LOMA LINDA UNIVERSITY

School of Public Health

KNOWLEDGE, PERCEPTIONS, BELIEFS AND BEHAVIORS RELATED TO THE PREVENTION OF HYPERTENSION AMONG BLACK SEVENTH-DAY ADVENTISTS LIVING IN LONDON

By

Maxine A. Newell

A Dissertation in Partial Fulfillment of the Requirements for the

Degree of Doctor of Public Health in Health Education

June 2008

Each person whose signature appears below certifies that this dissertation in his/her opinion, is adequate in the scope and quality as a dissertation for the degree of Doctor of Public Health

_____

Naomi Modeste, Chairman
Chair, Department of Health Promotion and Education

_____

Helen Hopp Marshak,
Associate Professor of Health Promotion and Education

_____

Colwick Wilson
Associate Professor of Counseling and Family Science

ABSTRACT OF THE DISSERTATION

Knowledge, Perceptions, Beliefs and Behaviors Related to the Prevention of Hypertension among Black Seventh-Day Adventists Living in London

by

Maxine Newell

Doctor of Public Health-Candidate in Health Education

Loma Linda University, Loma Linda, California, 2008

Naomi Modeste, Chairman

This study was a cross-sectional survey of the hypertension (HTN) knowledge and risk behaviors of Black Seventh-day Adventists (SDA) in London. Recruitment took take place in 17 predominantly Black SDA churches in London. A questionnaire assessed knowledge and lay-beliefs about HTN and perceptions towards HTN using the health belief model (HBM) constructs of susceptibility, severity, benefits, barriers, and self-efficacy. Cohen's Perceived Stress Scale was incorporated into the questionnaire. Blood pressure, height, weight and waist circumference were and current lifestyles practices were evaluated for the presence of HTN risk factors.

Of the 312 volunteers, ages 25 to 79, 55% were born in the Caribbean, 10% in Africa and 35% in the UK. Sixty-nine percent were female and 31% male. Descriptive statistics were calculated for their knowledge, common lay-beliefs and the levels of the HBM variables. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were

regressed on the demographic variables and the relative risk estimate (RRE) score, a measure of the behavioral risk factors for HTN.

Twenty-five percent of the study participants were hypertensive, with a greater prevalence among men (34%) than women (21.6%) (p =.037). Though participants were knowledgeable about the causes and consequences of HTN, they did not feel that they were at increased susceptibility of developing HTN, and in general did not practice preventive lifestyles - 68.6% were at increased risk for developing HTN

Age (p = .002), gender (p =.000002) and family history of HTN (p = .006) were independent predictors of SBP, while the RRE score (p =.002) was an independent predictor of DBP. The HBM variable of self-efficacy was the only independent variable that was predictive of the RRE score (p =.022).

In general, SDA lifestyles are healthier than non-SDAs, but for these participants this was not the case. More attention needs to be given to behavior change in order for the emphasis on health living within the SDA church to translate into preventive behaviors.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 6 - CONCLUSION AND RECOMMENDATIONS

LIST OF FIGURES

CHAPTER 1 - INTRODUCTION

ACKNOWLEDGMENT

This journey began what seems to be a long time ago with the gentle nudging of my friends and family in London. It has been a long and arduous one, but also extremely rewarding. I would like to thank each faculty member in the School of Public Health that shared their knowledge with me, but especially I would like to thank my advisor and Chair, Dr. Naomi Modeste. I am thankful for the prodding that she provided along the way: Knowing that I would receive inquiries as to long silences whenever I got a little discouraged and wanted to walk away from the whole process kept me motivated to get back "on task".

Drs. Helen Hopp Marshak and Colwick Wilson, the other members of my committee provided guidance, knowledge and perspective—they helped me to see that all of the disastrous moments were not so disastrous after all.

There were others without whom success would have been impossible: The leadership of the South England Conference of Seventh-day Adventists, the London Pastors who allowed me to recruit in their churches, the church members who volunteered to be part of my study, friends and church members here in Southern California who encouraged me and my family who continued their support throughout. Thank you.

God knew I needed you all to fulfill the plan that He had for my life. I thank Him for His plan and I thank Him for all of you.

CHAPTER 1

INTRODUCTION

A. Statement of the Problem

The primary cause of morbidity and mortality worldwide is cardiovascular disease (Gomez & Cappuccio, 2005) and there is considerable evidence that hypertension (HTN) is a strong risk factor for cardiovascular disease (Agyemang & Bhopal, 2003; Williams, et al., 2004). Worldwide, malnutrition and smoking are the only risk factors that contribute to more deaths than HTN (Campbell et al., 1999).

In both the United States (US) and the United Kingdom (UK) the prevalence of morbidity and mortality associated with HTN is much higher in Blacks than in Whites (Agyemang & Bhopal, 2003; Lemic-Stojcevic, Dundas, Jenkins, Rudd, & Wolfe; 2001; Pescatello et al., 2003). In the US, the prevalence for HTN among Blacks is 40.5% as compared to 27.4% among Whites (CDC, 2005). Similarly, in the UK Blacks have a higher prevalence of HTN than Whites. The 2004 (National Health Service, 2005) did not report a direct comparison of HTN rates between Blacks and Whites, but did report that Black Caribbean men and women had higher prevalence rates (38.4% and 31.7%) than the general population (31.7% and 29.5%). In 10 out of 14 prevalence studies in the UK, however, Black men had higher mean systolic blood pressure than White men and 10 out of 12 studies reported higher rates for Black women than White women (Agyemang & Bhopal, 2003).

Hypertension is identified as the most commonly diagnosed condition in the UK and its treatment the "most important single intervention" in the primary care setting

(Mead, 2004, p. 1). One in two UK Blacks is hypertensive by the age of 50 (Dong et al., 1999), and the reported morbidity associated with HTN is much higher in Blacks that in Whites (Agyemang & Bhopal, 2003; Lemic-Stojcevic, et al., 2001).

Gillum (1979) noted that as far back as 1930, scientists have documented differences in blood pressure (BP) between Blacks and Whites. In his article, Gillum reviewed the studies up until 1979 that examined the pathology of the radial racial differences in HTN. One of the factors implicated in such differences in the earlier studies was that of genetics but it was not clear how much genetics impacted BP. Twenty-one years later, Cooper and Zhu (2001) said of the study of genetics and HTN that there has been much progress but there is still much research to be done, and currently, the work in genetics is raising more questions than answers.

In his discussion of the pathophysiology of HTN in Blacks and Whites, Gillum (1979) summarized what was then known about the phenomenon of higher rates of HTN among Blacks. The difference was influenced by personal characteristics, where HTN onset was earlier for Blacks than Whites and, beyond the age of 35, higher in Black women than men. Differences in plasma-renin activity made Blacks more sensitive to sodium than Whites. Autopsies revealed adrenal cortical abnormalities in Blacks. Lower levels of dopamine-β-hydroxylase in Blacks lead to differences in autonomic nervous system function. There were also dietary factors such as increased sodium and decreased potassium and calcium intake in Blacks. Environmental factors, where more Blacks lived in poverty than Whites, with lower levels of occupation and education, and higher socioecological stress, were also understood to contribute to the higher HTN prevalence in Blacks.

Much of the study of genetics has taken place in the US, and has been fueled by the consistent findings of higher prevalence of HTN among US Blacks when compared to their White counterparts. When examined internationally, however, the rates of HTN among people of the African Diaspora reveal an east-west gradient with rates among Blacks increasing as they move from the less developed countries of Africa to the developed countries in the west: The rates, among Blacks, in Nigeria, Jamaica and the US were 13.5%, 28.6% and 44% respectively (Cooper, et al., 2005). With the understanding that people of African descent all share some common genetic make-up (Cruickshank, Mbanya, Wilks, Balkau, McFarlane-Anderson & Forrester, 2001), this "epidemiological transition" (Gomez & Cappuccio, 2005, p. 13), that is, change in the pattern of the disease that has evolved simultaneously with change in societies, suggests greater significance for the interaction of HTN with socio-economic and environmental factors than genetics (Cooper, et al., 2005; Gomez & Cappuccio, 2005).

There are clearly lifestyle contributors to HTN that include being overweight, excessive alcohol consumption, high salt intake, smoking, diets low in fruit and vegetable consumption, elevated cholesterol levels, sedentary lifestyles and stress (CDC, Office of Minority Health, 2005; Williams et al., 2004). In their discussion of the treatment of HTN, Campbell et al. (1999) stated that the rising cost of drug therapy makes it necessary that alternative methods of treatment be considered. They underscore the importance of getting the public to see the efficacy of lifestyle changes.

Studies have demonstrated the effectiveness of lifestyle modifications including weight control, sodium reduction, exercise, increased fruit and vegetable consumption, and stress management to prevent and treat HTN (Beilin, 2004; Fraser, 2003; Jamnik et

al., 2005; Svetkey et al., 2005; Willet, 2003). The lack of community resources, however, and the fact that many patients do not follow their recommendations, frustrates clinicians who take the time to counsel their patients to change their lifestyles (Campbell et al., 1999).

While non-pharmacological approaches, such as dietary changes, are effective in controlling HTN in both Whites and Blacks, Svetkey et al. (1999) reported that when participants in a randomized controlled study consumed a diet rich in fruit, vegetables, low-fat dairy products, foods low in fats and cholesterol and a modest amount of animal protein, the positive response was greater in Blacks than in Whites. In their study, all participants on antihypertensive medications were weaned off of their medications 2 weeks before the collection of the baseline data. At the end of the 8-week intervention, the blood pressure (BP) of Blacks dropped by 6.9/3.7 mm Hg compared to 3.3/2.4 mm Hg in Whites. In their 2003 study of the impact of non-pharmacological approaches to reduce coronary heart disease events Erlinger, Vollmer, Svetkey, and Appel (2003) also found a greater response in Blacks than Whites.

In the US, treatment rates for HTN are higher among Blacks than Whites: 55.4% versus 48.6% (Morbidity and Mortality Weekly Report, 2005). Similarly, in the UK the treatment rates are higher for Blacks with percentages ranging from 4.6% to 32% in Black hypertensives and 3.4% to 9% in White hypertensives (Agyemang & Bhopal, 2003). This difference in treatment rates could be a reflection of awareness among physicians of the increased risks of HTN in Blacks. Despite these higher treatment rates however, HTN continues to be a more dominant cause of mortality in Blacks than Whites (Agyemang & Bhopal, 2003). Gomez and Cappuccio (2005) question the effectiveness

of the current treatment approach where individuals with high BP are treated with drugs because "the majority of strokes are observed in patients over 60 years and below the treatment threshold for hypertension" (p.16). There is evidence, they state, "of a continuous relation between blood pressure and cardiovascular mortality from a level of blood pressure as low as 115/75 mm Hg" (p. 15). The fact that Blacks not only have a greater prevalence of HTN but, even among normotensives, generally have higher BPs than Whites (Agyemang & Bhopal) could explain the higher prevalence of morbidity and mortality associated with HTN in Blacks (Lemic-Stojcevic et al., 2001; Pescatello et al., 2003) despite the higher treatment rates.

The perception of HTN and its consequences differ between Blacks and Whites in the US. Blacks most commonly identified renal failure as a consequence of HTN, while Whites identified heart disease. More significantly, and maybe as a function of the fact that Blacks are twice as likely as Whites to be hypertensive, they are more likely than Whites to accept higher diastolic blood pressures as normal (Bloomfield, Young & Graves, 1993).

In 1983, Snow interviewed African Americans concerning their common beliefs about HTN. Among them were that HTN was an acute illness recognized by symptoms such as headaches and dizziness, medication for HTN was prone to make them sick, and home remedies such as taking Epsom salts or washing hands in vinegar were effective treatments for HTN (Snow, 1983). These results might be dismissed as being out-of-date and therefore irrelevant. Surprisingly, many of the same beliefs, which are contrary to current medical understanding, persist. In 2002, Wilson and colleagues reported on lay beliefs of low-to-middle-income urban African Americans and found that many believed

that HTN can be identified by "episodic symptoms," such as headaches, and can be treated by eating garlic, vinegar, or Epsom salts. These food remedies were preferred because they had fewer side effects than prescribed medicines.

Despite decades of public health education in African American communities, the perception of the causes, consequences and treatment of HTN of low-to-middle-income African Americans are poorly related to the medical understanding of this disease (Wilson et al., 2002). There is still a wide gulf in the understanding of HTN between health care professionals and lay persons.

Is there a parallel phenomenon of misunderstanding of HTN among Blacks in the UK? While research supports a similar disparity of HTN rates between Blacks and Whites in the UK (Agyemang & Bhopal, 2003; Hajat, Tilling, Stewart, Lemic-Stojcevic & Wolfe, 2004; Khan & Beevers, 2005; Lane & Lip, 2001) there are limited data regarding the perceptions of Blacks in the UK towards HTN. A study of the perceptions of UK Blacks is necessary if an effective public health education approach for the prevention and treatment of HTN is to be developed.

B. Purpose of the Study

The purpose of this study was to evaluate the beliefs and attitudes about HTN among Seventh-day Adventist (SDA) Blacks in London. The study examined factors that predispose them to HTN such as poor diet, physical inactivity, family history of HTN, obesity and stress. The lifestyle recommendations of the SDA Church include most of those in current literature: abstinence from smoking and the use of alcohol, a vegetarian or near vegetarian diet, and an active lifestyle (Fraser, 1999; Fønnebø, 1994). As such, SDA lifestyles are generally healthier than non-SDAs (Braithewaite, Fraser, Modeste,

Broome, & King, 2003). The study of SDA populations in the Netherlands, Japan, Denmark, Norway, and the US each, to varying degrees, support the finding that a SDA lifestyle does positively impact the risk of disease, including HTN (Fønnebø, 1994; Fraser 1999). One of the aims of this study was to provide information on the lifestyle practices of Black SDAs living in London.

A study of the prevalence rates of Black SDAs in London was beyond the scope of this research; however, blood pressure levels were measured and compared against national statistics for Blacks in the UK. The examination of Black SDA beliefs and attitudes towards HTN revealed whether or not their perceptions of HTN, like US Blacks, cause them to have inaccurate beliefs regarding HTN or under-appreciate the importance of their need to maintain or change lifestyles in order to reduce their HTN risk.

C. Research Questions

There were four questions guiding this research regarding Seventh-day Adventists living in London:

1. What are the knowledge levels, and common lay-beliefs held concerning hypertension?
2. What are the levels of the Health Belief Model (HBM) variables of perceived susceptibility, severity, benefits and barriers related to controlling hypertension?
3. Is there a relationship between the levels of HBM variables related to preventing hypertension and behavioral hypertension risk factors?
4. What is the relationship between the behavioral variables and BP levels, controlling for demographic variables?

D. Theoretical Framework

The theoretical framework chosen for this study was the health belief model (HBM). This model has been used to explain and predict health behavior for over 5 decades. The core HBM constructs of perceived susceptibility, severity, benefits, barriers and self-efficacy concerning the prevention of HTN were examined in this study. Even though this was only an observational study where no attempts were made to change behavior, the construct of self-efficacy was still relevant as it related to the participants' perceptions of their abilities to maintain or adapt behaviors which can prevent HTN.

Health educators are aware that a good education program based solely on an appropriate and valid theory does not a successful intervention make. Integral to the success of any intervention is the need for the program to be culturally appropriate (Reniscow, Braithwaite, Dilorio, & Glanz, 2002). While there is criticism that the HBM needs additional studies to examine the relationships among the model constructs, studies using these constructs showed that different ethnic groups have varying perceptions towards given health issues as captured by HBM variables (Janz, Champion, & Strecher, 2002).

Brown and Segal (1996) used the HBM to examine ethnic differences in temporal orientation and the implications for HTN management. Temporal orientation is defined as time perception structured by life experiences, which influences the perceptions of the effects of current behavior. African Americans were more present-oriented than Whites, reacting to situations "only if and when it occur[ed]" (p. 351), and as such, believed that they were less susceptible to the consequences of HTN than their future-oriented White counterparts who were "motivated to act in ways to achieve desired future ends" (p. 351).

Thus, the HBM seemed an appropriate foundation for examining the HTN beliefs in my study.

In another study, Brown and Segal (1996) used the HBM to compare the perceptions of African Americans and Whites towards the treatment of HTN with drugs versus home remedies. African Americans had a higher perception of susceptibility to HTN consequences than did Whites. Participants who perceived HTN as severe were more likely to comply with taking prescribed medications. Curiously, participants with lower perceptions of susceptibility were also more likely to be compliant with medications.

While my study was not a comparative study, application of the HBM was helpful in revealing some of the unique perceptions of Black SDAs in London towards HTN and how these perceptions influenced their risk for HTN.

Figure 1.1 shows a diagram of the variables used in my study. The study examined how perceptions about preventing HTN were hypothesized as being related to current HTN risk behavior. A person's perception of their susceptibility to HTN should, if they believe themselves to be highly susceptible, manifest behaviors that reduce susceptibility. If, on the other hand, they do not consider themselves susceptible, no care will be taken to avoid risk factors. Likewise, their perceptions of the severity of the consequences of HTN will determine whether or not they will change their behavior should they become hypertensive. Even if individuals consider themselves susceptible, they will weigh the benefits of doing things to avoid HTN versus just living with the consequences should they become hypertensive. Perceived barriers to preventing HTN, such as the ease or difficulty of following a vegetarian diet will impact taking action to

reduce the risk of HTN. Finally, whether or not an action is taken will also depend on the individuals' confidence in their ability to perform the behavior.

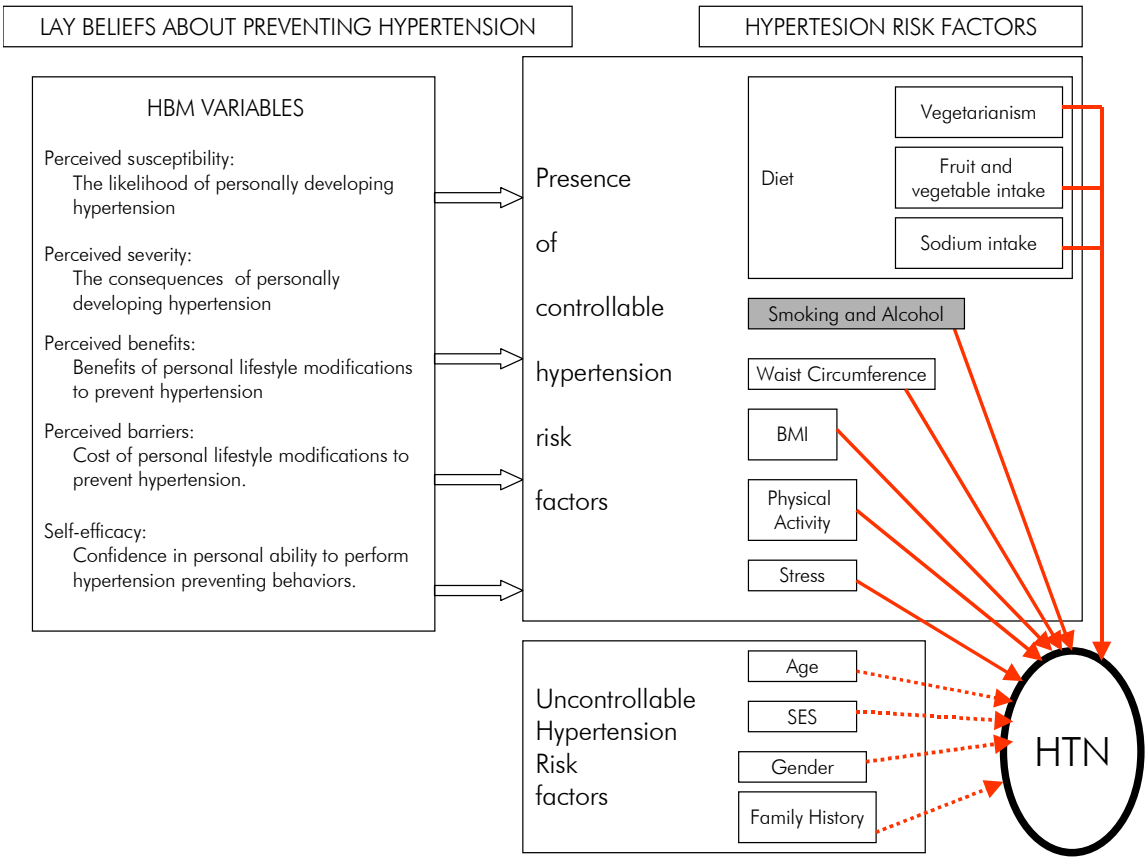

Figure 1.1. Diagram of the Study Variables

Note. Variables in the shaded box were not included in the study (Few SDAs smoke and use alcohol). Variables with dashed arrows were uncontrollable variables and were used as covariates in the study.

