypertension is caused by factors outside an individual's control, such as germs, altered immunity, chance, or accident; however, known or standard risks factors for hypertension such as aging, poor medical care, and family history seemed to have loaded into different factors without a clear or coherent conceptual definition. Additionally, the developer (Moss-Morris et al., 2002) of the IPQ-R extracted four causal attribution subscales where the psychological items clustered together and explained the most variance, followed by known risk factors for hypertension and items related to poor immunity clustered in respective factors.

The present study's causal attribution contrasts from other studies in that both standard hypertension risk factors and psychological/life stressors loaded together in the same factor. Previous studies, both qualitative and quantitative, have mostly reported that perceptions about cause of hypertension among Black adults have often centered

around stress/psychological models versus biomedical models (Heckler et al., 2008; Lukoschek, 2003; Wilson et al., 2002; Heurtin-Roberts & Resisin, 1990); however, a new finding from the present study is that there may be a shift with this population, or subgroups within it, which is beginning to view the cause of hypertension within a model that encompasses both the psychological/stress and biomedical models together.

The contrast in the present study's causal attribution result could be due to the sample's higher educational level, age, and the use of a more structured recruitment strategy compared with previous studies.

Although two causal attribution factors were identified in this study with the Lifestyle and Uncontrollable Causal Views factor explaining the most variance, a look at the individual subscale mean score on these two factors clearly indicates that the sample does not believe that hypertension is caused by factors related to unhealthy lifestyle such as smoking and alcohol in combination with factors outside their control. The sample, however, neither agreed nor disagreed that a combination of life stressors and known risk factors for hypertension caused their hypertension. This finding suggests that the sample has some level of ambivalence regarding the cause of hypertension. Several old qualitative studies have reported misconceptions about hypertension among Black hypertensive adults that are related to believing that psychological factors rather than biomedical factors cause hypertension (Boutin-Foster, Ogedegbe, Ravenell, Robins, & Charlson, 2007; Ogedegbe et al., 2004; Schlomann, & Schmitke, 2007; Wilson et al., 2002); however, in the present study these two factors clustered together.

Relationship between medication adherence and hypertension perceptions.

The second but primary aim of this study was to examine whether there would be any

relationship between medication adherence and perceptions about hypertension timeline, controllability, consequences, emotional representation, illness coherence, and cause among Black hypertensive adults 35 to 65 while controlling for depression, educational level, age, duration of hypertension diagnosis, experience of hypertension-related symptoms, and severity of hypertension. The hypothesis that there would be a statistically significant relationship between medication adherence and hypertension perception, where high scores on the subscales of the IPQ-R would be associated with better medication adherence scores, was partially supported.

Only three of the nine perception subscales IPQ-R (Cyclical Timeline, Consequences, and Emotional Representation) demonstrated a statistical correlation with the outcome variable (medication adherence) and were included in the multiple regression model; only one subscale, Consequences, had a statistically significant association with medication adherence. Consequences appears to be a strong predictor of medication adherence; though additional variance explained by the addition of the three IPQ-R subscales into the model was small (5.8%), it was significant ($p = .041$). The stronger the sample's belief that hypertension is a disease that increases burden on one's life, the better their medication adherence. It is very possible that stronger belief that hypertension has consequences predicted medication adherence in this sample due to existing knowledge or personal experiences of the burden of hypertension on their lives or those of their friends or family members. The other two subscales (Emotional Representation and Cyclical Timeline) may not have been significant predictors of medication adherence among this sample because the sample may have had hypertension long enough to believe that their hypertension is rather predictable and does not instigate

any emotional reactions that prompt engaging in coping behavior, such as medication adherence. This is consistent with the result of the subscale mean scores discussed earlier, which revealed that this sample does not believe that hypertension is a disease that is unpredictable or induces any emotional reaction. This also suggests that this sample may have a good understanding of their hypertension. As noted earlier, the sample have a strong belief that their high blood pressure can be controlled by their self-efficacy (personal control) and treatment control; thus they do not experience any emotional upset regarding their disease.

This result provides partial support for the hypothesis that hypertension perception will be associated with medication adherence. The finding of this study has lent credence to findings from previous studies where views about hypertension, especially cause, were found to guide self-management behavior among Black hypertensive adults (Heckler et al., 2008; Heurtin-Roberts & Reisin, 1990). Additionally, the study by Pickett et al. (2014) examined the association of illness perceptions and medication adherence among Black adults found that illness coherence was a predictor of self-care behaviors ($F = 7.10, p < .01$). Ross et al. (2004) explored the role of illness perceptions and treatment beliefs in medication adherence among hypertension patients in the United Kingdom and reported that emotional representation ($p = .01$) and personal control ($p = .01$) significantly predicted medication adherence. A study by Chen, Tsai, and Lee (2009) among Taiwanese hypertensive adults reported that treatment control, risk factors, and psychological attribution predicted medication adherence.

Additional findings of the current study were that both age and educational level had statistically significant predictive association with medication adherence, thus

justifying the need to use them as covariates in the multiple regression analysis. The older the participant, the better their medication adherence; and the higher their educational level, the better their medication adherence. Heckler et al. (2008) and Ross, Walker, and Macleod (2004) also noted an association between medication adherence and age. Nevertheless, with covariates and the three subscales noted above in the model, only 23.9% of the variance in adherence was explained.

Because most of what is known about hypertension perceptions and medication adherence among Black adults has been based on qualitative studies with samples that were majority female, the third and final aim of the present study was to explore whether there were any gender differences in illness perceptions and medication adherence.

The results showed only the Lifestyle and Uncontrollable Causal Views of hypertension demonstrated a statistically significant gender difference; compared to women, men had a slightly stronger belief in this factor as a cause of hypertension. There were no statistically significant gender differences on the scores of the other eight IPQ-R subscales or on the adherence scale, indicating that males and females were similar in their perceptions of hypertension and their reports of antihypertensive medication adherence. Ross et al. (2004) found that men were more likely than females to believe that risk factors caused hypertension.