E. Significance to Health Education

The treatment rates for UK Blacks with HTN are higher than those of their White counterparts (Agyemang & Bhopal, 2003). A majority of the individuals who experience strokes, however, are over the age of 60 and below the treatment threshold for pharmacological intervention to manage HTN (Gomez & Cappuccio, 2005). The

pharmacological approach, when effective, is individual, but the aim of health education is about lowering blood pressure (BP) throughout the population (Gomez & Cappuccio).

"In health interventions, formative evaluations are first conducted to determine baseline characteristics of the target audience, which in turn inform the suitability of various types of messages for the audience" (Rimal & Real, 2005, p. 410). Given that the pharmacological approach to lowering BP is not cost-effective on a population level, and that the literature makes it evident that the lifestyle modification approach is cost-effective, the aim of this research was to identify psychosocial variables, in terms of the knowledge, beliefs, perceptions and behaviors of SDA Blacks in London concerning the prevention of HTN. Once these are known, health educators can target them in order reduce the risk of HTN, and ultimately decrease its prevalence. As health educators continue to use theory-based interventions to develop programs to promote lifestyle recommendations, information from this study can assist them and other health care providers in improving the cultural appropriateness of their interventions. If these interventions based on research findings are successful, they could reduce the public burden of HTN among Blacks in the UK.

CHAPTER 2

REVIEW OF LITERATURE

A. Overview

In the Health for Minority Groups report, the statistics for the 2004 Health Survey for England (National Health Service, 2005) revealed that the general prevalence rate for female hypertension (HTN) is 29.5% and for males, 31.7%. While a prevalence rate is not given for Black Africans, the rates for Black Caribbean males and females in the United Kingdom (UK) are 38.4% and 31.7%, respectively. In most of the studies, however, where Black Africans and Black Caribbeans were combined into one ethnic group, 'Afro-Caribbean', the prevalence rates still remained higher than their White counterparts: The mean blood pressure (BP) ranged from 124.5/78.5 mm Hg to 138/84 mm Hg for Afro-Caribbeans and from 120/75 mm Hg to 129/77 mm Hg for Whites (Lane & Lip, 2001).

The risk factors for HTN are divided into those over which an individual has no control (heredity, race, gender and age), those linked to lifestyle (alcohol and tobacco use, excess sodium intake, lack of exercise, and stress) and obesity, which Wood (2005) classified as a "medical condition", but which is clearly related to diet and exercise. While the literature on HTN is quite extensive, this review was limited to a discussion of the risk factors for HTN, the probable causes of the disparity between Blacks and Whites, the changes of the prevalence of HTN with the African Diaspora and the contribution of socioeconomics to the elevation of BP among Blacks, and the potential of lifestyle modification to reduce the prevalence of HTN.

Because part of the purpose of this proposed study was to identify whether the beliefs among Blacks in the UK parallel those of Blacks in the United States (US), the literature was examined to see what research had been done in the UK on the beliefs of Blacks concerning HTN.

In the literature coming out of the UK, several terms are used for people of African descent: Afro-Caribbean, African Caribbean, African, Black Caribbean, Black African and Black. In this study these terms were also used somewhat interchangeably to refer to people of African descent.

B. Risk Factors for Hypertension

1. Smoking and Alcohol Consumption

The literature generally lists smoking as an important risk factor for cardiovascular disease/coronary heart disease (Bernaards, Twisk, Snel, van Mechelen, & Kemper, 2005; Kaplan, 2004; Lee et al., 1998; Onal, Erbil, Ozel, Aciksari, & Tumerdem, 2004), but the specific relationship to hypertension is not fully understood. While there is a consistent acute rise in BP during smoking (Kaplan, 2004; Lee et al., 1998), the results of long-term smoking in epidemiological studies are not so clear-cut.

For most diseases related to alcohol consumption there is a dose-response where the risk of the disease increases with the increase of alcohol intake. With cardiovascular diseases, in general, and HTN in particular, the relationship is not as straightforward (Tomson & Lip, 2006). Researchers describe a 'J-shaped association' where moderate or light drinkers have lower BP than both non-drinkers and heavy drinkers (Tomson & Lip; Twisk, Kemper, Mechelen & Bertheke, 2001; Kaplan, 2004; Ohmori et al., 2002; Malinski, Sesso, Lopez-Jimenez, Buring & Gaziano, 2004). However, "the J-shaped

association between alcohol intake and all-cause mortality represents the sum of its protective effect on CHD mortality and detrimental effect on other, primarily non-cardiovascular causes of death" (Nanchahal, Ashton, & Wood, 2000 p. 57).

Seventh-day Adventists generally adhere to the churches prohibition against the use of alcohol and tobacco (Fønnebø, 1994; Fraser, 1999). The numbers of individuals for whom these risk factors would be relevant, therefore, were not expected to be significant and, as such, were not examined in this study.

2. Family History

van der Sande et al. (2001) refer to a review written in 1986 where it was stated that there was little or no association of family history to an increased risk of HTN. This is in contrast to the current understanding where "familial aggregation of BP has been repeatedly demonstrated" (DeStefano et al., 2001, p. 13) and "well recognized" (Daniels et al., 2004, p. 676). Most authorities now recognize that children of parents with HTN have a higher risk of developing HTN than children of normotensive parents (Jackson & Dishman, 2002). The statistics for heritability risk vary from study to study ranging from 14 to 82% for systolic blood pressure (SBP) and 8 to 64% for diastolic blood pressure (DBP) (DeStefano et al.).

Researchers are careful to point out that the etiology of HTN is multifactorial (Fisher et al., 2002; Melander, 2001) and that the variability accounted for by nature versus nurture is not fully understood (DeStefano et al., 2001). Twin studies, however, have added a little more clarity to the picture. A study of 767 nuclear families with both monozygotic and dizygotic twins showed that genetics accounted for 46% of the variance in SBP while environment accounted for 31% (Luft, 2004). Overall authors of twin

studies estimate that the heritability of blood pressure varies from 50% - 70% (Melander). In comparisons between twin and adoptive studies, higher correlations of BP levels were found between parents and their 'blood' children than their adoptive children (DeStefano et al.).

DeStefano et al. (2001) took a closer look at familial aggregation of HTN by comparing maternal and paternal influences. In their study they found that while the proportion of hypertensive fathers of hypertensive probands was about 50%, it ranged from 65 to 85% for hypertensive mothers. This increased risk for maternal offspring held true for all ethnic groups. The risk of developing HTN, among those with hypertensive parents, was lowest for those with hypertensive fathers only and highest for those with both maternal and paternal HTN.

The relationship between first degree relative and HTN including sibling relationships have been studied and the conclusion is that being a sibling of an individual with premature coronary heart disease (CHD) presents an even greater risk of developing CHD than being an offspring (Yanek et al., 1998). As high BP is a known risk factor for CHD, Yanek and colleagues looked at the prevalence of HTN in siblings and found that it to be 44%, with only 60% of the siblings aware of being hypertensive. Yanek et al. compared their data to that of the third National Health and Nutrition Examination Survey (NHANES III). Among siblings of hypertensives, 38% had Stage 1 HTN (140/90-159/99 mm Hg); in the general population it was 15%. For Stage 2 (160/100-179/109 mm Hg) the numbers were 10% for siblings and 5% for the general population. For both samples, Yanek et al., and NHANES III, 2% had Stage 3 HTN ($\geq$ 180/110 mm Hg). Though siblings were aware of the diagnosis of their family members, they, the

undiagnosed siblings, were not following lifestyle recommendations to control their BP. Because siblings are an "easily-identifiable risk group" (Yanek et al., p. 127) further study of familial aggregation could lead to "family-based intervention" (Daniels et al., p. 680), which could be more effective in the treatment and control of HTN.

Family history is likely to be significant in the prevalence of HTN among Blacks in the UK; however, given that many of the Blacks living in the UK are first-generation, the association may not be as strong as that reported in Blacks living in the US.

3. Stress

Psychosocial stress is a risk factor for chronic disease and it is "well accepted that… [it] contributes to the pathogenesis of hypertension" (Bierhaus, Humpert & Nawroth, 2004, p.1189) including HTN. The exact mechanism of how stress leads to HTN, or any other biological consequence, is not completely understood (Plante, 2002; Esler, Rumantir, Kaye, & Lambert, 2001). In their review of risk factors for HTN, Kornitzer, Dramaix and De Backer (1999) said of the relation between stress and HTN that the "results of empirical studies are still equivocal" (p. 704) but what is known is that the central nervous system, specifically the sympathetic nervous system (SNS), is responsible for the regulation of BP. This regulation is accomplished by the catecholamines norepinephrine and epinephrine that come from the adrenal medulla. When an individual faces a mentally stressful situation, the body responds with increases in cardiac output, norepinephrine and blood pressure as a result of α-adregenic receptor stimulation (Scollan-Koliopoulos, 2005). Both mental and physical stress produce a physiological response, but mental/psychological stressors lead to a greater response (Bedi, Varshey, & Babbar, 2000).

The SNS response to stress is commonly described as the 'fight or flight response', which is 'normal.' Repeated exposure to stressful situations however, leads to a chronic, rather than transitory arousal of the SNS (Kornitzer et al., 1999), which in turn leads to the development of HTN (Esler et al., 2001). One theory, the structural autoregulation theory of HTN, or vascular remodeling, postulates that chronic elevations of BP, secondary to the arousal of the SNS, results in vascular hypertrophy which interferes with the autoregulation of BP. "Vascular hypertrophy is thought to be a self-reinforcing adaptation that regulates blood flow in the face of elevated pressure by increasing vascular resistance, but in doing so it contributes to further the pressure elevation" (Bedi et al., 2000, p.11).

A second proposed mechanism for stress induced HTN is that of endothelial dysfunction (ED). The endothelium regulates homeostasis through "vasodilation, inhibition of inflammatory responses and suppression of smooth muscle cell growth" (Bolad & Delafontaine, 2005, p. 271). Nitric oxide (NO), a vasodilator, is formed by endothelium cells, and with ED, the production of NO is impaired. Additionally, ED induces production of the vasoconstrictor angiotensin II which is recognized as a contributor to the development of hypertension (Bolad & Delafontaine).

The alteration of renal blood flow is a third proposed mechanism of stress induced HTN. In normotensive individuals and those without a family history of HTN exposure to mental stress resulted in a small, but statistically significant rise in renal blood flow. For individuals with a family history of HTN, the renal blood flow fell, but, during the duration of the test, returned to normal. For hypertensives, however, mental stress caused a "marked decrease" (Bedi et al., 2000, p. 7) in renal blood flow that persisted for the

duration of the stressor. It could be that the increase in renal arteriolar tone, along with the accompanying release of rennin and increased reabsorption of sodium in response to mental stress is associated with the development of HTN.

These are elementary discussions of the probable physiologic mechanisms of how stress causes HTN, and again the point is repeatedly raised concerning the multifactorial nature of HTN (Livingston, 1993; Scallon-Koliopoulos, 2005; Schwartz et al., 2003). Even with the discussion of stress as a risk factor, the argument is made that the development of HTN is a result of interaction between environmental, genetic and individual differences (Schwartz et al.), and that individuals react differently to stress (Bedi et al., 2000; Scallon-Koliopoulos) (see Figure 2.1).

According to Livingstone (1993), looking at stress from a sociopsychological viewpoint is highly important when examining racial differences in BP. In the US, research shows that Blacks face more stressors than their White counterparts and that these stressful events begin earlier in life, and there is a higher frequency of events that are both undesirable and uncontrollable.

Not only do Blacks face more stress than Whites, but their cardiovascular response is greater and different to that of Whites. When faced with stress, the BP of Whites increase as a result of corresponding increases in cardiac output, stroke volume, heart rate, epinephrine and norepinephrine, along with a *decrease* in total peripheral resistance. Blacks, on the other hand, respond to stress with an increase in BP caused by the release of norepinephrine and *increased* peripheral vasoconstriction (Bedi et al., 2000).

Within the Black community in the US, Dressler and colleagues (1998) describe "cultural consonance in lifestyle" (p. 530) as strongly correlated to BP. Cultural consonance in lifestyle is a measure of an individual's ability to live up to the expectation of community norms; that is, are they able to purchase their own home or car, can they play a leadership role in their community? Others have described the stress that comes from coping with life in the Black community as the "John Henryism hypothesis" (Bennett et al., 2004, p. 370) where Blacks face continual psychological stressors from the demands of their jobs, through discrimination, and due to job insecurities. This chronic sustention of stressors leads to prolonged and dangerously elevated physiological responses that ultimately lead to HTN (Bennett et al.). A search in EBSCO and PubMed data bases did not find any study of stress and BP in Blacks in the UK. Thus, it is unclear if the same environmental and cultural influences exist for Blacks living in the UK.

Individuals who have frequent exposure to stress need to learn how to manage their response to that stress. Reducing emotionality, that is, learning how to relax, and engaging in breathing exercises, cognitive behavioral therapy, biofeedback and meditation, are some of the techniques suggested by Jamnik et al. (2005), Livingstone (1993) and Scallon-Koliopoulos (2005) to help individual respond more slowly to stress. Over time, these techniques can reduce HTN (Scallon-Koliopoulos).

Despite the fact that the connection between an external stress and the biological responses which ultimately affect the vascular system is not precisely defined nor clearly understood (Plante, 2002), most authorities now recognize that stress is a significant risk factor for HTN. While there is an absence of literature in the UK on the subject of Blacks and stress, it can be assumed that as a minority group, they face some of the same

stressors as Blacks in the US, and consequently, stress is a risk factor that needs to be examined in this population.

4. Age

Senescence was previously understood as the generalized deterioration that comes with and is a part of aging. More recently, a distinction is made between chronological age and physiological age. With this new differentiation, senescence is considered as pathological rather than normal (Plante, 2002). Age is described as a risk factor for HTN (Schwartz et al., 2003), with both SBP and DBP increasing with age from the second decade (Kornitzer et al., 1999).

In the Third National Health and Nutrition Examination Survey (NHANES), Burt et al., (1995) reported that the prevalence of BP in the US increases sharply from the third to the sixth decade (from approximately 9% to 51%). The onset of elevated BP is earlier in Blacks, however, than in Whites (CDC, 1997). While this disparity is mirrored in the UK, Agyemang and Bhopal (2003) point out that before the age of 30 the BP of Blacks is lower than that of Whites.

Plante (2002) suggests that preventive measures such as exercise, maintaining optimum body weight and composition, a healthy diet and the development of mental attitudes to buffer the effects of everyday stress could be effective in mitigating or even reversing some of the conditions that arise during senescence.

Plante's (2002) suggestion is supported by Timio et al. (2001) who did a 32-year study of nuns living in a nunnery. When compared to a control group of laywomen, none of the nuns had a rise in DBP over 90 mm Hg, while the control group demonstrated the expected rise in BP with age. Timio et al. proposed that in the absence of any significant

difference in use of alcohol, tobacco and caffeine, weight and body mass index (BMI) and sodium intake between the nuns and the control group that the "low burden of psychosocial factors….[i.e.] the silent environment of the nunneries and the relaxing period of meditation and isolation fade the anxiety and conflict of the nuns" (pp. 362-363). As such, the autonomic nervous system responses to anxiety and conflict are lessened in the nuns as compared to that of the control group.

Timio et al. (2001) mention two other populations that do not succumb to the physiological increase in BP with aging: the primitive Aborigines and inhabitants of the Melanesia Islands (Papua New Guinea). It is apparent that remaining isolated from western habits and psychosocial stresses, for example, leading relaxed lives, is protective against HTN.

While it is impossible for Blacks in the UK to isolate themselves from the stresses of western life, it is possible for them to learn how to adapt lifestyles that can lessen the pathology of aging, including elevated BP.

5. Overweight and Obesity

Overweight, having a BMI of greater than 25, and obesity, having a BMI of greater than 30, are described as epidemic in industrialized countries (El-Atat, Aneja, McFarlane, & Sowers, 2003; Pausova, 2006) and are the major risk factors for many chronic conditions such as diabetes, cardiovascular disease and coronary heart disease (Goldberg, 2003). They are related to HTN independent of age or gender (Appleby, Davey & Key, 2002; Lopes, Bortolotto, Szlejf, Kamitsuji, & Krieger, 2001) and accounts for 78% and 65% of HTN in males and female, respectively (El-Atat et al.; Pausova). While genetics and prenatal conditions may affect the prevalence of overweight and

obesity, the primary cause for the worldwide increase is the imbalance between food intake and levels of physical activity (Goldberg).

Esler et al. (2001) stated that in general, individuals with HTN are overweight. In their US-based study, Harris, Stevens, Thomas, Schreiner, and Folsom (2000) reported that the mean weight in kilograms for normotensive women was 68.0 $\pm$ 13.5 for Whites and 79.0 $\pm$ 16.2 for Blacks, for those with HTN the mean weights were 75.8 $\pm$ 16.5 and 84.4 $\pm$ 18.6, respectively. For the normotensive White men they reported 83.9 $\pm$ 12.8 and for normotensive Black men 83.3 $\pm$ 14.6. For their hypertensive counterparts the mean weights were 88.5 $\pm$ 15.4 and 88.4 $\pm$ 17.2, respectively. While the mechanisms of BP elevation as a result of being overweight and obese are not well understood (Esler et al.), a study that examined the effect of weight loss on BP demonstrated that a 10 kg weight loss sustained for 2 years resulted in a 6 mm Hg decrease in SBP and a 4.6 mm Hg decrease in DBP (Kaplan & Opie, 2006). In their review article of HTN and vegetarianism, Berkow and Bernard (2005) reported that decreases in BP are statistically significant at 6 months, 36 months and 7 years. At the 7-year follow-up, 18.9% of the weight loss group was hypertensive, but in the control group the prevalence was 40.5%.

In their review of the different methods used to measure body fat, Snijder, van Dam, Visser, and Seidell (2006) state that the technique used usually depends on the goal of the research, the availability of time and financial resources, and sample size. The different techniques include BMI, waist-to-hip ratio (WHR), sagittal abdominal diameter (SAD), waist circumference (WC), percent body fat, skinfold measurements (Snijder et al.), the division of WC by the square of the height (Fuchs et al., 2005) and waist/height ratio (Harris et al., 2000). BMI does not take into consideration fat distribution, and

given that android or central obesity is the type that is associated with cardiovascular diseases risk (El-Atat et al., 2003; Goldberg, 2003; Neiman, 2003; Snijder et al.) and HTN specifically (Harris et al.; Janssen, Katzmarzyk, & Ross, 2002), obesity screening should include measures of central obesity such as WC.

Several authors including Fuchs et al. (2005), Gus et al. (2004) and Janssen et al (2002), concluded that WC is a more powerful predictor of hypertension than BMI. The strength of WC as a predictor however, varies between gender and ethnicity. The odds ratio (OR) for HTN, based on WHR, WC and waist/height ratio and elevated BMI was greater for White American women than for Black women. The odds of HTN with each of the anthropometric variables were similar for Black and White males (Harris et al., 2000). Gus et al., and Jansen et al., found that among individuals with normal BMI, high WC values are related to HTN. Harris et al., also found that lean Blacks in the US have a prevalence rate of HTN that is more than twice as high as lean Whites. Even though WC is highly correlated with BMI (Harris et al.), these findings indicate that, as a predictor for HTN, WC can contribute more information than BMI alone.

Snijder et al.'s (2006) review of the efficacy of different methods of body fat measurement reveal inconsistencies as to which is the best predictor of CVD. Several authors, however, discuss the advantage of using WC because, unlike BMI and percent body fat, it does not overestimate the risk of HTN in the elderly. As individuals age they lose height either because of scoliosis or kyphosis and they also experience a decrease in lean body mass - sarcopenia. Consequently, the relationship between the percentage of body fat and BMI is age dependent (Jackson et al., 2002; Snijder et al.). There is no difference, however, in the correlation between WC and visceral fat in young and older

individuals (Snijder et al.). Though BMI, WHR and WC are all predictors of obesity-related HTN risk, WC appears to be superior (Gus et al., 2004).

In the UK, the general overweight (including obesity)/obesity prevalence rates are 66.5% and 22.7% for men and 57.1% and 23.2% for women. As seen in Table 2.1, of the Black men, only the African men's prevalence rates are below that of the general male population. African women have the highest prevalence rates of all females (National Health Service, 2005).

The prevalence of raised WHR/WC for the general population is 33% and 31% for males and 30% and 41% for women. Both Black Caribbean and African men have lower prevalence rates than the general male population. Black women have prevalence rates that are significantly higher than the general female population (see Table 2.1).

Table 2.1.

Comparison of Prevalence (Percentages) of Measures of Body Fat between the General and Black Population in the United Kingdom

	Overweight[a]	Obese	Raised[b] WHR[*]	Raised[c] WC[**]
Men				
Gen. pop.	66.5	22.7	33	31
Caribbean	67.4	25.2	25	22
African	61.8	17.1	16	19
Women				
Gen. pop.	57.1	23.2	30	41
Caribbean	64.5	32.1	37	47
African	69.8	38.5	32	53

[a] Including obese.
[b] ≥ 0.95 in men and ≥ 0.85 in women.
[c] ≥ 102 cm (40 in) in men and ≥ 88cm (35 in) in women.
[*] Waist/hip ratio.
[**] Waist Circumference.

Note. From National Health Service, 2005.

Although BMI is very useful for screening body fat it does not give any information about fat distribution. Abdominal fat, which is more closely related to HTN risk than fat accumulated in hips and thighs (Nieman, 2003), also needs to be measured. In a report on obesity in Great Britain, Rennie and Jebb (2005) indicated that between 1980 and 2000 the prevalence of obesity among men went from 6% to 23% and among women from 8% to 25%. As disconcerting as the changes in BMI are, Rennie and Jebb stated that the increase in waist circumference has been even greater and that focusing only on BMI may actually underestimate the increase in fatness. Consequently, for my study both BMI and WC were measured.

6. Physical Activity

A number of studies have examined the effects of exercise training on BP. These studies lack uniformity across designs and include a variability of exercise routines, but a meta-analysis of 54 randomized controlled studies revealed a net pooled effect of exercise on BP of – 4.9/– 3.7 mm Hg in hypertensives and – 4.0/– 2.3 mm Hg in normotensives, with a greater effect in short duration (<10 weeks) compared with longer duration (>24 weeks) studies (Beilin, 2004).

In the UK, 30 minutes of moderate to vigorous physical activity on 5 or more days of the week is the current recommendation for health (Health Survey for England, 2004). Specific to the prevention/treatment of HTN, 20-30 minutes of moderate to vigorous cardiovascular exercise on 4-5 days of the week reduces BP and is effective for long-term control of HTN (Pescatello et al., 2004). Although more research is needed on the effect of accumulated physical activity, which is less intense and does not necessarily aim to improve physical fitness, many practitioners have begun recommending it as a

modality for treating HTN. It can significantly reduce BP in prehypertensive and hypertensive individuals (Brookes, 2005).

Padilla, Wallis and Park (2005) studied the effects of 8 to 12 hours of accumulated physical activity such as digging, raking, splitting logs and brisk walking on normotensives, prehypertensives and hypertensives. Each participant wore a 24 ambulatory BP monitor. In the 12 hours after the measured hours of activity, there was no change in BP for the normotensives. Prehypertensives experienced a 6.6 $\pm$ 2.3 mm Hg decrease in SBP that lasted for 6 hours, and for the hypertensives, the decrease in SBP was 12.9 $\pm$ 4.3 mm Hg for a duration of 8 hours, but there were no appreciable changes in the DBP.

Luke et al. (2005) state that because obesity is so easy to evaluate there is a potential exaggeration of its contribution to HTN, while other risk factors such as physical inactivity have been poorly measured and probably account for a greater proportion of variance in BP than is currently understood. As such, they used an objective measure of physical activity, rather than relying on questionnaire data to compare the levels of physical activity between Blacks in Nigeria, Jamaica, and the US.

Using stable isotopes, they measured the total caloric expenditure in the participants over intervals of 10-14 days. As expected, there were strong correlations between physical activity and adiposity for each group (-0.35 for Nigeria, -0.70 for Jamaica, and –0.46 for the US). The data also revealed an east-west gradient with stepwise increases from Nigeria to Jamaica to the US for energy expenditure during rest and physical activity. Activity energy expenditure (AEE) per kg weight was negatively correlated with SBP in all three groups (-0.25 for Nigeria, -0.23 Jamaica and –0.12 for

the US). Luke et al. (2005) found that AEE per kg weight accounted for 19% of the variance in SBP, when controlling for percent body fat and BMI. AEE per kg weight accounted for 20% of the variance in DBP, when controlling for percent body fat, and 21% of the variance when controlling for BMI. There was a consistently negative correlation between AEE and both SBP and DBP independent of BMI or percent body fat. This indicates that increasing physical activity improves cardiovascular risk.

Data for physical activity in the UK revealed that for the general population, 37% of the men and 25% of the women had high activity levels, defined as meeting the recommended minimum of 30 minutes of moderate to vigorous activity five or more days per week. Black Caribbean men had the same percentage as the general male population (37%) while Black African men were slightly lower, at 35%. For the Black women the percentages were 31% and 29% for Caribbeans and Africans respectively, both higher than the general female population of 25% (National Health Service, 2005).

Given that a little more than a third of all males and only a quarter of all females in the UK meet the recommended minimum for physical activity, it is little comfort that the Black community, in general, is exercising a little more than the general population. Due to the burden of HTN in the Black community more emphasis needs to be placed on increasing the amount of daily physical activity, whether through sporting or leisure activities or accumulated lifestyle physical activity.

7. Sodium Intake

An abundance of evidence in the literature indicates a relationship between sodium intake and BP levels. He and MacGregor (2002) and Hooper et al. (2004) carried out meta-analyses of randomized controlled trials of the effects of sodium

reduction on BP. He and MacGregor assessed a total of 28 trials where the trial lasted for more than 4 weeks and there were no pharmacological interventions. They determined that these trials demonstrated that a reduction of sodium intake had a significant effect on lowering SBP and DBP. On average the BP of hypertensives decreased by 5/3 mm Hg and normotensives by 2/1 mm Hg. Their findings demonstrate that, in the long-term, population salt reduction would have a positive impact on public health by decreasing population BP and therefore cardiovascular mortality.

Hooper et al.'s (2004) meta-analysis included 11 trials that had a minimum of 26 weeks of follow-up after the onset of the intervention. Their conclusion was that sodium reduction (the exact measurements varied for each of the studies) resulted in a decrease of 1.1 mm Hg for SBP and 0.6 mm Hg for DBP, and that the low salt diet enabled those who were hypertensive to discontinue their medications without a subsequent loss of BP control.

While government recommendations are for a decrease of sodium intake from 10 to 12 g/day to 5 to 6 g/day, the long-term trials that Hooper et al. (2004) reviewed only attained an average of 2 g/day reduction. Although the sodium reductions were small, on a population level, they would lead to a significant decrease in strokes, heart attacks and heart failure (Hooper, Bartlett, Davey Smith, & Ebrahim, 2004).

Gomez and Cappuccio (2005), like Hooper et al. (2004), state that there are many studies demonstrating a dose-response in dietary sodium restriction. In the studies they examined, Gomez and Cappuccio found that for every 100 mmol reduction of 24 hour sodium excretion there was an average of 2.5 and 7 mm Hg decrease in SBP in normotensives and hypertensives, respectively.

Hooper et al. (2004) raised the question of the reality of long-term maintenance of low salt diets, since in Western societies, 75% to 80% of the sodium intake comes from processed foods (Gomez & Cappuccio, 2005). The only way that salt reduction can be effectively maintained in Western societies is for the food industry to cooperate with the health sector. In the UK, this approach was taken when in 2001 there was new legislation to decrease the amount of salt in processed foods (Gomez & Cappuccio; Hooper et al.).

While there is a dose-response of BP to sodium reduction, the response varies between individuals. Those with weaker responses of the renin-angiotensin system, that is low-renin Black populations, have larger reductions in BP as a result of dietary sodium reduction (Gomez & Cappuccio, 2005). In the UK, about 10% of the Black population have extremely high dietary sodium intake, 11-17g/day, and research demonstrates that Blacks do not respond in the same way as Whites when treated with anti-HTN pharmaceuticals. When treated with Angiotensin converting enzyme (ACE) inhibitors, the BP of Whites decreased by 15/11 mm Hg; for Blacks the reduction was only 7/7 mm Hg. Even when the dose was increased for Blacks, the reduction in BP was 10/8 mm Hg. The low-renin state of Blacks contributes to this difference, and what success there is with ACE inhibitors is improved when combined with dietary sodium reduction (Khan & Beavers, 2005). Whites respond well to monotherapies, such as ACE inhibitors, while most Black hypertensives need a combination of medications to keep BP below 140/90 mm Hg.

In the Health Survey for England 2004, 56% of the general male population added salt during cooking. For Black men, it was 77% among the Caribbean and 74% among the African. In the general female population it was 53%, with 69% of Black Caribbean

and 83% of African women adding salt during cooking. For both Black males and females the amount of salt added at the table was similar to that of the general population (National Health Services, 2005). The increased prevalence of HTN in the Black population, however, means that their sodium intake needs to be more carefully monitored than that of the general population.

Despite the common knowledge of the link between salt intake and HTN, Blacks in the UK may be consuming too much salt and it is unknown if the population for this study is consuming too much salt. Though there has been some progress in effecting change in the food industry, it will probably take many years before the reduction of salt concentrations become industry-wide. As such, emphasis must still be placed on individuals to make changes in their salt consumption as an approach to reduce the role of sodium in the prevalence of HTN.

8. Diet: Fruit and Vegetable Intake

Research on lifestyle modification to reduce BP shows that an increase in the intake of fruit and vegetables, which are rich in potassium, magnesium, and antioxidants (Berkow & Bernard, 2005; He & MacGregor, 1999; He & MacGregor, 2001; He & MacGregor, 2006; John, Ziebland, Yudkin, & Neil, 2002; Van Duyn & Pivonka, 2000), is frequently a part of the dietary recommendations (Beilin, 2004; Luke, Cooper, Prewitt, Adeyemo, & Forrester, 2001; Svetkey et al., 2005). In 2002, John et al. carried out a randomized control trial to examine the specific effects of fruit and vegetable consumption on plasma antioxidant concentrations and BP. They reported that after 6 months of a diet with a minimum of five daily portions of fruit and vegetables, the

SBP and DBP of the intervention group fell 4 mm Hg and 1.5 mm Hg respectively, more than in the control group.

The UK government recommends five or more portions of fruit and vegetables daily. However, only 23% of the men and 27% of the women in the general population meet that recommendation. The proportion of Black Caribbean men who meet this criterion is 32% and for the African men it is 31%. Caribbean and African women, like their male counter-parts, perform better than the general population at 31% and 32% respectively (National Health Services, 2005).

The average daily consumption of fruit and vegetables in the general population is 3.3 portions for men and 3.6 portions for women. African men average 3.7 and Caribbean men average 3.9. The average daily portions consumed for their female counter-parts are 3.8 and 3.9, respectively.

In the general population fruit and vegetable consumption increases with age, but the age-related increases are most marked in Black men and women. In the 55+ age category, the percentage of the general population that meets the recommended five or more portions increases to 29% for men and 30% for women but for Caribbean and African men it is 44% and 49% and for the women it is 37% and 38%. Table 2.2 details the fruit and vegetable intake in the UK.

The question of the effectiveness of diet to control HTN was studied more closely using DASH (Dietary Approaches to Stop Hypertension) (Svetkey et al., 1999). The inclusion criteria were $\geq$ 22 years of age and untreated SBP $\leq$ 160 mm Hg and DBP of 80 to 95 mm Hg. Those who were taking antihypertensive medications were weaned off their medications in the three weeks prior to the start of the controlled feeding. The

subjects were divided in to three experimental groups. Group One was the control group that was fed a typical American diet heavy in refined foods and sugars and few fruits, nuts, legumes and vegetables. The potassium, calcium, and magnesium intake was kept at 25th percentile of the general population intake (Sacks et al., 1995). Group Two was fed a diet that was rich in fruit and vegetables, but otherwise similar to the control diet. Group Three, the combination diet, was fed a diet of low-fat dairy products, lean meats, fish, and chicken. The intention was to decrease saturated fats but to increase protein and calcium intake. Additionally Group Three was fed many fruits, vegetables nuts and grains - sources of potassium, magnesium and dietary fiber. Their potassium, magnesium and calcium were at the 75th percentile of the general population's intake (Sacks et al.).

Table 2.2

Comparison of Prevalence (Percentages) of Fruit and Vegetable Consumption (Portions) between the General and Black Population in the United Kingdom

Daily Fruit and Vegetable Consumption	None	<1	1 or more, but < 2	2 or more, but < 3	3 or more, but < 4	4 or more, but < 5	5 or More
Men							
Gen. Pop.	8	4	16	19	16	14	23
Caribbean	8	2	16	16	14	12	32
African	8	3	16	16	13	14	31
Women							
Gen. Pop.	6	3	16	18	16	14	27
Caribbean	7	1	17	18	13	13	31
African	5	2	18	14	14	15	32

Note. From National Health Service, 2005

After 8 weeks, the combination diet (Group Three) was the most effective in reducing BP. The effect was greatest in those who were hypertensive at the beginning of the study with an average decrease of –11.6/-5.3 mm Hg. Normotensives experienced an

average decrease of –3.5/-2.2 mm Hg. Specifically, it was greatest for African American hypertensives who experienced an average decrease of –13.2/-6.1 mm Hg, while the reduction among White hypertensives was –6.3/4.4 mm Hg. While the investigators acknowledged that they did not know the effectiveness of the combination diet on more severe hypertensives, they suggested that even for people with stage 2 HTN and higher, the DASH combination diet, augmenting pharmacology, should be effective treatment (Svetkey et al., 1999).

The fruit and vegetable diet (Group Two) had an intermediate effect, between the control and combination diets, on the BP of the study participants. As with the combination diet, it was most effective in African Americans with an average reduction of -8.03/-3.4 mm Hg in hypertensives and -1.3/-0.3 mm Hg in normotensives. For hypertensive Whites, the average reduction was –5.9/-3.1 mm Hg and for normotensive Whites there was a non-significant increase of average BP by 0.8/0.4 mm Hg (Svetkey et al., 1999). The intermediate effectiveness of the fruit and vegetable diet in this study demonstrate the necessity of potassium, magnesium and fiber as a means of controlling BP. That the combination diet was superior to the fruit and vegetable diet in its BP reduction suggests that calcium intake is also an important nutrient when using diet for HTN control (Sacks et al., 1995).

In their research on the effects of oral potassium on blood pressure, Whelton et al. (1997) concluded that low potassium was a probable cause of HTN and that dietary supplementation of potassium, even in the absence of salt reduction, should be used to decrease BP in hypertensives. Today, most researchers (Berkow & Bernard, 2005; He & MacGregor, 2001; He & MacGregor, 1999; John et al., 2002; Van Duyn & Pivonka,

2000;) continue to recommend increasing the consumption of not only potassium, but magnesium and antioxidants as a way to prevent and treat HTN. Unlike Whelton et al., these scientists are not promoting dietary supplementation, but the adoption of varied diets that are rich in these macro and micronutrients.

While the data for fruit and vegetable consumption reveals higher consumption among Blacks in the UK, it should be remembered that five is the minimum number of recommended servings (British Nutrition Foundation, 2003). The average daily consumption for Blacks is only 3.8 servings. There is a need to encourage more people within the Black community to meet the minimum requirements, and those who do should be encouraged to aim for additional servings.

9. Diet: Vegetarian versus Meat-eating

Berkow and Barnard (2005) reviewed 14 studies conducted since 1966 on the relationship between vegetarian diets and HTN. They discussed 11 observational studies, and three randomized, controlled studies. Some of the best data from observational studies, they reported, have come from studies of Seventh-day Adventists (SDAs). A comparison of SDAs and Mormons, who share similar lifestyles, except for the increased use of meat among Mormons, showed that the BP of SDAs was significantly lower than for Mormons. Another study, reviewed by Berkow and Bernard, compared the prevalence rates of mild HTN among vegetarian SDAs, non-vegetarian SDAs and Mormons. The rates were 1% to 2% for the vegetarian SDAs, 8.5% for the non-vegetarian SDAs, and 10% for the Mormons.

Overall, observational studies show that the SBP and DBP of vegetarians are 3 to 14 mm Hg and 5 to 6 mm Hg lower, respectively, than non-vegetarians. For vegetarians,

the prevalence of HTN ranges from 2% to 40%, while the range is from 8% to 60% in non-vegetarians. The summary results for the randomized controlled studies also demonstrate that vegetarians have lower BP than the general population (Berkow & Bernard, 2005).

Appleby et al. (2002) conducted a study in the UK using the Oxford cohort (11,400 participants) of the European Prospective Investigation into Cancer and Nutrition (EPIC - Oxford). They compared the effects of four diets: meat eaters, fish eaters, vegetarians, and vegans. They found that meat eaters had the highest BP, vegans had the lowest, and fish eaters and vegetarians lay between the meat eaters and vegans. Adjusting for age and BMI, the prevalence of self-reported HTN among the males was 12.9% for meat eaters, 9.3% for fish eaters, 9.5% for vegetarians and 6.1% for vegans. The percentages for females were 10.6%, 9.7%, 8.7%, and 8.3%.

Researchers in the US have looked specifically at the effects of vegetarian diets on the BP of Blacks. Beginning in 1989, Melby, Goldflies, Hyner, and Lyle looked at the relationship between vegetarian and non-vegetarian diets and BP in adult SDA Blacks and Whites. Black vegetarians had a lower prevalence of diagnosed HTN than Black non-vegetarians, 18% versus 44%. When compared to Whites, however, Black vegetarians had a higher average BP. White vegetarians were at 113.6/66.2 mm Hg, White non-vegetarians were at 116.2/67.7 mm Hg, while Black vegetarians were at 122.9/74.4 mm Hg. The findings were similar when older Black and White long-term vegetarians and non-vegetarians were compared suggesting that adhering to a vegetarian diet does not completely attenuate the greater risk that Blacks have for HTN (Melby, Goldflies, & Toohey, 1993).

In 1994, Melby, Toohey, and Cebrick compared the BP of Black SDA vegetarians, semi-vegetarians (one to three servings of meat per week) and non-vegetarians. The percentage of individuals diagnosed with HTN and taking anti-HTN medications was 16.1% for vegetarians, 35.7% for semi-vegetarians, and 31.1% for non-vegetarians. While there was a trend for lower SBP in vegetarians, there were no significant differences among the three groups in SBP or DBP. This lack of difference could be explained by the fact that individuals being treated for HTN were also included in the study.

While data from more than 20 years of research show that the DASH is "best practice" (Ruesser & McCarron, 2005, p. 1,100) for the reduction and control of HTN, particularly among Black Americans, there is some disagreement as to which components are most effective. Ruesser and McCarron point out that while much of the publicity of the DASH approach has focused on fruit and vegetable intake, the most effective diet in the study included low fat dairy.

The observation that vegetarians have lower BP than their meat-eating counter-parts raises questions as to the cause for lowering of BP (Berkow & Bernard, 2005; Appleby et al., 2002). Aside from the fact that vegetarians have diets which are more likely to be higher in fiber, fruits and vegetable, and soy, and diets lower in total fats and saturated fats with a higher polyunsaturated to saturated fat ratio, the differences in BP, conclude Appleby et al., are mostly attributable to the lower BMI of vegetarians. In the DASH study however, the energy intake of all the participants was controlled to maintain body weight throughout the study (Sacks et al., 1995), and Berkow and Bernard point out that the BP lowering effect of diet appears to be independent of BMI.

Evidently, the usefulness of diet in the reduction of BP may not be by increasing the intake of any single nutrient, or a selected group of nutrients, but rather the adequate intake of a variety of foods that will provide the necessary mineral, macro and micronutrients that control BP. It appears as if this balance is more frequently achieved in the plant-based and dairy diet of vegetarians than in their meat-eating counterparts.

C. The African Diaspora and the Socioeconomics of Hypertension

Cooper and Zhu (2001) point out that the environment heavily influences HTN. Their argument for the primacy of the environment it supported by the fact that Blacks who have remained in Africa or the Caribbean have lower rates of HTN than those who have migrated to industrialized countries. From rural Africa to the Caribbean and to the industrialized nations of the United States, Canada and the United Kingdom, the prevalence or HTN can be described as a "consistent gradient" (Cooper & Rotimi, 1997, p. 806), from 10% to 15% in Africa, 20% to 25% in the Caribbean and 33% in the US (Cooper & Rotimi).