In summary, the results indicate that out of the nine subscales of the IPQ-R, most had no statistically significant association with medication adherence, and for the three that demonstrated significant correlations with medication adherence (Consequences, Emotional Representation, and Cyclical Timeline), only perceptions about consequences of hypertension significantly predicted medication adherence. Stronger beliefs that

hypertension causes a negative burden on life predicted better medication adherence. Additionally, men are more likely to believe that lifestyle choices and uncontrollable factors cause hypertension than women. Even though most studies about hypertension perceptions and medication adherence among Black adults have been based on studies with majority-female samples, the result of the present study suggests that Black males likely hold about the same views as Black females.

Strengths. The major strength of the present study is that sample was homogenous with respect to access to primary care in that all participants were established patients in one of four primary care settings. An important strength of the PCA conducted in the current study is that explicit a priori criteria were used in deciding how items were selected, unlike the two previous studies that conducted PCA on the 18 causal items of the IPQ-R (Pickett et al., 2014; Moss-Morris et al., 2002). These two previous studies did not give a clear report on how factors were selected or how cross-loadings were handled. Additionally, the two factors extracted in the current study demonstrated acceptable evidence of internal consistency reliability. The sample, though more educated than the usually lower-educated samples often seen in studies of Black adults, were recruited from multiple clinics that serve a lower-to-middle-class Black adult patient population, thus increasing the chance that the target population was recruited. In contrast with the present study's sample, the sample in Pickett et al. (2014) recruited participants with lower educational levels from shopping malls, community housing, and clinics, while the sample in Moss-Morris et al. (2002) included individuals with various types of chronic medical illnesses other than hypertension who were recruited from both

inpatient and outpatient settings in Europe. Using a chart review to confirm diagnosis of primary/essential hypertension was also a strength.

Additionally, this is one of the few studies that measured hypertension perceptions and medication adherence quantitatively and used standardized questionnaires. To the author's knowledge, the current study is the second study within the last 10 years that has examined the impact of perceptions of hypertension on antihypertensive use. The present study, however, is the first to report an association between consequences and medication adherence among Black hypertensive adults. Furthermore, the present study has partially presented evidence that Black hypertensive males and females may hold the same perceptions regarding hypertension.

Limitations. The present study is not without limitations. Misclassification of medication adherence or illness perceptions is likely a limitation of this study due to the use of self-report questionnaires to measure hypertension perceptions and medication adherence. Self-report questionnaires may lead to participants' overestimation of adherence, recall bias, and likelihood for giving socially acceptable responses (Morisky et al., 2008). Because of the use of a cross-sectional design in this study, cause and effect cannot be ascertained. Another important limitation is the inability to address the impact of acculturation on hypertension perceptions and/or medication adherence, especially for foreign-born Blacks. However, the current study's focus was not strictly on a foreign-born sample of Black hypertensive population. Finally, not measuring depression with a standardized instrument was also a limitation of this study.

Implication. The findings of this study are generalizable to Black hypertensive adults 35 to 65 years old, most of whom had a high school education or higher, in

primary care settings. The findings of this study, especially as it relates to perceptions about cause of hypertension, revealed that Black adults hold ambivalent views about what factors cause hypertension, however, this sample seem to lean toward a belief that hypertension is caused by a combination of psychological/life stressors and known risks factors for hypertension. Furthermore, in this study, perceptions that hypertension is a disease with consequences or burden was found to be significantly associated with medication adherence.

These findings highlight the need for clinicians and nurse educators to frequently assess patients' perceptions about their hypertension, educating and correcting any misconceptions the patient may have. Since knowing that strongly believing that hypertension has complications is associated with better medication adherence, nurses that take care of Black adults with hypertension should frequently highlight the importance of medication adherence as a means to reduce complications and the general health burden of uncontrolled hypertension, especially at the time of diagnosis and at every encounter in the healthcare setting. Exploring patients' perceptions of hypertension presents clinicians with an important opportunity to correct misconceptions about the disease. Assessing patients' perceptions about their hypertension creates an opportunity for the clinicians to identify patients that may have poor outcome from hypertension earlier on so that interventions can be initiated.

Despite the limitations discussed above, there is value in the knowledge gained, and the results will inform the design of a longitudinal study with a larger sample size that could further examine and clarify hypertension beliefs and its role in medication adherence among Black hypertensive adults. Further recommendation for future study in

this area could focus on exploring the role of acculturation on hypertension perceptions and medication adherence among foreign-born hypertensive Black adults residing in the United States. Future studies should also explore how perceptions of hypertension differ by blood pressure control status.

Conclusion

This study has demonstrated that illness perceptions, especially perception that hypertension places a burden on one's life, is related to medication adherence among Black hypertensive adults aged 35 to 65 years. This study's results further established that there is ambivalence among Black hypertensive adults regarding whether the combination of life stressors and known hypertension risk factors are causes of hypertension; however, it is also clear in this study that the sample did not agree that hypertension is caused by factors not generally accepted as risk factors by the medical community. Although men and women are very similar in reports of their medication adherence and their perceptions of hypertension, men are more likely than women to attribute cause of hypertension to unhealthy lifestyle choices and influences outside an individual's control.

A well-thought out and designed intervention is needed to improve perceptions about hypertension and better disease control among Black hypertensive adults; however, more studies, such as a repeat of the present one with larger sample sizes, are needed to elicit more knowledge and understanding of hypertension perceptions, including consequences, and their impact on medication adherence or general self-care management behaviors among Black hypertensive adults.

There is a need for future research to focus on populations with the highest prevalence of uncontrolled hypertension and its complications (Levine et al., 2011). Targeting Black hypertensive adults between the ages of 35 to 65 years for interventions to improve understanding of hypertension and promote medication adherence will help in forestalling potential future negative outcomes that could emanate from uncontrolled hypertension among Black hypertensive adults. Although no specific intervention has been ascertained to be a lasting solution to the problem of poor blood pressure control among the Black adult population, it is likely that interventions that are designed to address all or most of the factors implicated in the poor blood pressure control in the Black adult population may provide a lasting solution to this problem.