This phenomenon has also been described as part of an "epidemiological transition" (Gomez & Cappuccio, 2005, p. 13) where the prevalence of cardiovascular diseases differ geographically and evolves concurrent to changes in societies: Countries with high mortality and fertility, such as those in sub-Saharan Africa, the Americas and south Asia experience circulatory disorders resulting from nutritional and infectious deficiencies. Countries, such as China, where mortality drops within a short period of time and there is rapid modernization, have a higher prevalence of HTN. Countries where life expectancy is consistently improving have to deal with diseases that come with

sedentary lifestyles and high fat diets such as atherosclerotic CVD and coronary heart disease.

Cooper et al. (2005) examined the results of surveys on hypertension that were international in scope and conducted since 1986, in North America and Europe. The findings of these surveys were compared against the results for Black populations in the International Collaborative Study on Hypertension (ICSHIB). Despite the gradient, the comparison revealed that Blacks in America (having the highest HTN prevalence rates of all Blacks in the ICSHIB of 44%) had lower rates than those of Whites in Spain (46.8%), Finland (48.6%) and Germany (55.3%), three of the six European nations included in the comparison. Luke et al. (2001) identified two additional European countries - Russia and Poland - whose populations had HTN rates that were similar to those of Blacks in America. That there are White populations whose prevalence of HTN supersedes that of Blacks in the US and the UK, weakens the argument for genetics playing a major role in HTN among Blacks.

Globally, it would seem that Blacks do not necessarily have consistently higher BPs, as the literature from the US and UK suggests. The question, however, remains—What is the cause of the east-to-west gradient? The international prevalence rates could be a reflection of treatment rates for HTN, 25% in the US compared to 10% in Europe, but the fact that Africa with the lowest prevalence rate of 13.5% only has a treatment rate of 1% suggests that socioeconomics plays a role, though yet to be well defined, in the prevalence of HTN among Blacks (Cooper et al., 1997; Cooper et al., 2005; Cooper & Zhu, 2001; Gomez & Cappuccio, 2005; Luke et al., 2001).

The socioeconomic (SES) environments for Africans around the world vary more than for any other population group. It ranges from subsistence agriculture in most of West Africa and parts of the Caribbean to urban and suburban small-market economies in other parts of the Caribbean to the post-industrialized economies of the UK and US. The differences in these economic environments are reflected in health contrasts (Luke et al., 2001). Within Africa and other developing countries there seems to be a positive association between SES and HTN (Cooper et al., 1997; Mendez, Cooper, Wilks, Luke, & Forrester, 2003). This could be explained by the shift towards western lifestyles and the inherent risk factors for HTN. In developed countries, however, there is often a negative association between SES and HTN (Colhoun, Hemingway, & Poulter, 1998; Cooper et al., 1997). A possible explanation for this could be that in addition to lifestyles that increase HTN risk, individuals of lower SES have the additional burdens of job insecurity and unemployment (Colhoun et al.).

That the gradient follows the move from rural to industrialized lifestyles it is reasonable to assume that there is collinearity between levels of BP and most known risk factors (Cooper et al., 2005). Luke et al. (2001) suggest that nutritional status accounts for most of the variation in rates between West Africans and Blacks living in the West. Aside from the increased obesity in Western Blacks, salt consumption is dissimilar: while Nigerians do not add salt to their food once it is cooked, Blacks in the West do. For Blacks in the West, the problem of increased sodium intake is compounded by the fact that in Western societies salt is usually added to bread and processed foods which accounts for 75 to 80% of the salt intake. West Africans consume much fewer processed foods (Gomez & Cappuccio, 2005).

Globally, the association between SES and HTN is not linear, and in the UK, the negative association is not as consistent as other developed countries (Colhoun, Hemingway & Poulter, 1998). In fact, the most recent assessment of social class as part of the Health Survey for England (1999) concluded that the association between high BP and either social class or household income was unclear and inconsistent (Karlsen, Primatesta, & McMunn, 1999). For Caribbean Blacks in particular, there was no difference in the report of diagnosed HTN between manual workers and non-manual workers and those who owned their homes versus those who rented (Nazroo, 2001).

Socioeconomic status in and of itself does not predispose a person to HTN, but it often serves as a marker for lifestyle characteristics that include many of the risk factors for HTN (Flack & Nasser, 2003). As there is a significantly higher proportion of Blacks in the UK, when compared to Whites, who are in the manual social class (Dundas, Morgan, Redfern, Lemic-Stojcevic & Wolfe, 2001; Primatesta, Bost & Poulter, 2000; Nazroo, 2001), it is important that steps be taken to increase the awareness of the link between behavior and HTN.

D. Lifestyle Modification to Lower Hypertension

Many researchers have examined the efficacy of lifestyle modification to lower HTN (Beilin, 2004; Campbell et al., 1999; Erlinger et al. 2003; Svetkey et al.,1999; Svetkey et al., 2005; Twisk et al., 2001) and recommend it as an effective and inexpensive way to treat HTN (Fraser, 1999, 2003; Gomez & Cappuccio, 2005; Willet, 2003). While much research has been done on individual HTN risk factors, repeatedly the point is made that the cause of HTN is multi-factorial and as such, when the term

'lifestyle modification' is used it is simply a call to address the treatment for and prevention of HTN in a comprehensive fashion.

Seventh-day Adventists tend to adhere to a lifestyle that is similar to recommendations for the prevention of HTN: vegetarianism is promoted; alcohol and tobacco use is condemned, and regular exercise is encouraged (Fønnebø, 1994). Church members are not forced to adopt any of the lifestyle recommendations and as a result the lifestyle practices vary, but less than that of the general population, especially for tobacco and alcohol use which is extremely low. In general, however, SDAs have lower cardiovascular disease risks, including HTN, when compared with the general population (Fraser, 2003).

In 2005, Svetkey et al. reported the results of the DASH study, an 18-month randomized trial where participants were separated into three groups. Those randomized to the traditional lifestyle recommendations received behavioral interventions for weight loss if they were overweight, reduction of sodium intake, adherence to the recommended alcohol intake if they drank and an increase in physical activity. Those randomized to the advice only group had a single 30-minute, individual session where a registered dietician discussed the risk factors for HTN and provided the participant with printed educational material. The intervention for the third group was traditional lifestyle recommendations (behavioral interventions) plus DASH (Writing Group of the PREMIER Collaborative Research Group, 2003).

At the first 6-month follow up among the participants 50 years or older, BP reduction was highest in the group receiving traditional lifestyle recommendations plus DASH and was the lowest in the group who only received advice. The difference

between the traditional and traditional plus DASH groups was not evident in participants younger than 50. The participants in the traditional and traditional plus DASH groups did, however, have lower BP than those in the advice only group. Svetkey et al. (2005) noted that the individuals in the traditional and traditional plus DASH groups with stage 1 HTN were able to reach their treatment goal without taking pharmaceuticals.

While the awareness, treatment and control rates of HTN in the UK has improved, a majority of the individuals with HTN are either inadequately controlled, or are receiving no pharmaceutical intervention. The detection and treatment rates are higher in Blacks than other races (including Whites), but given that there is still disparity in the mortality and morbidity burden that Blacks bear in cardiovascular diseases (Lane & Lip, 2001) and that diet and other lifestyle factors account for approximately 80% of the prevalence of HTN and related cardiovascular disease (Beilin, 2004), health practitioners must be more proactive in advocating lifestyle modification in the treatment and prevention of HTN.

Despite the knowledge within the Black community of the need to control BP and that medications do control BP, the use of pharmaceuticals has not been as successful as in the White community. It might be more effective, therefore, for health educators to explore the attitudes of Blacks to the wide range of lifestyle contributors to HTN and see whether or not there are cultural barriers to recommended behavior changes. Not until health educators and health practitioners are aware of the knowledge, beliefs, perceptions and attitudes towards HTN that shape the lifestyle behaviors of Blacks, will advocacy for lifestyle change be effective.

E. Health Beliefs of Blacks in the United Kingdom

There is a paucity of information on the health beliefs, in general, of UK Blacks. There are many articles on mental health and a few on cultural sensitivity and diversity in health care. Among these is a 1997 study in which Wrightson and Wardle compared the locus of health control scores for Asian, White and Afro-Caribbean women. They found that the locus of health beliefs for Afro-Caribbean women was similar to those of White women where the highest mean scores were for internal control 26.50 and 24.57, respectively. For powerful others the scores were 16.81 and 16.87, and for chance locus of control, 16.44 and 17.31. This indicates that though, there are cultural differences between these ethnic groups, when it comes to health promotion, there are mutual beliefs that can be incorporated into programs.

Dundas, Morgan, Redfern, Lemic-Stojcevic and Wolfe (2001) studied the difference in behavioral risk factors for stroke between Whites, Black Caribbeans and Black Africans and found that the perceived risk of stroke or heart attacks was similar among the groups. Black Caribbeans and Black Africans, however, were more likely than Whites to have a fatalist attitude towards their health - they thought that there was little that they could do, in terms of behavior change, to influence their health.

In response to the limited literature in the UK on heart health beliefs in Blacks, Higginbottom (2000) conducted a qualitative study, using ethnographic techniques, to examine the heart health beliefs and behaviors of Africans and African Caribbeans in two UK cities. Her research, though, was limited to adolescents. She found that most adolescents understood what constituted a healthy diet and believed that African and African Caribbean food was healthier than Western foods. They understood the negative

effect of tobacco and alcohol on health. They did not, however, understand what a unit of alcohol meant nor did they know the guidelines for alcohol intake. They were able to identify heart healthy exercises, but as with alcohol, they did not know the current guidelines for exercise.

Specific to HTN Morgan and Watkins (1988) examined the beliefs and responses to antihypertensive medications among Whites and Caribbeans. The study was restricted to those who had been taking prescription drugs for HTN for at least 1 year. Both groups had similar perceptions as to the cause of HTN. Forty-six percent of the White respondents and 43% of the Caribbean respondents identified tension, worry and stress as causes of HTN. For family and hereditary, overweight and other causes the percentages were similar. More than double the percentage of Caribbeans identified diet, smoking and alcohol as causes than Whites (23% and 10%). Forty-three percent of the White respondents, but only 20% of the Caribbean respondents were unable to identify any of the causes of HTN.

During the interviews Morgan and Watkins (1988) used the term 'high blood pressure'. When asked if they knew what HTN was, 46% of the White respondents and 53% of the Caribbean respondents knew that it was a different name for high blood pressure. Of those who had no idea what HTN was, 37% were White and 27% were Caribbeans. The rest of the respondents, 17% White and 20% Black, said that HTN was "having lots of worries" (p. 566) or being "highly stressed" (p. 566), but they regarded it as a distinct and separate condition from high blood pressure.

Regarding the perception of symptoms with elevated BP, 57% of the White respondents and 80% of the Caribbeans felt that they could tell whether or not their BP

was elevated. Similar to the findings in the US, the most commonly perceived symptom was a headache or pressure around the forehead (23% for Whites and 50% for Caribbeans) (Morgan and Watkins, 1988).

Ninety-three percent of the respondents knew that uncontrolled high BP could kill. The most likely causes of death cited were heart attacks and strokes. Fifty-seven percent of the White respondents worried about having high BP, compared to only 37% of the Caribbeans, but for most of the worriers it was not a "major or constant worry" (Morgan & Watkins, 1988, p. 568). Both groups felt that there was no need to worry about their BP because the doctors would control it. A common reason for the lack of worry among the Caribbeans was that it was 'normal' for them: they stated that they "knew a lot of people who have high blood pressure" (p. 568) or "It's in my family" (p. 569).

As part of this study, Morgan and Watkins (1988) also reported on the difference in antihypertensive drug adherence among White and Caribbean hypertensives. The published findings were the same as those Morgan reported for a 1995 study where she focused on the significance of ethnicity in health promotion regarding HTN. She reported that Caribbeans were half as likely as Whites to take the anti-hypertensive drugs as prescribed.

While both Caribbeans and Whites were concerned about taking drugs for a long time, Caribbeans were more concerned and more likely to supplement with herbal remedies and to "leave off" (Morgan, 1995, p. S81) taking their medication or decrease the dose if they were not feeling ill. Whenever the Caribbeans who were out of compliance with their medication regime experienced what they believed to be the

symptoms of elevated BP, they would take their medications as prescribed until they felt better. None of their respondents shared these practices or concerns with their general practitioners (Morgan, 1995).

Although Morgan (1995) suggested that there was a need for increased awareness of ethnic beliefs and practices to enhance the effectiveness of treatment for HTN, I was able to find one additional study in the UK that addressed these concerns.

In 2005, Connell, McKevitt, and Wolfe did a qualitative study of Caribbeans living in London. They re-visited the need for developing strategies to manage HTN in this population. They found that the beliefs about HTN reported by Morgan (1995) and Morgan and Watkins (1988) persisted and that when Caribbeans were told that their BP was normal they understood themselves to be cured. As in the US, years of education and treatment have done little to change the beliefs of Caribbeans regarding HTN.
In addition to the limited number of studies to address the behavior of Black hypertensives, there is no literature specific to the knowledge, beliefs, attitudes, and perceptions of Blacks, who have not been diagnosed with HTN, towards HTN.

F. Conclusion

The "notion of black exceptionalism" (Cooper & Rotimi, 1997, p. 804) has distracted researchers from answering the question of the causes of hypertension in Blacks. Instead they have focused on possible genetic explanations as to why Blacks experience hypertension at a greater rate than Whites (Luke et al., 2001). It is evident, however, that considering the prevalence of HTN among Blacks and the resulting morbidity and mortality, the economic, and quality of life advantages of preventing and treating HTN with a dietary/lifestyle approach cannot be overlooked. Admittedly, there

is still much study to be done regarding the specific effects of particular foods, rather than macro and micronutrients on HTN (Fraser, 1994). While we anticipate more revelations in the future concerning the causes of HTN in Blacks, for today, diet modification, increasing the amount of weekly physical activity, and learning how to relax are effective and affordable ways to decrease HTN throughout the Black population.

Although Blacks acknowledge "doctors' expertise" (Connell et al., 2005, p. 358), and understand the need for their HTN to be controlled (Morgan & Watkins, 1988), the belief that physical experiences indicate elevated BP persists. Additionally, many continue to have misgivings about extended use of prescribed drugs. These beliefs negatively impact the management of HTN with pharmaceuticals in the Black community.

As mentioned earlier, one way to introduce a program that will change the behavior of a particular group is to begin by understanding the perceptions of the group. It has been demonstrated, in the US and UK, that the beliefs of Blacks about the use of antihypertensive medication seem to be 'fixed'. By trying to understand the perceptions of Blacks towards others of the risk factors for HTN, health educators will be able to develop culturally appropriate interventions that will not be 'road-blocked' by the persistent beliefs about HTN medications. The lack of cultural appropriateness, Svetkey et al. (2005) note, will affect the degree to which the target population is able to achieve the lifestyle modification goals.

Although limited to SDAs, the results of this study will impact health education by contributing to the knowledge and understanding of HTN and the factors that contribute to its development in the Black population in the UK. Findings may also assist

other health professionals to better understand how to deal with members of the Black community in their efforts to reduce the prevalence of HTN among Blacks in London.

CHAPTER 3

METHOD

A. Study Design

This was a cross-sectional study of Black SDA Christians living in London. The study employed quantitative survey methodology and was non-invasive. Using convenience sampling technique, participants from 17 predominantly Black churches across London were asked to complete a questionnaire and have blood pressure and anthropometric measurements taken.

B. Study Population and Setting

Participants self-selected to be part of the study. The inclusion criteria for the participants were: (a) current members of the SDA church, (b) residents in any of the London boroughs, (c) both male and female between the ages of 25 and 79, and (d) those who self-described as Black. The exclusion criteria were: (a) the reported use of alcohol or tobacco, and (b) having a diagnosis of HTN and currently taking medication to control BP. The data were collected at each church on the day and time designated.

C. Study Variables

The main study variables were the risk factors for HTN and BP including:

1. Diet

Various aspects of dietary consumption were assessed. A plant-based diet, versus one with animal protein consumption, was classified as follows: (1) Vegan defined as a plant-based diet with no consumption of meat, fish or poultry; (2) Vegetarian, defined as plant-based diet with the inclusion of dairy products; and (3) Non-

vegetarian defined as a diet that includes any consumption of animal protein. Fruit and vegetable intake was defined as the average number of servings per day. Sodium intake defined as whether or not salt was added during cooking, or added at the table before tasting the food, or added at the table after tasting the food, or was rarely or never added at the table. Diet was measured by self-reported responses to items in the questionnaire.

2. Body Mass Index (BMI)

BMI was defined as the body weight in pounds multiplied by 703 divided by height in inches. BMI was classified as > 18.5 being underweight, 18.5–24.9 being normal, 25.0–29.9 being overweight and 30–39.9 being obese, and > 40 being extremely obese. Nurses took participants' weight and height measurements.

3. Waist Circumference (WC)

Waist circumference was defined as increased cardiovascular disease risk when WC is ≥ 102 cm (40 in) in men and ≥ 88cm (35 in) in women. Nurses measured participants' WC and recorded the results (see section 2 in Procedures).

4. Physical Activity

Physical activity was defined as the number of days that the participant reports doing moderate to vigorous activity for at least 30 minutes each week, and the physical nature of their jobs, that is, manual versus sedentary.

5. Stress

Stress was defined as the perceived levels of stress experienced in the lives of the respondents during the last month, and was measured by self-reported responses to the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1993).

6. Blood Pressure (BP)

Blood pressure was used both as a continuous variable and also using the categories of HTN as defined by the British Hypertension Society (BHS) (see Appendix A). Blood pressure is the main dependent variable in this study. Nurses measured and recorded the participants' systolic and diastolic BP (see section 2 in Procedures).

7. Health Belief Model Variables

The five core HBM constructs were measured by self-reported responses to items in the questionnaire which included: (a) perceived susceptibility of the likelihood of developing HTN or of the vulnerability to the consequences of uncontrolled HTN; (b) perceived severity of HTN; (c) perceived benefits of lifestyle modification to prevent HTN; (d) perceived benefits of lifestyle modification to prevent HTN; and (e) self-efficacy: confidence in one's ability to adapt or continue lifestyle behaviors to prevent HTN.

The HBM constructs were the primary independent variables, and blood pressure was the primary dependent variable. The risk factors for HTN were included as covariates in a multiple regression model.

D. Instrumentation

A structured questionnaire was developed for use in this study (see Appendix B). The questionnaire was checked for clarity before it was used as the instrument for data collection.

The items in the first section focused on demographic questions such as age, gender, education, and yearly income. Questions were formulated to include items to assess the participants' knowledge and lay beliefs about HTN.

Also included were questions on diet and exercise to evaluate participants' current practices related to HTN prevention. Most of these items were adapted from the Health Survey for England's focus on Minority Health (National Health Service, 2005). The Health Survey for England is a series of annual surveys that began in 1991 (Department of Health).

The Perceived Stress Scale, used for measuring stress, was in the public domain and was reprinted with permission from the American Sociological Association (Cohen, Kamarck, & Mermelstein, 1993).

Most of the items for the HBM constructs were adapted from the instrument developed by Desmond, Price, Roberts, Pituch, Smith et al. (1992) or from Champion's 1984 HBM scale (a scale developed using the variable of breast self-examination frequency). Desmond et al.'s instrument demonstrated a Cronbach alpha for internal reliability of .93. Its test-retest reliability was .73 and the factor analysis to test for construct validity demonstrated that 83% of the items loaded onto one factor. Using Cronbach's alpha and Pearson r, the susceptibility, severity, benefits, barriers, and health motivation scales were all judged to be reliable. Over the years, Champion's HBM scale has been used in the US, and internationally, for example, Taiwan, Thailand, and Turkey.

E. Equipment

Based on the recommendation of the British Hypertension Society (BHS), the plan was to use mercury sphygmomanometers for the measurement of BPs. However, by the time of data collection, there was a change and the use of the mercury sphygmomanometer had been banned in some of the London hospitals; therefore two digital BP monitors were used along with a standard and a large adult cuff.

Weight was measured using a Conair Weight Watchers Glass Memory Precision Electronic Scale (WW43) which features a multiple sealed load cell system for best accuracy over time. Accuracy was microprocessor-controlled for precision performance and reliability. An inbuilt leveler feature kept users from "cheating" by shifting weight. Height was measured using a portable Seca Leicester height measure.

F. Procedures

1. Recruitment

Once the study was approved by the South England Conference of Seventh-day Adventists, and Loma Linda University Institutional Review Board (IRB), the pastors of SDA churches throughout London were contacted. The pastors/first elders were informed of the study and permission was requested to recruit in their church. Ultimately, participants were recruited at the Holloway, Peckham, New Life, Holcolm Road, Hampstead, Hackney, Stoke Newington, Chingford, Walthamstow, Croydon, Muswell Hill, Stratford, Plumstead, Edmonton, Haringey, Chiswick and Brixton churches. Two participants were recruited at a members' meeting for the London SDA Credit Union.

The study was promoted by the student investigator (SI) and church leaders during church services. Inserts (see Appendix C) were placed in the bulletins, and posters were placed on the bulletin boards. An explanation of the study and its benefits to the church members, along with the inclusion and exclusion criteria were presented. The members were invited to participate and cards were handed out and collected at the end of the service.

Follow-up calls were placed to those who filled out the cards, as a reminder to meet at a specific church on the date scheduled for data collection. Prior to the published start time for data collection, the SI briefed the nurses on the purpose of the research, and let them know that at any point participants were free to change their minds about taking part and should not be coerced into continuing. There was also a review of the techniques for the collection of the BP and anthropometric measures: weight, height and WC.

2. Informed Consent

Upon arrival at the site on the day of data collection, the SI presented potential participants with the consent form (see Appendix E). Once they had read the consent form, the SI reviewed it with them and answered any questions before they signed. Once they signed the consent forms they were requested to place one back in the envelope that contained their questionnaires and to keep one for themselves. Prior to any data entry, the informed consents were separated from the questionnaires and stored separately.

3. Data Collection

After the consent form was presented and signed, the participants completed the questionnaire. The nurses then explained the procedure for the BP and anthropometric measurements. Once this was done the participant sat quietly for 5 minutes before the first BP was taken. The nurse then measured and recorded the BP in the opposite arm. A repeat BP measurement was taken in the arm that had the highest DBP. Once the BP was taken, the nurse took each participant's anthropometric measurements: height, weight and WC. The forms for recording the measurements had

an identification code that matched them to the appropriate questionnaire (see Appendix F). A few who found it inconvenient to meet at their churches were visited in the homes where the questionnaires were completed and measurements were taken, following the same procedures used at the church sites.

Once the nurses had recorded the participant's data, the form was placed in the envelope along with the questionnaire, until time for data entry. The participants then moved on to speak with the SI who did a quick review of their measurements and gave a short consultation describing the risks that they had and the changes that they could make in order to decrease their HTN risks. Each was given an educational brochure obtained from the BHS about the definition, prevention and control of HTN. All of the participants who presented with elevated BP readings were advised to make an appointment to see their general practitioner (GP).

G. Data Analysis

Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) for Windows software program Version 14. First the data were entered and cleaned and descriptive analysis was done on all variables.

The data were adjusted as follows:

For item one, respondents were given the option of "Caribbean", "African" or "Other". A new category of "Black British" was created. Those who identified themselves as "British Caribbean" were classified as "Caribbean" along with those who were born in British Guyana.

Twenty-three individuals did not select a response for item four indicating whether or not they were born in the UK, but based on their response to item 9 "Which

country were you born in?" the appropriate selection was made. Additionally, St. Vincent" and "St Vincent and the Grenadines" were combined.

All of the zero responses for item 18, individuals in household over the age of 18, were changed to one. This correction did not, however, take into account the individuals who did not put zero, but still neglected to include themselves. Eight individuals who indicated that the number of individuals employed in the household was zero (item 20), reported that they were employed in item 22. The responses for these eight individuals were changed from zero to one for item 20.

Five of the individuals who indicated that they were unemployed in item 23, explained that they were students. "Student" was added as a forth category.

Individuals who selected more than one response for item 24 (best time to measure BP) were re-entered as "Don't Know"

The distinction between "normal" (130/85) and "optimal" (120/80) BP for item 29 may not be available to laypersons. Both responses therefore, were considered correct.

Prior to reverse coding, all of the HBM variable items (46-81) were recoded with higher numbers indicating agreement: Strongly agree = 5; agree = 4; neither agree not disagree = 3; disagree = 2; and strongly disagree = 1.

Individuals who indicated that they were vegan (item 92) or vegetarian (item 93) and then went on to indicate fish or meat consumption were classified as non-vegetarian. Those who said "yes" to both vegan and vegetarian, but did not indicate any fish or meat consumption were classified as vegan.

Data analysis was performed in order to answer each research question as follows:

Question 1: What are the knowledge levels, and common lay-beliefs held by Black Seventh-day Adventists living in London concerning hypertension? Descriptive statistics were used to evaluate the responses to the items relating to the demographics and knowledge. The measures of central tendency, mean, median and mode are reported.

Question 2: What are the levels of the health belief model (HBM) variables of perceived susceptibility, severity, benefits, barriers and self-efficacy related to controlling hypertension in Black Seventh-day Adventists living in London? Scores for the HBM constructs concerning behaviors to prevent HTN are reported. The measures of central tendency are reported for these scores.

Question 3: Is there a relationship between the levels of HBM variables related to preventing hypertension and the behavioral hypertension risk factors among Black Seventh-day Adventists living in London? This question was analyzed using multiple linear regressions to examine how the HBM factors predict the presence of risk factors for HTN. Using the heart disease and stroke estimates created by researchers at Harvard Medical School, Harvard School of Public Health (Colditz et al., 2000) and the Siteman Cancer Center (nd) as guidelines, a 10-year relative risk estimate (RRE) for HTN was developed to score the HTN risks for the participants in this study. The regressions were run with the demographic variables, the HBM variable scores and the knowledge scores as the independent variables. The dependent variable was the RRE:

$$\text{RRE} = \beta_0 + \beta_1 \text{Age.} + \beta_2 \text{Gender} + \beta_3 \text{Family history of HTN} + \beta_4 \text{SES} + \beta_5 \text{Caribbean vs African} + \beta_6 \text{Caribbean vs. UK-born} + \beta_7 \text{Perceived Susceptibility} + \beta_8 \text{Perceived Severity} + \beta_9 \text{Perceived Benefits} + \beta_{10} \text{Perceived Barriers} + \beta_{11} \text{Self-Efficacy} + \beta_{12} \text{Knowledge Scores}$$

Question 4: What is the relationship between the behavioral variables and BP levels, controlling for demographics variables among Black Seventh-day Adventists living in London? This question was analyzed using running multiple linear regressions. Systolic BP and DBP, the dependent variables, were regressed on demographic variables and the RRE score, for example:

$$\text{SBP} = \beta_0 + \beta_1 \text{Age.} + \beta_2 \text{Gender} + \beta_3 \text{Family history of HTN} + \beta_4 \text{SES} +$$

$$\beta_5 \text{Caribbean vs African} + \beta_6 \text{Caribbean vs. UK-born} + \beta_6 \text{RRE Score}$$

Education was categorized as "primary education school" vs. "secondary education and beyond" and used as the measure of SES (Dalstra et al., 2005).

H. Power Analysis

Using the SamplePower software and alpha set at 0.05, a sample size of 284 subjects was necessary to achieve power at .80 for the multiple regression analysis for question four which had seven independent variables and four covariates. As question three had only five independent variables this sample size was sufficient to run the multiple regression analysis. A total of 352 questionnaires were distributed: 27 (7.67%) were not returned, and of those that were returned 13 could not be used. Ultimately, the sample size used for running the analyses was 312.

I. Strengths and Limitations

Though Black SDAs are only a subset of the Black population living in London, the advantage of studying this population is that, like SDAs in previous studies, they have a broad range of dietary habits ranging from those who adhere very closely to the churches dietary recommendations, to those whose diets are similar to the general

population. This increases the statistical power of this to detect associations between diet and BP in this study.

Another strength of this study is associated with the prevalence of smoking and alcohol consumption. It is known that most Adventist do not smoke or drink (Fraser, 1999); as such, none of the risk factors studied are confounded with current alcohol and tobacco use.

The primary limitation in the study is that the blood pressure readings were not collected on separate days; therefore the influence of daily fluctuations of blood pressure for the subjects cannot be determined. The second limitation is lack of random selection. Since a convenience sampling technique was used, it can be assumed that the individuals who self-selected for this study are different from those who did not; that is, they are more concerned about their health. Therefore, the generalizability of the study to the entire population of Black SDA and Blacks in the general UK population is limited. Using a convenience sample also presents a potential for the study to be somewhat biased to those who volunteered. Also, the cross-sectional design of the study does not allow determinations of causality.

Finally, while the instrument used in the survey was read for clarity, it was not pre-tested prior to the study. The items were validated after the study.

J. Research Ethics

There was no identifying information on the questionnaires the responses to the questionnaire were recorded anonymously as participants were asked not to write their names anywhere on the questionnaire. The questionnaires were matched to the forms with the clinical data by numerical identification codes. The participants were assured of

the improbability of their being personally identified with any of the information that was collected. After the data collection, only the SI had access to the data

The SI and the nurses ensured that the consent forms were signed only after the participants fully understood the ramifications of their doing what was involved in the study, and that even after signing, they were free to change their minds at any point. They were reassured of the fact that the IRB process considered the risks to them for taking part in the study to be minimal, and that the study was approved by Loma Linda University Review Board. The only risk that they faced was that of emotional discomfort should they be told that their BP was high. If a participant was identified as having elevated BP, they were advised to visit their GP as soon as possible

CHAPTER 4

PUBLISHABLE PAPER

Risk Factors for Hypertension among a Church-based, Black Population in London

Being Submitted to: Ethnicity and Health

Risk Factors for Hypertension among a Church-based, Black Population in London

Maxine A Newell, DrPH,[1] Naomi N Modeste, DrPH, [1] Helen Hopp Marshak, PhD [1] And Colwick Wilson, PhD[2]

[1]*School of Public Health, Loma Linda University, California, USA,* [2]*School of Science and Technology, Loma Linda University, California, USA*

Address for correspondence: Naomi N. Modeste, Dr.PH, School of Public Health, Loma Linda University, Loma Linda, CA, 92350, USA, Tel.: + 1 909 558 4741; Fax: + 1 909 555 0471; E-mail: nmodeste@llu.edu

ABSTRACT

Objectives. *Compared to other ethnic groups, people of African descent in the United Kingdom have an increased prevalence of hypertension, (HTN) and subsequent morbidity and mortality. We studied a group of people of African descent in London to examine the impact of their beliefs and lifestyle on HTN.*

Design. *Data were collected from a convenience sample of individuals aged 25-79 from 17 predominantly Black churches across London. The main variables measured were systolic and diastolic blood pressure and the risk factors of age, gender, socioeconomic status, body mass index, waist circumference, levels of physical activity, diet and salt consumption for HTN*

Results. *25.3% of the subjects were hypertensive. Hypertension was more prevalent among males (34%) than females (21.6%). Relative risk estimates (RRE) scores for hypertension were predictive of diastolic blood pressure ($p<.05$) and 68.6% had RRE scores that put them at risk for developing HTN.*

Conclusion. *Relative to HTN, the lifestyle practices of this church-based Black group was not superior to that of the general Black population in the UK.*

Keywords. *hypertension, risk factors, Blacks in London*

Risk Factors for Hypertension among a Religious Black Population in London

INTRODUCTION

The increased prevalence of hypertension (HTN) and subsequent morbidity and mortality among people of African descent in the United Kingdom (UK) as compared to other ethnic groups is well documented.[1-7] These findings are mirrored in the Health Survey for England 2004[8] which reported HTN prevalence rates for men and women in the general population as 31.7% and 29.5%, but somewhat higher for Black Caribbean men and women (38.4% and 31.7% respectively).

The risk factors for HTN in general populations are well known and include:

1. *Smoking:* The literature generally lists smoking as an important risk factor for cardiovascular disease/coronary heart disease[9-12] but the specific relationship between hypertension is not fully understood. While there is a consistent acute rise in blood pressure (BP) during smoking,[10, 11] the relationship to long-term smoking in epidemiological studies is not as clear.

2. *Alcohol consumption*: For cardiovascular diseases, in general, and HTN in particular, researchers describe a 'J-shaped association' where moderate or light drinkers have lower BP than both non-drinkers and heavy drinkers'.[10, 13-16] According to Nanchahal, Asdon and Wood, however, "the J-shaped association between alcohol intake and all-cause mortality represents the sum of its protective effect on CHD mortality and detrimental effect on other, primarily non-cardiovascular causes of death" (p 57).[17]

3. *Family history*: Although the statistics for heritability risk vary from study to study, ranging from 14 to 82% for systolic blood pressure (SBP) and 8 to 64% for

diastolic blood pressure (DBP),[18] most authorities now recognize that children of parents with HTN have a higher risk of developing HTN than children of normotensive parents.[19]

4. *Stress*: The exact mechanism of how stress leads to HTN is not completely understood,[20, 21] but, according to Bierhaus, Humpert and Nawrithit it is "well accepted that… [stress] contributes to the pathogenesis of hypertension" (p 1189).[22] When an individual faces a mentally stressful situation, the body responds with increases in cardiac output, norepinephrine and blood pressure as a result of α-adregenic receptor stimulation.[23] Both mental and physical stressors produce these physiological responses, but with mental and psychological stressors the response is greater.[24] Blacks have greater increases in vascular tone in response to stress than Whites, and it has been suggested that this is due to the combination of increased peripheral vascular resistance and higher levels of environmental and psychosocial stress. These ethnic differences lead to sustained HTN.[25]

5. *Age*: Age is a risk factor for HTN[26] with both SBP and DBP increasing with age from the second decade.[27] Agyemang and Bhopal's [5] meta-analysis of the research on differing prevalence of BP levels between Blacks and Whites revealed that up to the 3rd decade, the BP of Blacks in the UK is lower than that of Whites; beyond the age of 30, however, Blacks have higher BP levels compared to Whites.

6. *Overweight and obesity*: Overweight (a BMI > 25) and obesity (a BMI >30) are major risk factors for many chronic conditions such as diabetes, cardiovascular disease and coronary heart disease.[28] They are related to HTN independent of age or gender[29, 30] and account for 78% and 65% of HTN in males and female, respectively.[31, 32] The prevalence rates of overweight (including obesity) for Caribbean (64.5%) and

African (69.8) women in the UK are somewhat higher than those of the general female population (51.7). The overweight prevalence rates for African men (61.8) are lower than the general male population (66.5) while those for Caribbean men (67.4) are higher.[8]

7. *Lack of physical activity (PA)*: Moderate to vigorous cardiovascular exercise for 20-30 minutes 4-5 days of the week reduces BP and is effective for long-term control of HTN.[33] Additionally, many practitioners recommend accumulated PA, which is less intense and does not necessarily aim to improve physical fitness, as a modality for treating HTN which can significantly reduce BP in prehypertensive and hypertensive individuals.[34]

8. *Sodium Intake*: In their meta-analyses of randomized controlled trials on the effects of sodium reduction on BP, He and Macgregor[35] demonstrated that a reduction of sodium intake had a significant effect on SBP and DBP. On average the BP of hypertensives decreased by 5/3 mm Hg and normotensives by 2/1 mm Hg. Their findings demonstrated that, in the long-term, population salt reduction would have a positive impact on public health by decreasing population BP and therefore cardiovascular mortality.

Hooper et al.[36] conducted a meta-analysis of 11 randomized controlled trials on the effects of sodium reduction on BP and reported that sodium reduction resulted in a decrease an average of 1.1 mm Hg for SBP and 0.6 mm Hg for DBP. Though modest, these reductions allowed individuals on a low salt diet, who were hypertensive, to discontinue their medications without a subsequent loss of BP control.

9. *Diet*: In 2002, John et al.[37] carried out a randomized control trial to examine the specific effects of fruit and vegetable consumption on BP. They reported that after

six months of a diet with a minimum of five daily portions of fruit and vegetables, the SBP and DBP of the intervention group fell 4 mm Hg and 1.5 mm Hg, respectively, more than in the control group.

Comparisons of the effects of vegetarianism and non-vegetarianism showed that the SBP and DBP of vegetarians are 3 to 14 mm Hg and 5 to 6 mm Hg lower, respectively, than non-vegetarians. For vegetarians, the prevalence of HTN ranged from 2% to 40%, while the range was 8% to 60% in non-vegetarians.[38]

As part of its policy on health, the British government has set one of the 2010 targets as the reduction of deaths from heart disease and stokes in those less than 75 years of age by two fifths. One of the means by which they plan to achieve this goal is by the improvement of individual lifestyles.[39] Most of these lifestyle recommendations, including the avoidance of alcohol and tobacco, and the promotion of vegetarian or vegan diets, are part of the traditional emphasis on healthy living advocated by the Seventh-day Adventist (SDA) church, [40, 41] a conservative Protestant Christian organization.

In the United States (US), the health profile of Black SDAs is better than that of non-SDA Blacks.[42] The aim of this study was to examine the risk factors for HTN among a sample of Black SDAs living in London to ascertain if their lifestyle as SDAs, when compared to US Black SDAs, other SDA groups around the world, and the non-SDA Black population in the UK, positively impacted HTN risk.[40, 41]

METHODS

This was a cross-sectional study of Black SDA Christians living in London. The study employed quantitative survey methodology and was non-invasive. Using a convenience sampling technique, 352 participants from 17 predominantly Black churches

across London, self-selected to be part of the study and volunteered to complete a questionnaire and have their blood pressure and anthropometric measurements taken by qualified nurses.

The inclusion criteria for the participants were: (a) current members of the SDA church, (b) residents in any of the London boroughs, (c) both males and females between the ages of 25 and 79 years, and (d) those who self-described as Black. The exclusion criteria were: (a) the reported use of alcohol or tobacco (the numbers of individuals for whom these risk factors would be relevant were not expected to be significant and, as such, were not examined in this study), and (b) having a diagnosis of HTN and currently taking medication to control blood pressure (BP).

Blood pressure was recorded using digital monitors and classified according to the British Hypertension Society (BHS). BP was measured with the participant seated, once in each arm and then repeated in the arm with the highest reading. An average of the repeated measure in one arm was then calculated and recorded.

Anthropometric measures were taken with participants in light clothing and without shoes. Weight was measured using a Conair Weight Watchers Glass Memory Precision Electronic Scale (WW43). Height was measured using a portable Seca Leicester height measure. Body mass index (BMI) was calculated as the body weight in kilograms by height in meters squared, and classified as > 18.5 being underweight, 18.5–4.9 being normal, 25.0–29.9 being overweight and 30–39.9 being obese, and >40 being extremely obese. Waist circumference (WC) was measured and recorded in centimeters using a flexible measuring tape ($\geq$ 102 cm in men and $\geq$ 88 cm in women constitute increased risk for HTN).

A structured questionnaire was developed for use in this study. The items in the first section focused on demographic questions such as age, gender, education, and yearly income. Questions were formulated to assess the participants' knowledge and lay beliefs about HTN. The health belief model (HBM) was the theoretical model used to develop the section which examined perceptions about HTN. Cohen's Perceived Stress Scale[43] was used to measure stress. Questions were also included on diet (salt, fruit and vegetable consumption, whether participants were vegan or vegetarian), and levels of daily physical activity to evaluate current practices related to HTN prevention. The questionnaire was checked for clarity before it was used as the instrument for data collection.

Building on the 10-year relative risk estimates (RRE) for cancers developed by researchers at Harvard Medical School and Harvard School of Public Health,[44] researchers at the Siteman Cancer Center expanded the RRE to include heart disease and stroke[45]. Using the heart disease and stroke estimates as guidelines, a 10-year RRE for HTN was developed to score the risk for the participants in this study (see Table 1).

(Insert Table 1 here)

The Statistical Package for the Social Sciences (SPSS) version 14.0 was used for data entry and analyses. Frequencies and percentages were computed for all categorical variables of the study and descriptive statistics for HBM scales and continuous anthropometric measures and BP. Linear regressions were run to examine the associations between the RRE score and SBP, the RRE score and DBP, and the RRE score and class of HTN, as classified by the BHS.

RESULTS

Of the 312 respondents, 171 (55.0%) were born in the Caribbean, 32 (10.3%) in Africa and 108 (34.7%) in the UK. The majority (69%) were female with a mean age for the group of 44.37 years. When age was examined by place of birth, the means were significantly different ($p<0.001$), with Africans-born being the youngest (37.38) and Caribbean-born being the eldest (49.24). The majority were married with 43.2% married for the first time, 4.5% remarried, 9.1% divorced, and 3.9% separated while 36.4% were single/never married. Only 4.2% had not completed secondary school, while a little over one third (34.7%) completed graduate degrees (see Table 2).

(Insert Table 2 here)

The results of the blood pressure measurements for Black SDAs in London are shown in Table 3. Both the mean SBP and DBP were lower for women than for men (126/77 versus 136/78), but only the difference between SBPs was significant ($p <.001$). A significantly smaller percentage of women (21.6) than men (34.0) were hypertensive ($p = .032$).