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Appendix A
UTHSC CPHS Approval



Committee for the Protection of Human Subjects

6410 Fannin Street, Suite 1100
Houston, Texas 77030

Stella Eke

University of Texas Health Science Center at Houston

School of Nursing

NOTICE OF APPROVAL TO BEGIN RESEARCH October 23, 2017

HSC-SN-17-0872 - ASSOCIATION OF ILLNESS (HYPERTENSION)
PERCEPTIONS AND ANTIHYPERTENSIVE MEDICATION
ADHERENCE AMONG BLACK HYPERTENSIVE ADULTS IN PRIMARY
CARE SETTINGS

Number of Subjects Approved: Target: 1000 /Screen: 113

PROVISIONS: This approval relates to the research to be conducted under the above referenced title and/or to any associated materials considered by the Committee for the Protection of Human Subjects, e.g. study documents, informed consent, etc.

APPROVED: By Expedited Review and Approval

REVIEW DATE: 10/23/2017

APPROVAL DATE: 10/23/2017

EXPIRATION DATE: 09/30/2018

CHAIRPERSON: L. Maximilian Buja, MD

Subject to any provisions noted above, you may now begin this research.

CHANGES: The principal investigator (PI) must receive approval from the CPHS before initiating any changes, including those required by the sponsor, which would affect human subjects, e.g. changes in methods or procedures, numbers or kinds of human subjects, or revisions to the

informed consent document or procedures. The addition of co-investigators must also receive approval from the CPHS.

ALL PROTOCOL REVISIONS MUST BE SUBMITTED TO THE SPONSOR OF THE RESEARCH.

INFORMED CONSENT DETERMINATION:

Signed Informed Consent Required

INFORMED CONSENT: When Informed consent is required, it must be obtained by the PI or designee(s), using the format and procedures approved by the CPHS. The PI is responsible to instruct the designee in the methods approved by the CPHS for the consent process. The individual obtaining informed consent must also sign the consent document. Please note that only copies of the stamped approved informed consent form can be used when obtaining consent.

HEALTH INSURANCE PORTABILITY and ACCOUNTABILITY ACT (HIPAA):

HIPAA Authorization required:

HIPAA Authorization within consent form

UNANTICIPATED RISK OR HARM, OR ADVERSE DRUG REACTIONS: The PI will immediately inform the CPHS of any unanticipated problems involving risks to subjects or others, of any serious harm to subjects, and of any adverse drug reactions.

RECORDS: The PI will maintain adequate records, including signed consent and HIPAA documents if required, in a manner that ensures subject confidentiality.

Appendix B

Recruitment Sites Permission



Albert Oguejiofor MD MRCP (London)
Board Certified, Internal Medicine

September 22, 2017

To Whom It May Concern:

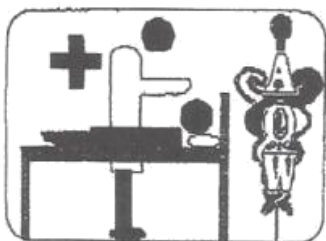
I am aware of Ms. Stella Eke's research study titled "Association Between Illness (hypertension) perception and medication adherence among black hypertensive adults in a primary care setting."

I am the medical director at Mercy Southwest Internal Medicine and I give Ms. Stella Eke permission to recruit potential participants from our clinic.

Thank you,

Albert Oguejiofor MD. MRCP (UK)

7737 Beechnut Street, Suite 200, Houston Texas 77074
Phone: 713-777-6606 Fax: 713-777-6686 Email: mercysw22@gmail.com



Austin O. Williams, M.D., P.A.

"A Doctor who cares about your health"

7015 Almeda Road, Suite 5
Houston, Texas 77054
Phone #: 713-665-5959
Fax #: 713-665-5161

September 28, 2017

Re: Stella Eke

To: Whom It May Concern:

Miss Stella Eke has requested to recruit patients from our clinic for her research study on hypertension. This is to help fulfill her pursuit of a Ph. D. at the University of Texas School of Nursing in Houston, Texas. I am aware that this research will focus on exploring the association between illness (hypertension), perception, and medication adherence amount black hypertensive adults between 35 to 65 years old in the primary-care setting. I am writing this letter to inform you that she has my approval to pursue this study in our clinic.

If you have any have any further questions concerning this matter, I can be reached at the address and/or the phone number listed above.

Yours truly,

Austin O. Williams, M.D.

Family Medicine Clinic of Crestwater, LLC

Dr. Arnold K. Carothers

Diplomate of The American Board of Family Medicine

17121 Westheimer Rd.

Houston, Texas 77082

Office: 281-242-0581

Fax: 281-242-0582

09/25/2017

To whom it may concern:

It would be my pleasure to permit Mrs. Stella Eke to carry out her research study related to "Association of Illness (hypertension) Perception and Medication Adherence among Black hypertensive adults in primary care setting" at our clinic.

If you have any questions or concerns, feel free to contact my office.

Sincerely,

A handwritten signature in black ink, appearing to read "Arnold K. Carothers", written over a horizontal line.

Dr. Arnold K. Carothers



The University of Texas
Health Science Center at Houston

UTHealth Services

September 28, 2017

Dear Committee Member,

I have reviewed the research study proposed by Ms. Stella Eke titled, "Association of Illness (Hypertension) and Antihypertensive Medication Adherence among Black Hypertensive Adults Age 35 to 65 Years Old." Ms. Eke has requested to use our electronic medical record, Practice Partner, to obtain data on subjects who may be potential subjects for the research study. Ms. Eke has signed a UT Health confidentiality agreement stating that she will comply with the standards of the Health Information Portability and Accountability Act (HIPAA) to maintain the confidentiality of patient information. Furthermore, Ms. Eke has agreed that subjects will be contacted and invited into the study by the clinic personnel only and that all patient information that leaves the clinic must be de-identified prior to removal from the clinic. No HIPAA protected data may be removed from the clinic regardless of format.

Ms. Eke has agreed to these terms and I support her use of our EMR to identify subjects and gather data for her research.

Sincerely,

A handwritten signature in black ink, appearing to read "Susan Parnell".