The findings for the HTN risk factors of BMI, WC, and perceived stress are also reported in Table 3. The mean BMI for men was 22.00 and for women 26.64. More men (45.2%) than women (40.1%) were overweight, but more women (18.4%) were obese as compared to the men (16.1%). The only individuals in the study who were morbidly obese were women (1.0%). None of the gender differences in BMI, however, were significant. Sixty-nine women (20.5%) had WC measurements that put them at risk for cardiovascular disease, while only 11 (12.5%) men were at risk ($p <.001$). Similarly, the

perceived stress mean for women (18.2) was significantly higher than men (16.1, p =.021).

(Insert Table 3 here)

Dietary patterns are reported in Table 4. Thirty percent of the women and 32.8% men did not eat meat, and of these non-meat-eaters a larger percentage of women (14.9) were vegan while a larger percentage of the men were vegetarian (20.3). While the majority of the study population was neither vegan nor vegetarian (60.1%), only 2.6% of them ate meat or fish 7 days a week. Only 25.1% met the government recommendation of five servings of fruit and vegetables daily, with higher rates for women (28.0%) than men (18.3%). The only dietary variable where the gender differences was significant was for fish consumption (p = .036).

(Insert Table 4 here)

Overall, the women participated in less PA than the men: more or them reported never or rarely exercising for all types of PA except heavy housework. Heavy house work was also the only category where more females (11.6%) than men (3.6%) indicated being active on seven days of the week (see Table 5).

(Insert Table 5 here)

Direct comparison with Health Survey for England[8] data was not possible, but some comparisons can be made for the risk factors of BMI, WC, PA, fruit and vegetable consumption, sodium use in cooking and at the table, and the mean levels of BP between this study and the national data from 2004 (see Table 6).

(Insert Table 6 here)

Multiple regression analyses was conducted to decide if the relative risk estimate (RRE) based on the scoring of the risk factor variables for HTN were associated with SBP, DBP and BP classification according to the British Hypertension Society (BHS). When controlled for age, gender, SES and family history of HTN, the RRE score was predictive of, and positively associated with DBP, ($R^2 = .07$, $\beta = .20$, $p < .05$), although the effect size was small.

DISCUSSION

Research documents that only a small portion of the population that is hypertensive is diagnosed and adequately managed.[6] Additionally, Blacks in the UK are more likely to have their HTN detected in the community than their counterparts from other ethnic groups.[46] In the present study it was not surprising then that, even though one of the inclusion criteria for this study was that the participants were not being treated for HTN, 34.0% of males and 21.6% of females had elevated blood pressure readings. The national prevalence rates for the general population in 2006 were 31.0% for males and 28.0% for females.[47]

In the US, African American women are 1.81 times more likely than African American men to have HTN,[48] and in the UK there is a greater prevalence of HTN among Caribbean women than Caribbean men.[49] A 2003 study[50] on the Caribbean island of Barbados, also found a higher prevalence of HTN among women than men. Despite the increased risk for females in several of the HTN risk factors examined in this study, fewer women (21.6%) were hypertensive when compared with men (34.0%). It is unclear why this is so, but research has shown that there is a strong association of overweight and obesity with HTN[30, 31] and the absence of any significant differences in

the rates of overweight and obesity between the genders in this study might account for the lower levels of HTN among females.

Dong and colleagues[51] stated that by the age of 50 one in two UK Blacks is hypertensive. When those who were 50 and older were separated from the younger participants in our study, a similar proportion of the older population (48.8%) were hypertensive. As with the whole group, however, fewer women (45.5%) were hypertensive than men (53.6%), although the difference in this older age category was not statistically significant.

Compared to data reported for minorities in the Health Survey for England,[8] the subjects in this study had lower BMI means, a lower percentage of those with WC that put them at risk for HTN, and a much lower percentage of salt added at the table. Salt used in cooking in, however was somewhat higher in our study, and those who met the government guidelines for daily PA and fruit and vegetable consumption were lower (see Table 6).

Because such a large percentage of our study population rarely or never used salt at the table, the higher percentage of salt use in cooking than those reported in the national data could be due to the subjects' knowledge that salt added at the table is worse than salt added in cooking.

Given the emphasis on this among SDAs, the low percentage of subjects that met the government guidelines for daily consumption of fruit and vegetables is baffling. The presence of many imported fruit and vegetables means that they have access to produce from many of their native countries. Sixty-three percent of the participants, however, had annual incomes of $\leq$ £30,000 which might make the price of familiar produce prohibitive.

The lower levels of PA when compared to the general UK population might be explained by age: In the national data the levels of PA drops off as age increases. The mean age for our study sample was 44.37 and ranged from 25-79 years, compared to a range of 16-55+ for the national survey. A large proportion of younger individuals with higher levels of PA were probably excluded from this study.

Nationally, only 5% of the population identify as vegetarian or vegan,[51] but in our study 12.9% reported being vegan and 18.9% claimed to be vegetarians (31.8% total). In other studies omnivores had higher BPs than vegetarians, vegans and those who ate fish,[29, 38] and while the percentage of omnivores in our study was high, only 1.1% ate red meat and 1.6% white meat daily. The mean BP levels for our study were 131.95/78.70 for vegetarians 128.39/76.77 for vegans and 128.15/77.00 for omnivores. These results might were not significant and might be explained by the fact that the fruit and vegetable consumption in our study population was low and therefore little of their HTN controlling benefits were experienced by the vegans and the vegetarians. As noted earlier, few of the omnivores reported daily meat consumption, and this could be the reason for their relatively low BP levels.

Besides the use of salt at the table, BMI and WC were the only risk factors where the participants in this study were at decreased risk for HTN when compared with the national data for minorities (see Table 6). Predictably, their SBP and DBP means were higher, but the percent classified as hypertensive, however, was lower than Caribbean Blacks, but higher than African Blacks in the national study (see Table 6).

Much of the data examining HTN in Blacks in the UK separates the group into Caribbean Blacks and African Blacks. One limitation of our study was the low number

of African-born Blacks, only 10.3% of the sample, making it challenging to compare the data for our study with the national data. Another limitation was that no pilot study was done prior to data collection. This could have increased the reliability and validity of the items used to assess the risk factors for HTN. Finally, having a convenience sample of individuals who self-selected into the study increased the probability that the participants represented individuals who were more concerned about their health, in general, than others from this segment of the Black population. Random selection would have avoided this effect and increased the generalizability of the findings but would have been difficult to accomplish partly due to the fact that even though each church keeps a list of baptized members, these lists are frequently out of date and many members remain on the list who are no longer in attendance. Additionally, this approach would have required a level of funding which was not available for our study.

We recommend that in the future a similar study be carried out with a larger number of Africans and respondents from other large cities in the UK. This might increase the relevance of comparisons with the national data. This study reinforces the need for educators to develop programs that aim for behavior change to include preventive behaviors. Despite the exposure to information on health within the SDA community, the respondents did not have engage in behaviors that decreased their risk for HTN.

In conclusion, the evidence presented in our study that the lifestyle of this church-based Black population is protective against HTN is mixed. Unlike their US counterparts, and other SDA populations around the world, the health profile of the Black SDAs in London especially relative to HTN, does not stand out as superior to that of the

general Black population in the UK. Many of the health practices traditionally emphasized by the SDA church were not being practiced even though there was knowledge of the association of these practices to the reduction of HTN risk. (These findings are reported elsewhere.)

TABLE 4.1. *Ten-Year Relative Risk Estimate Scoring for Hypertension*

Risk Factor	RR Score
Age: > 50	+2
Female	+1
Family History:	+2
Parental	+3
Sibling	
BMI	
Women	
25-28.9	+2
≥ 30	+3
Men	
25-29.9	+2
≥ 30	+3
Waist circumference	
Women >35in	+1
Men >40	+2
Stress Score >14.7	+2
Salt	
Added during cooking	+1
Generally added at table without tasting food	+3
Generally taste then food then add salt at the table	+2
Taste food and occasionally add salt at the table	+1
Rarely/never add salt to food at the table	-1
Vegan	-4
Vegetarian	-3
Fish ≥ 3 servings per week	-2
Red meat consumption ≥ 3 servings per week	+2
White meat consumption ≥ 3 servings per week	+1
Fruit/Vegetable ≥ 5 servings per day	-1
Physical Activity at least 30 minutes per day for five days or three hours per week	-2

Adapted from Colditz et al., 2000 and Siteman Cancer Center (nd)

TABLE 4.2. *Demographics for Sample of Seventh-day Adventists Living in London, by Place of Birth*

	Total* 312	Caribbean 171 (55%)	African 32 (10.3%)	UK born 108 (34.7%)	*p*-value
Gender (%)					
Male	94 (31.1)	53 (31.7)	11 (37.9)	30 (28.6)	
Female	208 (68.9)	114 (68.3)	18 (62.1)	75 (71.4)	
Mean Age (SD)	44.4 (12.7)	49.2 (14.1)	37.4 (10.8)	39.0 (6.4)	<.0001
Marital Status (%)					<.0001
Single/Never married (%)	112 (36.4)	43 (25.6)	9 (29.0)	59 (54.6)	
First time married	133 (43.2)	80 (47.6)	19 (61.3)	34 (31.5)	
Remarried	14 (4.5)	10 (6.0)	0 (.0)	4 (3.70	
Divorced	28 (9.1)	21 (12.5)	1 (3.2)	6 (5.6)	
Separated	12 (3.9)	6 (3.6)	1 (3.2)	5 (4.6)	
Widowed	9 (2.9)	8 (4.8)	1 (3.2)	0 (.0)	
Annual household income (%)					.003
Less than £10, 000	41 (16.7)	25 (19.7)	4 (16.0)	11 (11.8)	
£10 - £20, 000	58 (23.6)	35 (27.6)	8 (32.0)	15 (16.1)	
£20 - £30, 000	55 (22.4)	30 (23.6)	3 (12.0)	22 (23.7)	
£30 - £40, 000	37 (15.0)	16 (12.6)	3 (12.0)	18 (19.4)	
£40 - £50, 000	17 (6.9)	9 (7.1)	3 (12.0)	5 (5.4)	
£50 - £75, 000	27 (11.0)	10 (7.9)	1 (4.0)	16 (17.2)	
£75 - £100, 000	5 (2.0)	0 (.0)	3 (12.0)	2 (2.2)	
More than £100, 000	6 (2.4)	2 (1.6)	0 (.0)	4 (4.3)	
Highest level of education (%)					<.0001
Primary school	12 (4.2)	10 (6.6)	0 (.0)	2 (1.9)	
Secondary school	35 (12.2)	30 (19.7)	2 (6.9)	3 (2.8)	
Trade/vocational school	59 (20.5)	35 (23.0)	4 (13.8)	19 (17.9)	
Undergraduate polytechnic or university	82 (28.5)	39 (25.7)	7 (24.1)	36 (34.0)	
Graduate degree	100 (34.7)	38 (25.0)	16 (55.2) *	46 (43.3)	

* One respondent did not indicate country of birth, 16 respondents did not indicate gender, 4 did not indicate marital status, 66 did not report household income, and 24 did not indicate level of education.

TABLE 4.3. *Results for Blood Pressure and Hypertension Risk Factors of BMI, WC and Perceived Stress, by Gender, for Sample of Seventh-day Adventists Living in London Ten-Year Relative Risk Estimate for Hypertension*

	Male	Female	All	*p*-value
Mean systolic BP (SD)	136.2 (18.0)	125.7 (16.4)	129.0 (17.6)	.000
Mean diastolic BP (SD)	78.4 (10.3)	77.04 (10.0)	77.4 (10.0)	.329
Hypertensive (%)*	32 (34.0)	45 (21.6)	79 (25.3)	.037
Normotensive (%)	62 (66.0)	163 (78.4)	233 (74.7)	.037
BMI (%)				.429
<18.5 "Underweight"	3 (3.2)	2 (1.0)	5 (1.7)	
18.5 – 24.9 "Normal"	33 (35.5)	82 (39.6)	115 (38.3)	
25.0 – 29.9 "Overweight"	42 (45.2)	83 (40.1)	125 (41.7)	
30.0 – 39.9 "Obese"	15 (16.1)	38 (18.4)	53 (17.7)	
≥ 40.0 "Morbid/severely obese"	0 (.0)	2 (1.0)	2 (.7)	
Waist Circumference (%) †				.000
No risk	80 (87.9)	131 (65.5)	212 (72.5)	
At risk	11 (12.1)	69 (34.5)	80 (27.5)	
Perceived stress scores††				.004
Mean (SD)	16.1 (6.04)	18.2 (5.89)	17.4 (6.01)	

* British Hypertension Society classifications (Mead, 2004).

† Increased cardiovascular disease risk when WC is ≥ 102 cm in men and ≥ 88cm in women.

†† Scores ranged from 0-40

TABLE 4.4. *Dietary Patterns of Seventh-day Adventists Living in London, by Gender*

Dietary Patterns	Males n (%)	Females n (%)	All n (%)
Vegans	9 (10.5)	28 (14.6)	37 (12.9)
Vegetarians	18 (22.2)	28 (16.7)	49 (18.9)
Red Meat Consumption			
Less than 1 day/week	37 (67.3)	97 (77.0)	139 (73.9)
1-2 days/week	13 (23.6)	18 (14.3)	33 (17.6)
3-4 days/week	3 (5.5)	11 (8.7)	14 (7.4)
5-6 days/week	2 (3.6)		2 (1.1)
White Meat Consumption			
Less than 1 day/week	16 (28.6)	39 (30.7)	56 (29.5)
1-2 days/week	23 (41.1)	53 (41.7)	81 (42.6)
3-4 days/week	11 (19.6)	28 (22.0)	40 (21.1)
5-6 days/week	5 (8.9)	5 (3.9)	10 (5.3)
7 days/week	1 (1.8)	2 (1.6)	3 (1.6)
Fish Consumption*			
Less than 1 day/week	17 (27.0)	37 (26.8)	56 (26.9)
1-2 days/week	29 (46.0)	71 (51.4)	104 (50.0)
3-4 days/week	14 (22.2)	18 (13.0)	33 (15.9)
5-6 days/week	1 (1.6)	12 (8.7)	13 (6.3)
7 days/week	2 (3.2)		2 (1.0)
Fruit and vegetable consumption			
Less than one portion/day	4 (4.3)	10 (5.0)	14 (4.6)
1-2 portions/day	37 (39.8)	51 (25.5)	90 (29.7)
3-4 portions/day	35 (37.6)	83 (41.5)	123 (40.6)
5 or more portions/day	17 (18.3)	56 (28.0)	76 (25.1)
Sodium intake			
Do you generally add salt during cooking?	70 (78.7)	160 (79.2)	236 (78.9)
Do you generally add salt at the table without tasting your food?	3 (3.2)	10 (4.8)	14 (4.5)
Do you generally taste your food and then add salt at the table?	9 (9.6)	23 (11.1)	32 (10.3)
Do you taste your food and occasionally add salt at the table?	13 (13.8)	23 (11.1)	37 (11.9)
Do you rarely, or never, add salt to your food at the table?	66 (70.2)	141 (67.8)	214 (68.6)

*Only variable with significant *p*-value ($p = .036$)

TABLE 4.5. *Levels of Physical Activity among a Sample of Black Seventh-day Adventists Living in London, by Gender*

Physical Activity	Male n (%)	Female n (%)	All n (%)	*p* value
How many days per week, on average, do you get at least 30 minutes of moderate to vigorous exercise?				.042
Never or rarely	21 (25.0)	84 (44.4)	105 (37.2)	
1-2 days	30 (35.7)	47 (24.9)	82 (29.1)	
3-4 days	16 (19.0)	32 (16.9)	50 (17.7)	
5-6 days	8 (9.5)	13 (6.9)	21 (7.4)	
7 days	9 (10.7)	13 (6.9)	24 (8.5)	
How many days per week, on average, do you take a walk of at least 30 minutes?				.573
Never or rarely	24 (27.3)	55 (28.4)	81 (27.7)	
1-2 days	24 (27.3)	49 (25.3)	76 (26.0)	
3-4 days	10 (11.4)	36 (18.6)	46 (15.8)	
5-6 days	18 (20.5)	34 (17.5)	55 (18.8)	
7 days	12 (13.6)	20 (10.3)	34 (11.6)	
How many days per week, on average, do you do heavy housework for at least 30 minutes?				.014
Never or rarely	29 (34.9)	41 (21.6)	72 (25.4)	
1-2 days	35 (42.2)	67 (35.3)	103 (36.4)	
3-4 days	9 (10.8)	40 (21.1)	53 (18.7)	
5-6 days	7 (8.4)	20 (10.5)	29 (10.2)	
7 days	3 (3.6)	22 (11.6)	26 (9.2)	
How many days per week, on average, do you do heavy manual work for at least 30 minutes?				.000
Never or rarely	35 (38.9)	124 (67.0)	166 (58.2)	
1-2 days	26 (28.9)	32 (17.3)	60 (21.1)	
3-4 days	10 (11.1)	13 (7.0)	24 (8.4)	
5-6 days	13 (13.8)	7 (3.8)	20 (7.0)	
7 days	6 (6.4)	9 (4.9)	15 (5.3)	
Meet government recommendations of PA 5 days per week				.930
Yes	47 (56.0)	103 (55.4)	150 (55.6)	
No	37 (44.0)	83 (44.6)	120 (44.4)	

* Parenthesis indicates percent.

TABLE 4.6. *Comparison of Hypertension Risk Factors in Current Study and the Health Survey for England 2004*

	Current study (N =312)		Health Survey for England 2004			
			Caribbean		African	
	Male	Female	Male	Female	Male	Female
Mean BMI	26.0	26.6	27.1	28.0	26.4	28.8
WC "at risk" (%)*	12.5	20.5	22.0	47.0	19.0	53.0
Meet government guidelines for PA	20.2	13.8	37.0	31.0	35.0	29.0
Consume five or more portions of fruit and vegetables daily *	18.3	28.0	32.0	31.0	31.0	32.0
Add salt during cooking *	78.7	79.2	77.0	69.0	74.0	83.0
Rarely/never add salt at the table *	70.2	67.8	49.0	64.0	43.0	45.0
Mean SBP	136.24	125.75	133.3	123.0	128.0	118.1
Mean DBP	78.35	77.04	74.70	73.70	73.50	72.80
Hypertensive†	34.0	21.6	38.0	32.0	25.0	19.0

*Increased cardiovascular disease risk when WC is ≥ 102 cm in men and ≥ 88cm in women.

†British Hypertension Society classifications.[52]

REFERENCES

1. Higginbottom GMW. 'Pressure of life': Ethnicity as a mediation factor in mid-life and older peoples' experience of high blood pressure. *Sociol Health Illn* 2006; **28**: 583-610.
2. Khan JM, Beevers DG. Management of hypertension in ethnic minorities. *Heart* 2005; **91:** 1105-1109.
3. Swift PA, Markandu ND, Sagnella GA, He FJ, MacGregor, GA. Modest salt reduction reduces blood pressure and urine protein excretion in Black hypertensives: A randomized control trial. *Hypertension* 2005; **6**: 308-312.
4. Hajat C, Tilling K, Stewart JA, Lemic-Stojcevic N, Wolfe CD. Ethnic differences in risk factors for ischemic stroke: A European case-control study. *Stroke* 2004; **35**: 1562-1567.
5. Agyemang C, Bhopal R. Is the blood pressure of people from African origin adults in the UK higher or lower than that in European origin white people? A review of cross-sectional data. *J Hum Hypertens* 2003; **17**: 523-534.
6. Lane DA, Lip GYH. Ethic differences in hypertension and blood pressure control in the UK. *QJM* 2001; **94:** 391-396.
7. Lemic-Stojcevic N, Dundas R, Jenkins S, Rudd A, Wolfe C. Preventable risk factors for coronary heart disease and stroke amongst ethnic groups in London. *Ethn & Health* 2001; **6**: 87-94.
8. *Health survey for England 2004: Volume 1: The health of minority ethnic groups.* National Health Services, National Centre for Social Research, 2005 [cited 2008 Jan 28]; Available from URL:

http://www.ic.nhs.uk/webfiles/publications/healthsurvey2004ethnicfull/HealthSurveyforEnglandVol1_210406_PDF.pdf.

9. Bernaards CM, Twisk JW, Snel J, van Mechelen W, Kemper HC. In a prospective study in young people, associations between changes in smoking behavior and risk factors for cardiovascular disease were complex. *J Clin Epidemiol* 2005; **8**: 1165-1171.

10. Kaplan NM. Lifestyle modifications for prevention and treatment of hypertension. *J Clin Hypertens (Greenwich)* 2004; **6**: 716-719.

11. Lee KS, Park CY, Meng KH, Bush A, Lee SH, Lee, WC, *et al*. The association of cigarette smoking and alcohol consumption with other cardiovascular risk factors in men from Seoul, Korea. *Ann of Epidemiol* 1998; **8:** 31-38.

12. Onal AE, Erbil S, Ozel S, Aciksari K, Tumerdem Y. The prevalence of risk factors for hypertension in adults living in Istanbul. *Blood Pressure* 2004; **13**: 31-36.

13. Tomson J, Lip GYH. Alcohol and hypertension: An old relationship revisited [editorial]. *Alcohol & Alcoholism* 2005; **41**: 3-4.

14. Twisk JWR, Kemper HCG, Van Mechelen W, Bertheke Post G. *AEP* 2001; **11**: 157-165.

15. Ohmori S, Kiyohara Y, Kato I, Kubo M, Tanizaki Y, Iwamoto H, *et al*. Alcohol intake and future incidence of hypertension in a general Japanese population: The Hisayama study. *Alcohol Clin Exp Res* 2002; **26**: 1010-1016.

16. Malinski MK, Sesso HD, Lopez-Jimenez F, Buring JE, Gaziano JM. Alcohol consumption and cardiovascular disease mortality in hypertensive men. *Arch Intern Med* 2004; **164**: 623-628.

17. Nanchahal K, Ashdon WD, Wood DA. Alcohol consumption, metabolic cardiovascular risk factors and hypertension in women. *Int J Epidemiol* 2000; **29**: 57-64.

18. DeStefano AL, Gavras H, Heard-Costa N, Bursztyn M, Manolis A, Farrer LA, *et al*. Maternal component in the familial aggregation of hypertension. *Clin Genet* 2001; **60**: 13-21.

19. Jackson EM, Dishman RK. Hemodynamic responses to stress among black women: Fitness and parental hypertension. *Med & Sci Sports & Exerc* 2002; **34**: 1097-1104.

20. Esler M, Rumantir M, Kaye D, Lambert G. The sympathetic neurobiology of essential hypertension: Disparate influences of obesity, stress, and noradrenaline transporter dysfunction? *Am J Hypertens* 2001; **14**: 139S-146S.

21. Plante GE. Vascular response to stress in health and disease. *Metabolism* 1999; **51**(Suppl 1): 25-30.

22. Bierhaus A, Humpert PM, Nawroth PP. NF-κB as a molecular link between psychosocial stress and organ dysfunction. *Pediatr Nephrol* 2004; **19**: 1189-1191.

23. Scollan-Koliopoulos M. Managing stress response to control hypertension in type 2 diabetes. *Nurse Pract* 2005; **30**: 46-49.

24. Bedi M, Varshey VP, Babbar R. Role of cardiovascular reactivity to mental stress in predicting future hypertension. *Clin Exp Hypertens* 2000; **22**: 1-22.

25. Stein MC, Lang CC, Singh I, He HB, Wood AJJ. Increased vascular adrenergic vasoconstriction and decreased vasodilation in Blacks: Additive mechanisms leading to enhanced vascular reactivity. *Hypertens.* 2000; **36**: 945-951.

26. Schwartz AR, Gerin W, Davidson KW, Pickering TG, Brosschot JF, Thayer JF. Toward a causal model of cardiovascular responses to stress and the development of cardiovascular disease. *Psychosom Med* 2003; **65**: 22-35.

27. Kornitzer M, Dramaix M, De Backer. Epidemiology of risk factors for hypertension. *Drugs* 1999; **57**: 695-712.

28. Goldberg G. FLAIR-FLOW 4: Synthesis report on obesity for health professionals. *Nutrition Bulletin* 2003; **28**: 343-354.

29. Appleby PN, Davey KD, Key TJ. Hypertension and blood pressure among meat eaters, fish eaters, vegetarians and vegans in EPIC-Oxford. *Public Health Nutr* 2002; **5**: 645-654.

30. Lopes HF, Bortolotto LA, Szlejf C, Kamitsuji CS, Krieger EM. Hemodynamic and metabolic profile in offspring of malignant hypertensive parents. *Hyptertension* 2001; **38**: 616-620.

31. El-Atat F, Aneja A, McFarlane S, Sowers J. Obesity and hypertension. *Endocrinol Metab Clin North Am* 2003; **32**: 823-854.

32. Pausova Z. From big fat cells to high blood pressure: Obesity-associated hypertension. *Curr Opin Nephrol Hypertens* 2006; **15**: 173-178.

33. Pescatello LS, Franklin BA, Fagard R, Farquhar WB, Kelley GA, Ray CA. American College of Sports Medicine position stand. Exercise and hypertension. *Med Sci Sports Exerc* 2004; **36**: 533-553.

34. Brookes L. Hypertension highlights: Significant new definitions, publication, risks, benefits—and gene therapy? *Medscape Cardiology* 2005; **9(2)**. [Cited 2006 March 10]. Available from: URL: http://www.medscape.com/viewarticle/514644.

35. He FJ, MacGregor GA. Effect of modest salt reduction on blood pressure: A meta-analysis of randomized trials. Implications for public health. *J of Hum Hypertens* 2002; **16**: 761-770.

36. Hooper L, Bartlett C, Davey Smith G, Ebrahim. Advice to reduce dietary salt for prevention of cardiovascular disease. *Cochrane Database Syst Rev* 2004; **1**: CD003656.pub2. DOI:10.1002/14651858.pub2.

37. John JH, Ziebland S, Yudkin P, Roe LS, Neil HAW. Effects of fruit and vegetable consumption on plasma antioxidant concentrations and blood pressure: A randomized controlled trial. *Lancet* 2002; **359**: 1969-1974.

38. Berkow SE, Bernard ND. Blood pressure regulation and vegetarian diets. *Nutr Rev* 2005; **63**: 1-8.

39. Department of Health. *Saving lives: Our healthier nation.* The Stationary Office, 1999.

40. Fraser GE. Diet and primordial prevention in Seventh-day Adventists. *Prev Med* 1999; **29(6 Pt 2)**: 18-23.

41. Fønnebø V. The healthy Seventh-day Adventist lifestyle: What is the Norwegian experience? *Am J Clin Nutr* 1994; **59(5 Suppl)**: 1124-29.

42. Montgomery S, Herring P, Yancey A, Beeson L, Butler T, Knutsen S, *et al*. Comparing self-reported disease outcomes, diet, and lifestyles in a national cohort of Black and White Seventh-day Adventists. *Prev Chronic Dis* [serial online] 2007 July [cited 2007 October 14]; 4(3): [14 screens]. Available from URL: http://www.cdc.gov/pcd/issues/2007/jul/06/06_0103.htm.

43. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983; **24**: 385-396.

44. Colditz GA, Atwood KA, Emmons K, Monson RR, Willett WC, Trichopoulos D *et al.* Harvard report on cancer prevention. Volume 4: Harvard Cancer Risk Index. *Cancer Causes Control* 2000; **11**: 477-88.

45. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine. *Your Disease Risk: Relative Risks.* [cited 2007 October 14]: Available from URL: http://www.yourdiseaserisk.wustl.edu/pdf_files/rr_ydr.pdf.

46. Lip G, Barnett AH, Bradbury A, Cappuccio FP, Gill PS, Hughes E *et al*. Ethnicity and cardiovascular disease prevention in the United Kingdom: A practical approach to management. *J Hum Hypertens* 2007; **21**: 183-211.

47. . Dong Y, Zhu H, Sagnella GA, Carter ND, Cook DG, Cappiccio FP. Association between the C825T polymorphism of the G protein β3-subunit Gene and hypertension in blacks. *Hypertension* 1999; **34**: 1193-1196.

48. Townes EM. *Breaking the fine rain of death: African American health issues and a womanist ethic of care.* New York: Continuum; 1988.

49. Nazroo JY. *The health of Britain's ethnic minorities: Findings from a national survey.* London: Policy Study Institute; 1997.

50. Brathwaite N, Fraser H, Modeste N, Bromees H, King R. Obesity, diabetes, hypertension and vegetarian status among Seventh-day Adventists in Barbados: Preliminary results. *Ethn Dis* 2003; **13**: 34-39.

51. Henderson L, Gregory J, Swan G. *National diet and nutrition survey: Adults aged 19 to 64 years. Vol. 1: Types and quantities of foods consumed.* London: The Stationary Office, 2002.

52. Mead M. British Hypertension Society guidelines 2004-BHS IV. Ten key comments for primary care. *Br J Cardiol* 2004; **11**: 246-250. [Cited 2004 November 16]. Available from URL: http://www.bjcardio.co.uk/pdf/950Vol11_Num3_May-June_2004_p246-250.pdf

CHAPTER 5

PUBLISHABLE PAPER

Health Beliefs and the Prevention of Hypertension in a Black Population Living in London

Being Submitted to: Ethnicity and Disease

Health Beliefs and the Prevention of Hypertension in a Black Population Living in London

Maxine Newell, DrPH, Naomi Modeste, DrPH, Helen Hopp Marshak, PhD, Colwick Wilson PhD

In the United Kingdom (UK) the prevalence of morbidity and mortality associated with hypertension (HTN) is much higher in Blacks than in Whites. A convenience sample of 312 individuals aged 25-79 from 17 predominantly Black churches across London was studied using the Health Belief Model (HBM) to examine their beliefs about the prevention of HTN. A questionnaire was used to collect demographic and anthropometric data, lifestyle practices and perceptions towards HTN using the HBM constructs of susceptibility, severity, benefits, barriers, and self-efficacy. A relative risk estimate (RRE) score was developed to assess the presence of several risk factors of HTN for each participant. Based on multiple regression analyses, the demographic variables were independent predictors of SBP ($R^2 = .195$), the combined behavioral variable (RRE score) was an independent predictor of DBP ($\beta = .18$, $p = .022$) and self-efficacy was the only independent significant variable associated with RRE scores ($\beta = -.21$, $p = .008$). The perception of self efficacy to perform behaviors that will decrease HTN risk need to

be effectively harnessed by health educators in order to positively impact the prevalence of HTN in this population.

Key Words: Health Belief Model, London, Blacks, Hypertension risk factors, Hypertension, Prevention

Health Beliefs and the Prevention of Hypertension in a Black Population Living in London

INTRODUCTION

Hypertension (HTN) is identified as the most commonly diagnosed condition in the UK and its treatment the "most important single intervention" in the primary care setting.[1] Even though it is the most common diagnosis, national surveys demonstrate that it is substantially under diagnosed[2] and, poorly controlled.[3]

Despite the increased prevalence of hypertension (HTN) and subsequent morbidity and mortality among people of African descent in the United Kingdom (UK) as compared to other ethnic groups,[4-10] most of the research on HTN within this population is conducted among individuals that are already diagnosed with HTN. A key tenet to health education and the changing of health outcomes on a population level is the concept of prevention.

Many psychosocial theoretical models are used by health educators to change or explain the behaviors of individuals. The health belief model (HBM) has been used to explain and predict health behavior for over 5 decades,[11] and is one of the most widely used models.[12] Although the importance of the different HBM constructs varies within and between cultures and across health behaviors[12] studies support the validity of these constructs to predict a wide variety of behaviors especially preventative behaviors .[13]

Specific to disease prevention, the HBM is a "value-expectancy" theory: the assumption is that there is a desire to avoid an illness accompanied by the belief that a specific health behavior will prevent that illness.[13] According to HBM, if individuals perceive themselves to be susceptible to HTN, and that HTN is a serious disease, they

will adapt behaviors to prevent HTN. The likelihood of performing these behaviors decreases if they perceive there are barriers (tangible and psychological costs) to doing so. Conversely, if they perceive these behaviors to be beneficial to reducing risk, the likelihood of adaptation increases. The perceived self-efficacy to adapt the behaviors also affects their choice to change.[11]

Most of the literature on the health beliefs of Blacks concerning hypertension, and prevention in particular, comes from the US. Higginbottom[4] points out that while African Americans in the US and African Caribbeans in the UK have some commonalities, their cultural, traditional, and social patterns are not the same. Consequently, the findings in the US cannot necessarily be extrapolated to the UK population.

Peters, Aroian and Flack[14] found that African Americans correctly associated the use of salt to the development of HTN. There was, however, a consistent lack of association with obesity, lack of exercise, alcohol consumption and smoking with HTN. Higgenbottom[4] reported similar findings in UK Blacks. Another common belief that was expressed by both groups was that the stress of their lives was the primary cause of their HTN and that it was something that they just had to live with. Higgenbottom[4] also found that the lay explanations for HTN among the UK Blacks tended to normalize HTN: It was not very serious and that it was a normal part of aging.

The lifestyle recommendations of the SDA Church include most of the recommendations in current literature: abstinence from smoking and the use of alcohol, a vegetarian or near vegetarian diet, and an active lifestyle.[15,16] As such, SDA lifestyles are generally healthier than non-SDAs.[17] The study of SDA populations in the Netherlands,

Japan, Denmark, Norway, and the US each, to varying degrees, support the finding that a SDA lifestyle does positively impact the risk of disease, including HTN.[15,16] In our study the HBM was used to examine the beliefs, perceptions and behaviors of Black SDAs living in London and to provide information on the lifestyle practices relating to the prevention of HTN.

METHOD

This was a cross-sectional study of Black SDA Christians living in London. The study employed quantitative survey methodology and blood pressure (BP), height, weight, and waist circumference measurements. In order to recruit subjects, announcements were placed in bulletins and on the bulletin boards of the selected churches and followed up with an oral presentation to promote the study and invite participation. Using a convenience sampling technique, 352 participants from 17 predominantly Black churches across London, self-selected to be part of the study and volunteered to complete a questionnaire and have blood pressure and anthropometric measurements taken by qualified nurses.

The inclusion criteria for the participants were: (a) current members of the SDA church, (b) residents in any of the London boroughs, (c) both males and females between the ages of 25 and 79, and (d) those who self-described as Black. The exclusion criteria were: (a) the reported use of alcohol or tobacco (the numbers of individuals for whom these risk factors would be relevant were expected to be minimal in this SDA sample and, as such, were not examined in this study), and (b) having a diagnosis of HTN and currently taking medication to control BP.

Blood pressure was recorded using digital monitors and classified according to the British Hypertension Society (BHS). It was measured seated, once in each arm and then repeated in the arm with the highest reading. An average of the repeated measure in one arm was calculated.

Anthropometric measures were taken with participants in light clothing and without shoes. Weight was measured using an electronic scale and height was measured using a portable Seca Leicester height measure. Body mass index (BMI) was calculated as the body weight in kilograms by height in meters squared, and classified as >18.5 being underweight, 18.5–24.9 being normal, 25.0–29.9 being overweight and 30–39.9 being obese, and >40 being extremely obese. Waist circumference was measured and recorded in centimeters using a flexible measuring tape.

A structured questionnaire was developed for use in this study. The items in the first section focused on demographic questions such as age, gender, education, and yearly income. Education was categorized as "primary education school" vs. "secondary education and beyond" and used as the measure of socioeconomic status (SES) for the analyses.[18] Questions were formulated to assess the participants' knowledge and lay beliefs concerning HTN. Also included were questions on diet and exercise to evaluate participants' current practices related to HTN prevention.

A five-point Likert scale was used to assesss the HBM constructs. Most of the items for the HBM constructs were drawn from the instrument developed by Desmond et al.[20] or adapted from Champion's[21] HBM scale (a scale developed for breast self-examination frequency). The questionnaire was checked for clarity before it was used as the instrument for data collection. Internal reliability was assessed after data collection

and the Cronbach's alpha for the five scales were .59 for susceptibility, .72 for severity, .74 for benefits, .68 for barriers and .85 for self-efficacy. The number of missing values for items in the HBM scales were reduced by inserting the mean score of the items for each individual.

Based on the 10 year relative risk estimates (RRE) for cancers developed by researchers at Harvard Medical School, Harvard School of Public Health,[22] and the Siteman Cancer Center who expanded the risk estimates to included heart disease and stroke,[23] a 10-year RRE score for HTN was developed to assess the risk for the participants in this study.[24]

The Statistical Package for the Social Sciences (SPSS) version 14.0 was used for data entry and analysis. Frequencies, percentages and descriptive statistics were computed for all variables and the associations between levels of education and knowledge about HTN and levels of education and BP were examined. Correlations were run between RRE scores and SBP and DBP. Linear regressions were performed to determine if the perceptions of HTN described by the HBM variables independently predicted the RRE scores for HTN.

RESULTS

A total of 352 questionnaires were distributed. 27 (7.67%) were not returned, and of those that were returned 13 could not be used. Ultimately, the sample size used for running the analyses was 312. As shown in table 2 of the 312 respondents, 171 (55.0%) were born in the Caribbean, 32 (10.3%) in Africa and 108 (34.7%) in the UK. Two thirds (68.9%) were female and 31% were male. The mean age for all of the respondents was 44.37. When age was examined by place of birth, the means were significantly different

($p<0.001$) with the Africans (37.38) being the youngest and Caribbeans (49.24) being the eldest. The largest percentage for marital status was 43.2% for those who were married for the first time followed by 36.4% who were single/never married. Only 4.2% did not complete secondary school, while a little over one third (34.7%) completed graduate degrees (see Table 1). (The findings for the HTN risk factors in this study are available elsewhere[24]).

(Insert Table 1 here)

On average, the respondents scored 73.0% on the knowledge scale. There was no significant association between knowledge about HTN and RRE scores, but there were significant inverse associations between education and SBP ($r = -.28$, $p < 0.01$) and DBP ($r = -.18$, $p < 0.05$).

The mean 10-year RRE score for HTN was 2.7 (SD 3.78) and ranged from -6 to 12 with a mode of 5. Over two-thirds of the respondents (68.6%) had positive scores and were at increased risk for developing HTN. The association between the RRE score and the levels of systolic blood pressure (SBP) was not significant ($r = .013$), but the association between the RRE score and diastolic blood pressure (DBP) approached significance ($r = .122$, $p = 0.059$).

The 5 point Likert scale for the HBM variables was labeled from strongly agree to strongly disagree. Overall perceptions of susceptibility to HTN was neutral (3.41, SD = .73) as was the response to barriers that hinder the adaptation of behaviors which decrease the risk of HTN (3.67, SD = .66). In general the group did not perceive that developing HTN had severe consequences (2.22, SD =.55). Severity was the only HBM

variable that had significant associations with either SBP or DBP. As perceptions of the severity of HTN increased, the SBP and DBP levels decreased ($p < 0.01$, r = -.139 and -.118 respectively). Most respondents thought performing behaviors to decrease the risk of HTN was beneficial (4.18, SD = .84), and felt they had the self-efficacy to change these behaviors (4.01, SD = .72).

Prior to running the multiple regressions, the correlation between household income and level of education was examined. These two variables were positively associated (r = .284, p = 0.01). Due to the fact that 21.2 % of the participants did not respond to the household income item, level of education was used as the measure for SES in the regression equations.

Regressions were run to determine which variables were independently associated with SBP, DBP and BP classification according to the BHS (<139/89 = "normal"). The demographic variables of age (p = .003), gender (p = .000002), and family history of HTN (p = .006) were independently associated with SBP (R^2 = .188). The change in R^2 was only .007 when the RRE score was added to the model (R^2 = .195) (see Table 2).

(Insert Table 2 here)

When controlled for age, gender, family history of HTN, SES and country of birth, the RRE score was the only variable that was significantly independently associated with DBP (p = .022). Although the overall model was not significant for this regression (p = .080), the addition of the RRE score variable changed the R^2 by .027, from .038 to .065 (see Table 3).

(Insert Table 3 here)

None of the HBM variables or knowledge scores were statistically significant independent predictors of BP levels. When the RRE score was the dependent variable, however, along with the demographic variables of age, gender and family history of HTN, self-efficacy was the only HBM variable that was a significant independent predictor (p =.008) (see Table 4). Between the first model, which only included the demographic variables, and the second model which also included all of the HBM variables and knowledge scores the R^2 change was .057, from .133 to .189.

(Insert Table 4 here)

DISCUSSION

Similar to the findings of Oliveria, Chen, McCarthy, Davis and Hill,[25] the respondents in this study were knowledgeable about HTN. In Oliveria et al.'s[25] survey 96% of the respondents thought that people could do things to lower their BP and the same percentage also thought that lowering BP would improve health. In our study, 96.6% also believed that people can do things to control their blood pressure while 91.2% knew that even lowering BP a little improves health. Less than 50% in this study, however, were able to correctly identify the numbers for SBP and DBP and 33% felt that individuals could tell if their blood pressure was high. Though the overall performance on the knowledge questions was good, there remained a lack of knowledge concerning the specifics of SBP and DBP which would allow for effective self-monitoring of BP.