Susan Parnell, RN, MSN, MPH, PhD, CIC
Assistance Professor of Clinical Nursing
Director, University of Texas Health Services
7000 Fannin, Suite 1620
Houston, TX 77030

Appendix C
Consent Forms



University of Texas Health Science Center at Houston/Memorial Hermann Healthcare
System

INFORMED CONSENT FORM TO TAKE PART IN RESEARCH

Protocol Title: Association of Illness Perceptions and Antihypertensive Medication

Adherence Among Black Hypertensive Adults in Primary Care Setting

HSC-SN-17-0872

INVITATION TO TAKE PART

You are invited to take part in a research project called, “Association of illness perception and medication adherence among Black hypertensive adults in primary care settings” conducted by STELLA EKE, of the University of Texas Health Science Center at Houston (UTHealth). For this research project, I will be called the Principal Investigator or PI.

Your decision to take part in this study is voluntary. You may refuse to take part or choose to stop taking part at any time. A decision not to take part or to stop being a part of the research project will not change the services available to you from your doctors, other healthcare providers at this clinic, and research staff with the University of Texas Health Science Center at Houston. Your participation in this study is completely voluntary. You may discontinue your participation in the study at any time while completing the survey without any penalty, and it will not affect your care.

You may refuse to answer any questions asked or written on any forms. This research project has been reviewed by the Committee for the Protection of Human Subjects (CPHS) of the University of Texas Health Science Center at Houston as HSC-SN-17-0872

PURPOSE

Your participation is being requested for a dissertation research study by Stella Eke, a Doctor of Philosophy(PhD) in Nursing student at University of Texas - Houston Health Science Center. The purpose of this study is to examine the relationship between perceptions about hypertension and medication adherence among Black hypertensive adults 35 to 65 years, in primary care. Some studies have shown that Blacks or African Americans have worse blood pressure control and suffer more severe complications from hypertension than other races. The student is conducting a study to examine whether your views or understanding about hypertension have any effect on the way you take your blood pressure medication.

PROCEDURES

If you agree and are able to take part in this study you will first sign the consent form. After obtaining your consent, you will be asked to complete two questionnaires and a demographic data form. After you complete the questionnaires, the PI will ask you for your name and date of birth in order to review your chart/medical record. The purpose of the chart review is only to verify your eligibility for the study and confirm some of the responses on the demographic form. It is very important that you know that participating in this study will in no way affect your care at this clinic. Your doctor or healthcare provider will not have access to or know about your survey responses. The researcher will not in any way share your completed survey with the clinic.

TIME COMMITMENT

The total amount of time you will be asked to be in this study is only the time it takes you to complete the questionnaires. This study involves only one-time completion of these questionnaires. Completing the questionnaires and demographic data form will take a total of approximately 15 to 20 minutes or less. There will be no other visit or meeting needed from you after you complete the questionnaires.

BENEFITS

You may receive no direct benefit from being in the study; however, your taking part may help hypertensive patients like you get better in the future. The major general benefit of this study is that it will help inform and support the design of useful interventions that can help Black adults in controlling their blood pressure, thereby reducing the risks for complications from uncontrolled hypertension.

RISKS AND/OR DISCOMFORTS

One of the possible risks to you as a participant in this study may relate to breach of confidential information. However, in this study, confidentiality will be strictly maintained to the extent allowable by law. To protect your privacy, the study has created study identification numbers that will be written on the survey you completed instead of your name; that way no one will know who completed the survey. Your name will not be written on any survey you completed. Information collected is only for research purposes and will not negatively impact your treatment or relationship with your healthcare providers. Your doctor or any other medical team will also not have access to your survey responses. The principal investigator (researcher), her school research advisor, and a statistician are the only people that will have access to your data or survey responses. Responses from the survey will be analyzed as a group and not on an individual basis. Any unneeded information accidentally collected from you will be shredded immediately; then the hard copies of the survey responses will be shredded one year from the study completion date. In case the research gets published, no patient identifying information will be included in the publication. The researcher will strive to prevent any chance of injury or problem to you as you participate in this study and will be willing and available to address any such issues if needed. However, University of Texas - Houston

does not provide medical services or financial assistance for injuries sustained due to your participation in this study.

Another potential risk will be fatigue because of the time you may spend completing the questionnaires. You may take a break from this survey as often as you want and resume it later.

ALTERNATIVES

You can also choose not to participate in this study as an alternative option to participating in this study.

STUDY WITHDRAWAL Your decision to take part is voluntary. You may decide to stop taking part in the study at any time. A decision not to take part or to stop being a part of the research project will not change the healthcare services available to you from your doctor or other healthcare providers.

COSTS, REIMBURSEMENT AND COMPENSATION

If you decide to take part in this research study, there will be no cost to you as a participant in this study; however, you will be given a \$10 to \$15 gift card to Walmart or Starbucks in appreciation for your time and participation upon completion of the questionnaires.

CONFIDENTIALITY

Please understand that representatives of the University of Texas Health Science Center at Houston may review your research and/or medical records for the purposes of verifying research data and will see personal identifiers. However, identifying information will not appear on records retained. You will not be personally identified in any reports or publications that may result from this study. There is a separate section in this consent form that you will be asked to sign which details the use and disclosure of your protected health information.

QUESTIONS

If you have questions at any time about this research study, please feel free to contact the principal investigator (STELLA EKE) at 832-683-1540, as she will be glad to answer your questions. You can contact the study team to discuss problems, voice concerns, obtain information, and offer input in addition to asking questions about the research.

**AUTHORIZATION TO USE AND DISCLOSE
PROTECTED HEALTH INFORMATION FOR RESEARCH**

PATIENT NAME: _____

DATE OF BIRTH: _____

Protocol Number and Title: Association of Illness Perceptions and Antihypertensive Medication Adherence Among Black Hypertensive Adults in Primary Care Setting. HSC-SN-17-0872

Principal Investigator: *STELLA EKE*

By signing this document, you give permission to your doctor to disclose (release) your health information that identifies you for the research study named above.

If you sign this document, you give permission to the researchers to obtain health information from the following health care providers:

<u>Name of Provider</u>	<u>Address of Provider</u>	Fax Number of Provider
Austin Williams, MD	7015 Almeda Rd suite 5, Houston TX 77054	N/A. PI will be at the clinic
Albert Oguejiofor, MD	7737 Beechnut suite 200 Houston TX 77036	Same as above
Arnold Carothers, DO	17121 Westheimer Rd Houston TX 77082	Same as above
UT-Health Clinic: Delorean Alexander, NP Angela Rutherford, NP George Delclos, MD	7000 Fannin suite 1620 Houston TX 77030	Same as above

The only identifying information will be your name and date of birth on the signature page of this form, however, this form will be separated from your completed survey. Your completed survey will be assigned a study number instead. Your consent forms will be stored in a locked cabinet and destroyed one year after study completion.

The purpose of the chart review is to verify eligibility for study participation. Information to be collected from the medical record include blood pressure readings, history of depression, duration of your high blood pressure, diagnosis of primary hypertension, and age.

The health information listed above may be used by and/or disclosed (released) to researchers and their staff. Your doctor is required by law to protect your health information. By signing this document, you authorize your doctor to disclose your health information for this research.

If all information that does or can identify you is removed from your health information, the remaining information will no longer be subject to this authorization and may be used or disclosed for other purposes. No publication or public presentation about the research described above will reveal your identity without another authorization from you.

Please note that health information used and disclosed may include information relating to HIV infection; treatment for or history of drug or alcohol abuse; or mental, behavioral health, or psychiatric care.

Also note that you do not have to sign this Authorization, but if you do not, you may not participate in this research study. Your doctor may not withhold treatment or refuse treating you if you do not sign this Authorization.

You may change your mind and revoke (take back) this Authorization at any time. Even if you revoke this Authorization, researchers may still use or disclose health information they already have obtained about you as necessary to maintain the integrity or reliability of the current research.

PI Name: STELLA EKE

The University of Texas Health Science Center at

Houston

Address: 6901 BERTNER AVE Houston TX

77030

SIGNATURES

Sign below only if you understand the information given to you about this research and you choose to take part. Make sure that any questions have been answered and that you understand the study. If you have any questions or concerns about your rights as a research subject, call the Committee for the Protection of Human Subjects at (713) 500-7943. You may also call the Committee if you wish to discuss problems, concerns, and questions; obtain information about the research; and offer input about current or past participation in a research study. If you decide to take part in this research study, a copy of this signed consent form will be given to you.

Printed Name of Subject	Signature of Subject	Date
Printed Name of Person	Signature of Person	Date
Obtaining Informed	Obtaining Informed	
Consent	Consent	

This study HSC-SN-17-0872 has been reviewed by the Committee for the Protection of Human Subjects (CPHS) of the University of Texas Health Science Center at Houston. For any questions about research subject's rights, or to report a research-related injury, call the CPHS at (713) 500-7943.

Appendix D
Recruitment Flyer



Black/African-American Hypertensive Adult Volunteers Needed for Research Study

A PhD in nursing student at University of Texas - Houston is conducting a dissertation study to investigate the relationship between hypertension perceptions and blood pressure medication adherence. This study will be conducted by Ms. Stella Eke under the supervision of her academic advisor at The University of Texas Health Science Center - Houston School of Nursing.

You may be eligible to participate in this study if you are:

- **Black/African-American adult- male or female-35 to 65 years.**
- **Have hypertension**
- **Ever been prescribed blood pressure medication by your doctor-whether you are taking it or not.**

Study details/Procedure:

If you volunteer to participate in this study, you will be asked to complete a one-time questionnaire related to the study, which would take approximately 15-20 minutes to complete.

Compensation for your time will be provided.

Location: At this clinic location

Do you think you may be interested?

For more information about the study, or to volunteer for this study,

please contact:

STELLA EKE ; Phone Number: 832-683-1540

*The study has been reviewed and approved by the Research Ethics Committee at
UTHealth*

Appendix E
Data Collection Instruments

Illness Perception Questionnaire

We are interested in your own personal views of how you now see your current illness.

Please indicate how much you agree or disagree with the following statements about your illness by ticking the appropriate box.

	VIEWS ABOUT YOUR HIGH BLOOD PRESSURE	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
IP1	My high blood pressure will last a short time					
IP2	My high blood pressure is likely to be permanent rather than temporary					
IP3	My high blood pressure will last for a long time					
IP4	This high blood pressure will pass quickly					
IP5	I expect to have my high blood pressure for the rest of my life					
IP6	My high blood pressure is a serious condition					
IP7	My high blood pressure has major consequences on my life					
IP8	My high blood pressure does not have much effect on my life					
IP9	My high blood pressure strongly affects the way others see me					
IP10	My high blood pressure has serious financial consequences					

	VIEWS ABOUT YOUR HIGH BLOOD PRESSURE	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
IP11	My high blood pressure causes difficulties for those who are close to me					
IP12	There is a lot which I can do to control my symptoms					
IP13	What I do can determine whether my high blood pressure gets better or worse					
IP14	The course of my high blood pressure depends on me					
IP15	Nothing I do will affect my high blood pressure					
IP16	I have the power to influence my high blood pressure					
IP17	My actions will have no affect on the outcome of my high blood pressure					
IP18	My high blood pressure will improve in time					
IP19	There is very little that can be done to improve my high blood pressure					
IP20	My treatment will be effective in curing my high blood pressure					
IP21	The negative effects of my high blood pressure can be prevented (avoided) by my treatment					
IP22	My treatment can control my high blood pressure					

	VIEWS ABOUT YOUR HIGH BLOOD PRESSURE	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
IP23	There is nothing which can help my condition					
IP24	The symptoms of my condition are puzzling to me					
IP25	My high blood pressure is a mystery to me					
IP26	I don't understand my high blood pressure					
IP27	My high blood pressure doesn't make any sense to me					
IP28	I have a clear picture or understanding of my condition					
IP29	The symptoms of my high blood pressure change a great deal from day to day					
IP30	My symptoms come and go in cycles					
IP31	My high blood pressure is very unpredictable					
IP32	I go through cycles in which my high blood pressure gets better or worse					
IP33	I get depressed when I think about my high blood pressure					

	VIEWS ABOUT YOUR HIGH BLOOD PRESSURE	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
IP34	When I think about my high blood pressure I get upset					
IP35	My high blood pressure makes me feel angry					
IP36	My high blood pressure does not worry me					
IP37	Having this high blood pressure makes me feel anxious					
IP38	My high blood pressure makes me feel afraid					

CAUSES OF MY HIGH BLOOD PRESSURE

We are interested in what you consider may have been the cause of your illness.

As people are very different, there is no correct answer for this question. We are most interested in your own views about the factors that caused your illness rather than what others including doctors or family may have suggested to you. Below is a list of possible causes for your illness. Please indicate how much you agree or disagree that they were causes for you by ticking the appropriate box.

POSSIBLE CAUSES		STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
C1	Stress or worry					
C2	Hereditary - it runs in my family					
C3	A Germ or virus					
C4	Diet or eating habits					
C5	Chance or bad luck					
C6	Poor medical care in my past					
C7	Pollution in the environment					
C8	My own behavior					
C9	My mental attitude e.g. thinking about life negatively					
C10	Family problems or worries caused my high blood pressure					
C11	Overwork					
C12	My emotional state e.g. feeling down, lonely, anxious, empty					
C13	Ageing					
C14	Alcohol					
C15	Smoking					
C16	Accident or injury					
C17	My personality					
C18	Altered immunity					

Hill-Bone Blood Pressure Therapy Scale

(NA/not applicable / DK/don't know)	None of the time	Some of the time	Most of the time	All the time	Don't know
1. How often do you forget to take your HBP medicine?	1	2	3	4	9
2. How often do you decide not to take your HBP medicine?	1	2	3	4	9
3. How often do you leave the pharmacy without obtaining your prescribed pills?(due to long line, closure of clinic, forgot	1	2	3	4	9
4. How often do you miss taking your HBP pills when you feel sick?	1	2	3	4	9
5. How often do you run out of HBP pills?	1	2	3	4	9
6. How often do you skip your HBP medicine 1-3 days before you go to the clinic?	1	2	3	4	9
7. How often do you miss taking your HBP pills when you feel better?	1	2	3	4	9
8. How often do you take someone else's HBP pills?	1	2	3	4	9
9. How often do you miss taking your HBP pills when you care less?	1	2	3	4	9

Demographic and Confounding Variable Data

1. Please write your age in years: _____
2. Which option best fits your educational level?
 - a. Less than high school
 - b. High school
 - c. Some college or trade school
 - d. Four-year college or greater
3. What is your gender?
 - a. Male
 - b. Female
4. How long has it been since you were told by a doctor that you have high blood pressure? _____
5. Where would you say your systolic (top blood pressure) reading usually is?
 - a. 140-159
 - b. Greater or equal to 160
6. Where would you say your diastolic (bottom blood pressure) reading usually is?
 - a. 90-99
 - b. Greater or equal to 100
7. Do you experience any worrisome symptoms from your high blood pressure?
 - a. Yes
 - b. No

8. Have you ever been diagnosed with depression by a doctor or do you take medication prescribed by a doctor or other healthcare providers for depression?
 - a. Yes
 - b. No

9. Do you have health insurance plan that pays for your blood pressure medication and doctor visit?
 - a. Yes
 - b. No

10. What is your employment status?
 - a. Employed
 - b. Unemployed
 - c. Retired

Appendix F
Enrollment Log

Participant Code Number	Screening Date (DD/MM/YY)	Eligible (Yes/No)	Ineligibility Reasons (Choose numbers from the list below)	Consent Signed (Yes/No)	Questionnaires Completed			Investigator Comments
					IPQ-R (Yes/No)	Hill-Bone (Yes/No)	Demographic (Yes/No)	

➤ **Eligibility Criteria:**

1. Black adult male and females—35 to 65 years
2. Diagnosis of primary hypertension for at least 12 months
3. Have been prescribed or is taking at least one hypertensive medication
4. Able to read and write in English.

➤ **Ineligibility Reasons:**

1. Secondary hypertension as supported by history of sleep apnea, renal artery disease, stenosis, certain cardiovascular diseases, hyperthyroidism, pregnancy, or adrenal gland tumor (pheochromocytoma)
2. Severe mental disorder that can hinder comprehension of instructions.

Appendix G
Chart Review Form

Patient Study number_____

1. Participant's age in years _____
2. Diagnosis of Primary/Essential Hypertension (ICD-10 code: I10)?: Yes or No
3. Duration of hypertension diagnosis? _____
4. Documented diagnosis of depression or taking antidepressant? Yes No
5. Two most recent systolic blood pressure readings_____
6. Two most recent diastolic blood pressure reading_____
7. Duration of hypertension diagnosis_____
8. Number of blood pressure medications_____

❖ **Decision: Met inclusion Criteria?** Yes No

❖ **If excluded, why (Write in)**_____

❖ **Or choose from exclusion criteria:**

- (a) Potential secondary hypertension as supported by history of sleep apnea, renal artery disease, stenosis, certain cardiovascular diseases, hyperthyroidism, pregnancy, or adrenal gland tumor (pheochromocytoma);
- (b) Severe mental disorder that can hinder comprehension of instructions;
- (c) Refusal to provide informed consent

Appendix H

Study Manual

Introduction

The purpose of this manual is to provide a guideline for data collectors or researchers. This document provides step-by-step instructions for the data collection process and is intended for use, to reduce error during the data collection process.

Purpose of Study

- To investigate perceptions about causes of hypertension among Black hypertensive adults aged 35 to 65 years of age.
- To examine the relationship between medication adherence and hypertension perceptions as related to views about hypertension timeline, controllability, consequences, emotional representation, illness coherence, and cause among Black hypertensive adults 35 to 65 years old while controlling for depression, educational level, duration of diagnosis, hypertension-related symptom, and severity of hypertension.
- To explore to what extent hypertension perceptions and medication adherence differ by gender after controlling for confounder.

Study Setting and Population:

The population of interest for this study is Black hypertensive adults, aged 35 to 65 years old in primary care settings. Recruitment/data collection will occur in four primary care clinics in Houston Metropolitan area. One of the clinics is a university-affiliated employee health clinic.

Approvals and Permissions:

Study approval was obtained from University of Texas-Houston Health Science Center Committee for the Protection of Human Subjects (CPHS). Written permission was obtained from management at each of the four sites.

Role of Principal Investigator

The Principal Investigator (PI) assumes the responsibility for all aspects of the study including proposal development and defense, screening and recruitment, data collection, data management, data analysis, data interpretation, writing up the final results and report, and presentation of findings. Furthermore, the PI serves as the coordinator of communication and activities between the parties involved in the study.

Assessing Eligibility

Inclusion Criteria: (a) self-identified Black adults; (b) males and females, aged 35 to 65 years; (c) diagnosis of primary/essential hypertension (diagnosis of essential hypertension was confirmed by PI during chart review based on written diagnosis of “essential or primary” HTN or ICD 10 code (I10) in patients’ charts); (d) duration of hypertension diagnosis for at least 12 months; (e) had been prescribed or was taking at least one hypertensive medication; (e) ability to read and write in English.

Exclusion criteria: (a) Secondary hypertension as supported by history of sleep apnea, renal artery disease, stenosis, certain cardiovascular diseases, hyperthyroidism, pregnancy, or adrenal gland tumor (pheochromocytoma) upon chart review, (b) severe mental disorder hindering comprehension of instructions; (c) refusal to provide informed consent.

Study Variables

Illness Perceptions. This will be measured with revised-illness perception questionnaire. IPQ-R has two sections: Illness representation (IR) with 38 items; and the Cause section with 18 items.

Medication Adherence: This variable will be measured with the nine-item medication adherence subscale of the Hill-Bone Blood Pressure Therapy adherence scale.

Covariates and demographic data: Demographic data include age, employment status, gender, health insurance status. Covariates include history depression, number of hypertension medications, experience of worrisome hypertension symptoms, duration of hypertension and hypertension severity. These data will be collected using a designed demographic data form designed for this study. Chart review will also be used to collect data on certain covariates.

Supplies Needed for Recruitment and Data Collection:

- Copies of the recruitment flyers
- Copies of IPQ-R, Hill-Bone and demographic data questionnaires
- Copies of informed Consent forms
- Enrollment Log
- Copies of PI chart review form
- Pencils or pens
- Clip boards
- Gift cards: Choice of Starbucks or Wal-Mart gift cards worth \$15 each card.

- Study codes or Numbers
- Large envelope to store completed questionnaires and PI chart review forms
- Large envelope to store completed informed consent.

Recruitment Procedure:

- Before initiation of data collection, the PI will first visit each of the four clinics and go over the recruitment process and familiarize himself/herself with the clinics.
- PI will be present at the clinic three to four days a week, rotating between the clinics.
- Recruitment flyer needs to be placed in the lobbies and exam rooms at each of the clinics.
- All data collection will take place in the clinics' lobbies as the patients wait to see their doctors.
- To maximize the likelihood of recruiting many participants each recruitment day, the PI may need to ask the clinic scheduler or front desk staff the days many patients that may likely qualify for the study are scheduled.

Data Collection Procedure

- PI approaches potential participants in the clinics' lobby with the recruitment flyer and gives a brief introduction of the study.
- Allow potential participants time to read the flyer and ask questions about the study.
- If participant is interested in participating, the PI gives them the informed consent form with signature. Remind participant to thoroughly read the informed consent and ask questions before signing, including introduction, benefit, compensation, risk and confidentiality.
- After consent is signed, have participants complete the study questionnaires.
- Always protect participants' privacy while collecting data in the lobby.
- Upon completion of the questionnaires, PI needs to go through the questionnaires for missing data; and have participant complete any missing information.

- Allow each participant to select a \$15-dollar Wal-Mart or Starbucks gift card.
- Every potential participant approached, whether eligible or not, should be logged in the “Enrollment log” form and reason for ineligibility documented.

Post Questionnaire Completion:

- Assign each participant’s completed questionnaire a study identification code; and write the code on each page of the questionnaire.
- Place each completed questionnaire in the large envelope.
- Using each participant’s name and date of birth, ask the clinic medical assistant or front desk secretary to pull the chart.
- Conduct the chart review using the form labeled “PI’s chart review form” .
- At the end of chart review, write each participant’s study identification code on the chart review form, attach it to the completed Illness Perception and Hill-Bone medication adherence questionnaires and demographic form, and place them in the large envelope.
- Be careful not to write any participant’s name or date of birth on any of the completed questionnaires or chart review form.
- Place the signed informed consent forms in a large envelope separate from the one containing the completed questionnaires.
- At the end of each recruitment day, count and document the number of remaining gift cards.

Data Management:

- The PI is responsible for management and storage of all collected data.
- PI is responsible for entering the data in SPSS.
- PI and advisor will verify accuracy of data entry.
- Completed questionnaires and consent forms will be stored in a locked cabinet throughout the study and for five years post study.

Data Analysis

- Data analysis will be conducted by PI with assistance of a statistician.
- Conduct principal component factor analysis of the 18 causal items of the IPQ-R to examine sample's perceptions about causal attribution of hypertension.
- Conduct multiple regression to investigate the association between illness (hypertension) perceptions and medication adherence.
- Conduct ANCOVA to explore gender differences in medication and adherence and hypertension perceptions.

Demographics and Covariates Codebook

<u>Variable</u>	<u>SPSS Name</u>	<u>Coding instructions</u>
Identification Code	ID	As in assigned study ID
Age	Age	Age in years
Educational level	Education	1 = less than high school 2 = high school 3 = some college or trade school 4 = four yr college or greater
Gender	Gender	1 = Males 2 = Females
How long diagnosed with HTN	HTN duration	Enter year (continuous)
Average systolic BP	SBP	1 = 140-159 (mild or stage 1) 2 = ≥ 160 (severe or stage 2) 3 = < 140 (normal)
Average diastolic BP	DBP	1 = 90-99 (mild or stage 1) 2 = ≥ 100 (severe or stage 2) 3 = < 90 (normal)
Experience worrisome HTN symptoms	HTN symptoms	1 = Yes 2 = No
Ever been diagnosed with Depression or take medication	Depression history	1 = Yes 2 = No
Health insurance for doctor visit and medication	Health insurance	1 = Yes 2 = No
Employment status	Employment	1 = Employed 2 = Unemployed 3 = Retired
HTN medication complexity	Number of HTN medications	≤ 2 = Not complex ≥ 3 = Complex
Recruitment site	Site	1 = Mercy SW 2 = AOW 3 = FMCC 4 = UT-Health

IPQ-R: IR (P1 to P38) coding

<u>Variable</u>	<u>SPSS label</u>	<u>Coding Instruction</u>
BP lasts a short time	IP1	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
BP likely to be permanent than temporary	IP2	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
BP last for a long time	IP3	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
This HBP will pass quickly	IP4	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
I expect to have BP rest of my life	IP5	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
BP is a serious condition	IP6	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
BP has major consequences	IP7	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree

<u>Variable</u>	<u>SPSS label</u>	<u>Coding Instruction</u>
BP doesn't have much effect on my life	IP8	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
BP strongly affects the way people see me	IP9	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My BP has serious financial consequences	IP10	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My BP causes difficulties for those close to me	IP11	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
There is a lot I can do to control my symptoms	IP12	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
What I do can determine whether my BP gets better or worse	IP13	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
The course of my BP depends on me	IP14	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree

<u>Variable</u>	<u>SPSS label</u>	<u>Coding Instruction</u>
Nothing I do will affect my HBP	IP15	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
I have the power to influence my HBP	IP16	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My actions will have no effect on the outcome of my HBP	IP17	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My HBP will improve in time	IP18	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
There is very little that can be done to improve my HBP	IP19	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My treatment will be effective in curing my HBP	IP20	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
The negative effects of my HBP can be prevented by my treatment	IP21	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree

<u>Variable</u>	<u>SPSS label</u>	<u>Coding Instruction</u>
My treatment can control my HBP	IP22	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
There is nothing which can help my condition	IP23	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
The symptoms of my condition are puzzling to me	IP24	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My HBP is a mystery to me	IP25	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
I don't understand my HBP	IP26	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My HBP doesn't make any sense to me	IP27	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
I have a clear picture or understanding of my condition	IP28	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree

<u>Variable</u>	<u>SPSS label</u>	<u>Coding Instruction</u>
The symptoms of my HBP change a great deal from day to day	IP29	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My symptoms come and go in cycles	IP30	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
MY HBP is very unpredictable	IP31	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
I go through cycles in which my HBP gets better or worse	IP32	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
I get depressed when I think about my HBP	IP33	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
When I think about my HBP I get upset	IP34	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My HBP makes me feel angry	IP35	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree

<u>Variable</u>	<u>SPSS label</u>	<u>Coding Instruction</u>
My HBP does not worry me	IP36	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Having this HBP makes me feel anxious	IP37	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My HBP makes me feel afraid	IP38	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree

Causal Attribution Coding

<u>Variable</u>	<u>SPSS label</u>	<u>Coding Instruction</u>
Stress or worry	C1	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Hereditary	C2	1= Strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Germ or virus	C3	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Diet or eating habits	C4	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Chance or bad luck	C5	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Poor medical care in my past	C6	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Pollution in the environment	C7	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree

<u>Variable</u>	<u>SPSS label</u>	<u>Coding Instruction</u>
My own behavior	C8	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My mental attitude	C9	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Family problems or worries	C10	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Overwork	C11	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My emotional state(anxious, feeling down, lonely, empty)	C12	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Ageing	C13	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Alcohol	C14	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree

<u>Variable</u>	<u>SPSS label</u>	<u>Coding Instruction</u>
Smoking	C15	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Accident or injury	C16	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
My personality	C17	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree
Altered immunity	C18	1= strongly disagree 2= disagree 3= neither agree nor disagree 4= agree 5= strongly agree

Hill-Bone HBP scale Codebook

<u>Variable</u>	<u>SPSS label</u>	<u>Coding Instruction</u>
Forget to take BP medicine	HBHBPmed 1	1= none of the time 2= some of the time 3= most of the time 4= all the time
Decide not to take your HBP medicine	HBHBPmed 2	1= none of the time 2= some of the time 3= most of the time 4= all the time
Leave pharmacy without picking medicine	HBHBPmed 3	1= none of the time 2= some of the time 3= most of the time 4= all the time
Miss taking HBP medicine when feel sick	HBHBPmed 4	1= none of the time 2= some of the time 3= most of the time 4= all the time
Run out of HBP pills	HBHBPmed 5	1= none of the time 2= some of the time 3= most of the time 4= all the time
Skip HBP medicine for 1-3 days before going to clinic	HBHBPmed 6	1= none of the time 2= some of the time 3= most of the time 4= all the time
Miss taking BP pills when feel better	HBHBPmed 7	1= none of the time 2= some of the time 3= most of the time 4= all the time
Take someone else's HBP pills	HBHBPmed 8	1= none of the time 2= some of the time 3= most of the time 4= all the time
Miss taking your HBP pills when you care less	HBHBPmed 9	1= none of the time 2= some of the time 3= most of the time 4= all the time

Curriculum Vitae

Stella Eke, PhD, DNP, RN, FNP-C

EDUCATION

University of Texas-Houston Cizik School of Nursing Nursing	2018	PhD
Texas Woman's University Denton/Dallas, TX Nursing	2011	DNP
Texas Woman's University- Houston, TX Nursing-FNP	2008	MS
Texas Woman's University- Houston, TX Nursing	2006	BS
Houston Community College Houston, TX Nursing	2002	ADN

PROFESSIONAL POSITIONS:

Mercy Family and Pediatric Clinic Houston, TX Family Nurse Practitioner	2012-present
South University Online program Adjunct faculty	2016-present
Houston Community College Adjunct Clinical Faculty	2011-2013
Shoetan Family Clinics- Houston, TX Family Nurse Practitioner	2011-2012
Christus Medical Group-Houston Family Nurse Practitioner	2008-2011

The Methodist Hospital
Houston, TX
Registered Nurse 2003-2008

PROFESSIONAL MEMBERSHIP:

Sigma Theta Tau International Honor Society of Nursing-
Houston Chapter 2008-present

Member of Houston Area Nurse Practitioner Organization 2007-present

PUBLICATIONS:

Eke S.O., Kus, E., Thompson, A. & Mancuso, P. (2011). Primary Hyperparathyroidism:
A Symptomatically Mild Disease with Serious Complications. *Journal for Nurse
Practitioners* (Published June 2011; *JNP*, Volume 7(6): 479-485)