The prevalence HTN among people of African descent, particularly the Caribbeans, in the UK is higher than the general population (38.4% and 31.7% for Caribbean men and women vs 31.7% and 29.5% for men and women in the general population) [26] and 25.3% of the study group was hypertensive without knowing it.

Despite these findings, the general feeling of the respondents, concerning susceptibility to developing HTN, was that Blacks were neither more or less susceptible. This perception could be the reason that though the participants knew that lowering BP would improve health, many did not know that they were hypertensive and could improve their own health by decreasing their BP. This disconnection between knowledge and personal risk is also described by Rieder.[27]

While over 90% correctly associated the effects of weight, stress, salt consumption, and exercise on BP, and there was general agreement that controlling BP was beneficial, there were also many perceived barriers to preventing HTN. Salt consumption, finding a place and time to exercise, and having to worry about controlling their weight were the barriers that had the highest levels of agreement as to their preventing the performance of behaviors that would improve these same risk factors. Similarly, in a study by Desmond et al.[20] the barriers that were most significant for Blacks were those of liking salty food and of not being able to eat the food you like. The fact that the respondents in Desmond et al's study were teenagers, who had similar barriers to that of the older respondents in this study, suggests that the perceptions are formed early and persists through adulthood.

In general, there was a perception that HTN was not a severe disease which was incongruous with the relatively high knowledge scores about the effects of HTN: 94% correctly identified that high BP could lead to strokes and heart problems, and 65% knew that HTN makes the kidneys work harder, but perceived severity scores were well below the scale midpoint. These findings are in contrast to those of Brown and Segal,[28] whose subjects felt that HTN was a serious disease. This difference could be due to the fact that

Brown and Segal's[28] subjects were all diagnosed with HTN, while none of those in our study were either diagnosed with, or being treated for HTN.

Respondents expressed confidence in their ability to perform all five of the behaviors that would decrease HTN risk: getting their BP checked regularly; limiting their salt intake; eating five or more servings of fruit and vegetables daily; exercising at least 30 minutes four or more days of the week and controlling their weight. As self-efficacy increased, the RRE score reflecting the lifestyle risk factors for developing HTN decreased. This association between self-efficacy and behavior has been described by other researchers. [29-31], and was confirmed in our study.

CONCLUSION

Despite having knowledge about the causes and consequences of HTN and knowing that people can do things to lower their BP, the respondents in our study had not adopted behaviors to prevent HTN. 25.3% were hypertensive and over two-thirds (68.6) were at increased risk of developing HTN. The general feeling of our study group, however, was that Blacks were neither more nor less susceptible than other ethnic groups to developing HTN.

Although many of the items used in the survey instrument were adapted from previously validated scales, one limitation of this study is that no pilot study was done prior to data collection. This could have increased the validity and reliability of the instrument used. Additionally, having a convenience sample of individuals who self-selected into the study increased the probability that the participants represented individuals who were more concerned about their health, in general, than other Black SDAs who attended church. Although random selection would have avoided this effect

and increased the generalizability of the findings it would have been difficult to achieve as records of church membership are frequently out of date and time and funding for this study were limited.

Given the SDA focus on healthy living and the frequency of health seminars at local churches, it can be assumed that some of the respondents in this study were previously exposed to information about HTN. That education about diseases is only the beginning of the effective intervention of health educators is supported by the findings of Haase, Steptoe, Sallis, and Wardle,[32] who, like this study, found that knowledge was not associated with behavior. For the emphasis on healthy living by the SDA church to translate into performance of preventative behaviors among the members more attention needs to be given to behavior change.

The increased prevalence of HTN among Blacks has been well documented.[4-10, 32-35] The perception of the participants in our study, however, is contrary to what is described in the literature and highlights the need for educators to make sure that while their target group understands the severity of a given disease, they also need to have a correct understanding of their susceptibility to that disease.

Finally, as health educators and other professionals design prevention and intervention programs for HTN, they need to take into account the emotional effects of having many positive risk factors. Strecher et al.[36] describe a process where their subjects, who had multiple risk behaviors, were encouraged to select one risk factor to focus on for change, and subsequently they were encouraged to select another behavior. For our study group, the high perception of self-efficacy to perform behaviors that will decrease HTN risk could be effectively harnessed by encouraging individuals to tackle

one behavior at a time or making small changes in several of the behaviors in order to prevent HTN. The sequential approach described by Strecher et al.[36] would also encourage ongoing evaluations of individuals' health, rather than a one-time assessment during an intervention program.

TABLE 5.1. *Demographics for Sample of Seventh-day Adventists Living in London, by Place of Birth*

	Total* 312	Caribbean 171 (55%)	African 32 (10.3%)	UK born 108 (34.7%)	*p*-value
Gender (%)					
Male	94 (31.1)	53 (31.7)	11 (37.9)	30 (28.6)	
Female	208 (68.9)	114 (68.3)	18 (62.1)	75 (71.4)	
Mean Age (SD)	44.4 (12.7)	49.2 (14.1)	37.4 (10.8)	39.0 (6.4)	<.0001
Marital Status (%)					<.0001
Single/Never married (%)	112 (36.4)	43 (25.6)	9 (29.0)	59 (54.6)	
First time married	133 (43.2)	80 (47.6)	19 (61.3)	34 (31.5)	
Remarried	14 (4.5)	10 (6.0)	0 (.0)	4 (3.70	
Divorced	28 (9.1)	21 (12.5)	1 (3.2)	6 (5.6)	
Separated	12 (3.9)	6 (3.6)	1 (3.2)	5 (4.6)	
Widowed	9 (2.9)	8 (4.8)	1 (3.2)	0 (.0)	
Annual household income (%)					.003
Less than £10, 000	41 (16.7)	25 (19.7)	4 (16.0)	11 (11.8)	
£10 - £20, 000	58 (23.6)	35 (27.6)	8 (32.0)	15 (16.1)	
£20 - £30, 000	55 (22.4)	30 (23.6)	3 (12.0)	22 (23.7)	
£30 - £40, 000	37 (15.0)	16 (12.6)	3 (12.0)	18 (19.4)	
£40 - £50, 000	17 (6.9)	9 (7.1)	3 (12.0)	5 (5.4)	
£50 - £75, 000	27 (11.0)	10 (7.9)	1 (4.0)	16 (17.2)	
£75 - £100, 000	5 (2.0)	0 (.0)	3 (12.0)	2 (2.2)	
More than £100, 000	6 (2.4)	2 (1.6)	0 (.0)	4 (4.3)	
Highest level of education (%)					<.0001
Primary school	12 (4.2)	10 (6.6)	0 (.0)	2 (1.9)	
Secondary school	35 (12.2)	30 (19.7)	2 (6.9)	3 (2.8)	
Trade/vocational school	59 (20.5)	35 (23.0)	4 (13.8)	19 (17.9)	
Undergraduate polytechnic or university	82 (28.5)	39 (25.7)	7 (24.1)	36 (34.0)	
Graduate degree	100 (34.7)	38 (25.0)	16 (55.2) *	46 (43.3)	

* One respondent did not indicate country of birth, 16 respondents did not indicate gender, 4 did not indicate marital status, 66 did not report household income, and 24 did not indicate level of education.

Table 5.2. *Results for Regressions for the Dependent Variable of Systolic Blood Pressure*

	B	*SE B*	*β*	*p* value	95% CI
Model 1					
Constant	117.02	6.58		.000	104.04, 130.00
Age	.31	.10	.22	.003	.11, .50
Gender (ref. Male)	-10.66	2.25	-.32	.000004	-15.09, -6.23
Family history of HTN	7.20	2.29	.21	.002	2.68, 11.72
Education*	-1.80	3.48	-.04	.605	-8.67, 5.06
African (ref. Caribbean)	3.26	3.69	.06	.377	-4.01, 10.53
UK born (ref. Caribbean)	-.99	2.48	-.03	.691	-5.88, 3.90
Model 2					
Constant	116.52	6.58		.000	103.54, 129.52
Age	.32	.10	.23	.002	.12, .52
Gender (ref. Male)	-11.19	2.28	-.33	.000002	-15.68, -6.69
Family history of HTN	6.50	2.35	.19	.006	1.85, 11.14
Education*	-2.26	3.49	-.05	.518	-9.15, 4.63
African (ref. Caribbean)	3.07	3.68	.06	.405	-4.19, 10.33
UK born (ref. Caribbean)	-.56	1.60	-.03	.726	-5.66, 4.13
RRE score	.38	.30	.09	.202	-20, .96

* Education used as proxy for SES

NOTE $R^2 = .188$ for Model 1; $R^2 = .195$ for Model 2; $\Delta R^2 = .007$ for Model 2

Table 5.3. *Results for Regressions for the Dependent Variable of Diastolic Blood Pressure*

	B	*SE B*	*β*	*p* value	95 % CI
Model 1					
Constant	71.22	4.27		.000	62.80, 79.65
Age	.09	.07	.11	.156	-.04, .22
Gender (ref. Male)	-1.67	1.46	-.08	.253	-.4.5, 1.21
Family history of HTN	2.57	1.49	.13	.086	-.37, 5.51
Education*	.33	2.26	.01	.884	-4.13, 4.79
African (ref. Caribbean)	1.65	2.39	.05	.493	-3.08, 6.36
UK born (ref. Caribbean)	-.81	1.61	-.04	.614	-3.99, 2.36
Model 2					
Constant	70.65	4.23		.000	62.30 – 79.00
Age	.11	0.65	.13	.094	-.02 – 24
Gender (ref. Male)	-2.28	1.47	-.11	.121	-5.17 – .61
Family history of HTN	1.75	1.51	.09	.249	-1.24 – 4.74
Education*	-.20	2.24	-.01	.929	-4.63 – 4.23
African (ref. Caribbean)	1.42	2.37	.05	.549	-3.25 – 6.09
UK born (ref. Caribbean)	-.56	1.60	-.03	.726	-3.71 – 2.59
RRE score	.44	.19	.18	.022	.07 – .81

* Education used as proxy for SES

NOTE $R^2 = .038$ for Model 1; $R^2 = .065$ for Model; $\Delta R^2 = .027$

Table 5.4. *Results for Regressions for the Dependent Variable of Relative Risk Estimate Score for Hypertension*

	B	*SE B*	*β*	R^2	*p* value	95 % CI
Model 1						
Constant	1.93	1.63			.239	-1.29, 5.15
Age	-.05	.03	-.15		.054	-.10, .001
Gender (ref. Male)	1.42	.56	.18		.012	.32, 2.52
Family history of HTN	1.85	.57	.23		.001	.73, 2.97
Education*	1.25	.85	.11		.146	-.44, 2.93
African (ref. Caribbean)	.62	.92	.05		.506	-1.21, 2.44
UK born (ref. Caribbean)	-.75	.62	-.10		.225	-1.97, .47
Model 2				.189		
Constant	11.77	3.96			.003	3.96, 19.58
Age	-.06	.03	-.19		.022	-.11, -.01
Gender (ref. Male)	1.48	0.56	.19		.009	.38, 2.59
Family history of HTN	2.08	0.57	.26		.000	.95, 3.20
Education*	.06	0.85	.09		.216	-.625, 2.75
African (ref. Caribbean)	.76	.93	.06		.416	-1.08, 2.61
UK born (ref. Caribbean)	-1.14	.63	-.15		.073	2.38, .11
Susceptibility score	-.14	.38	-.27		.706	-.89, .61
Severity score	-.24	.55	-.04		.657	-1.33, .84
Benefit score	-.16	.44	-.03		.709	-1.03, .70
Barrier score	-.16	.42	-.03		.709	-1.00, .68
Self efficacy	-1.43	.54	-.21		.008	-2.49, -.37
Knowledge score	-0.14	.02	-.08		.424	-.05, .021

*Education used as proxy for SES

NOTE $R^2 = .133$ for Model 1; $R^2 = .189$ for Model 2; $\Delta R^2 = .057$

REFERENCES

1. Mead, M. British Hypertension Society guidelines 2004-BHS IV. Ten key comments for primary care. *Br J Cardiol* [serial online] 2004; 11: 246-250. Available from: http://www.bjcardio.co.uk/pdf/950/Vol11_Num3_May-June_2004_p246-250.pdf. Accessed November 16, 2004.
2. Williams B, Poulter NR, Brown MJ et al. British Hypertension Society guidelines for hypertension management 2004 (BSH-IV): Summary. *BMJ* 2004; 328: 634-640.
3. Ross S, Walker A, MacLeod MJ. Patient compliance in hypertension: role of illness perceptions and treatment beliefs. *J Hum Hypertens*, 2007; 18: 607-613.
4. Higginbottom, GM. 'Pressure of life': Ethnicity as a mediation factor in mid-life and older peoples' experience of high blood pressure. *Sociol Health Illn* 2006; 28: 583-610.
5. Khan JM, Beevers DG. Management of hypertension in ethnic minorities. *Heart* 2005; 91: 1105-1109.
6. Swift PA, Markandu ND, Sagnella GA, He FJ, MacGregor, GA. Modest salt reduction reduces blood pressure and urine protein excretion in Black hypertensives: A randomized control trial. *Hypertens* 2005; 6: 308-312.
7. Hajat C, Tilling K, Stewart JA, Lemic-Stojcevic N, Wolfe CD. Ethnic differences in risk factors for ischemic stroke: A European case-control study. *Stroke* 2004; 35: 1562-1567.

8. Agyemang C, Bhopal R. Is the blood pressure of people from African origin adults in the UK higher or lower than that in European origin white people? A review of cross-sectional data. *J Hum Hypertens* 2003; 17: 523-534.

9. Lane DA, Lip GYH. Ethic differences in hypertension and blood pressure control in the UK. *QJM* 2001; 94: 391-396.

10. Lemic-Stojcevic N, Dundas R, Jenkins S, Rudd, A, Wolfe C. Preventable risk factors for coronary heart disease and stroke amongst ethnic groups in London. *Ethn & Health* 2001; 6: 87-94.

11. Janz NK, Champion VL, Strecher VJ. The health belief model. In: Glanz K, Rimer BK, Lewis FM, eds. *Health behavior and health education: Theory, research, and practice.* 3rd ed. San Francisco, CA: Jossey-Bass; 2002: 485-509.

12. Nahcivan NO, Secginli S. Health beliefs related to breast self-examination in a sample of Turkish women. *Oncol Nurs Forum* 2007; 34: 425-432.

13. Shiloh S, Vinter M, Barak A. Correlates of health screening utilization: The roles of health beliefs and self-regulation motivation. *Pscychol Health* 1997; 12: 301-317.

14. Peters RM, Aroian KJ, Flack JM. African American culture and hypertension prevention. *West J Nurs Res* 2006; 28: 831-854.

15. Fraser GE. Diet and primordial prevention in Seventh-day Adventists. *Prev Med* 1999; 29(6 Pt 2): 18-23.

16. Fønnebø V. The healthy Seventh-day Adventist lifestyle: What is the Norwegian experience? *Am J Clin Nutr* 1994; 59(5 Suppl): 1124-29.

17. Brathwaite N, Fraser H, Modeste N, Bromees H & King R. Obesity, diabetes, hypertension and vegetarian status among Seventh-day Adventists in Barbados: Preliminary results. *Ethn Dis* 2003; 13: 34-39.

18. Dalstra JAA, Kunst AE, Borrell C et al. Socioeconomic differences in the prevalence of common chronic diseases: An overview of eight European countries. *Int J Epidemiol* 2005; 34: 316-326.

19. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983; 24: 385-396.

20. Desmond S, Price J, Roberts S, Pituch M, Smith D. Perception of hypertension in Black and White adolescents. *J Health Beh Education Promotion* 1992; 16: 3-10.

21. Champion VL. Instrument development for health belief model constructs. *ANS Adv Nurs Sci* 1984; 6: 73-85.

22. Colditz GA, Atwood KA, Emmons K, et al. Harvard report on cancer prevention. Volume 4: Harvard Cancer Risk Index. *Cancer Causes Control* 2000; 11: 477-88.

23. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine. *Your Disease Risk: Relative Risks.* Available at: http://www.yourdiseaserisk.wustl.edu/pdf_files/rr_ydr.pdf. Accessed August 14, 2007.

24. Newell M, Modeste N, Hopp Marshak H, Wilson C. *Health beliefs and the prevention of hypertension a Black population living in London*. Unpublished manunscript 2008

25. Oliveria SA, Chen RS, McCarthy BD, Davis CC, Hill MN. Hypertension knowledge, awareness, and attitudes in a hypertensive population. *J G Intern Med* 2004; 20: 219-225.

26. *Health survey for England 2004: Volume 1: The health of minority ethnic groups.* National Health Services, National Centre for Social Research, 2005 [cited 2008 Jan 28]; Available from URL: http://www.ic.nhs.uk/webfiles/publications/healthsurvey2004ethnicfull/HealthSurveyforEnglandVol1_210406_PDF.pdf.

27. Rieder A. Getting into a healthy `CV success zone': effective strategies to prevent CVD. *Eur Heart J Supplements* 2007; 9: B4-B7.

28. Brown CM, Segal R. The effects of health and treatment perceptions on the use of prescribed medication and home remedies among African American and White American hyptertensives. *Soc Sci Med* 1996; 43: 903-917.

29. McClenahan C, Shevlin M, Adamson G, Bennett C, O'Neill B.. Testicular self-examination: A test of the health belief model and the theory of planned behaviour. *Health Educ Res* 2007; 22: 272-284.

30. Jackson L, Leclerc J, Erskine Y, Linden W. Getting the most out of cardiac rehabilitation: a review of referral and adherence predictors. *Heart*. 2005;91:10-4.

31. Sluijs EMF, Van Poppel MNM, Twisk JWR, Brug J, Van Mechelen W. The positive effect on determinants of physical activity of a tailored, general practice-based physical activity intervention. *Health Educ Res* 2005; 20: 345-356.

32. Haase A, Steptoe A, Sallis JF, Wardle J. Leisure-time physical activity in university students from 23 countries: Associations with health beliefs, risk awareness, and national economic development. *Prev Med* 2004; 39: 182-190.

33. Covelli MM, Prevalence of behavioral and physiological risk factors of hypertension in African American adolescents. *Pediatr Nurs* 2007; 33(4): 323-324, 327-332.

34. Jones DW., Dietary sodium and blood pressure. *Hypertens* 2004; 43: 932-935.

35. Haas, M. Hypertension, race, and glomerulli: More than simply a numbers game [commentary]. *Kidney International,* 2006; 69: 640-642.

36. Strecher V, Wang C, Derry H, Wildenhaus K, Johnson C. Tailored interventions for multiple risk behaviors. *Health Educ Res* 2002; 17: 619-626.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

A. Summary of Findings

Among people of African descent, in both the US and the UK, the prevalence of HTN is much higher than other ethnic groups (CDC, 2005; Higginbottom, 2006; National Health Service, 2005). Much research has examined HTN among Blacks in general, little has been written about the prevention of HTN among Blacks (a high risk population in the UK). While Seventh-day Adventists (SDAs) have been studied for many years in the US, there is very little, if any, research on SDAs in the UK. This study was important in the development of baseline information about the lifestyle practices of Black SDAs in the UK, and to ascertain if the general tenets of a healthy lifestyle, particularly as they relate to prevention, advocated by the SDA church are embraced by Blacks members in London.

This study examined the main controllable risk factors for HTN of BMI, waist circumference (WC), levels of physical activity (PA), stress, and diet. Three aspects of diet were analyzed: fruit and vegetable intake, sodium consumption and the differences between omnivorous, vegetarian and vegan diets. The numbers of individuals for whom the risk factors of smoking and alcohol consumption would be relevant were not expected to be significant and, as such, were not examined.

A relative risk estimate (RRE) scoring system was used to score the presence or absence of the HTN risk factors. The multiple linear regressions that were conducted revealed that the demographic variables were significant predictors of systolic blood

pressure (SBP) and RRE score for the behavioral variables was a significant predictor of diastolic blood pressure (DBP). This method, unfortunately, did not give any insight into which of the specific variables actually increased the risk of HTN. While correlations still give no information about the variance of each risk factor, they do provide valuable information about the risk factors in this population. Table 1 shows the correlations of BMI and WC with SBP, DBP and the class of HTN, as classified by the British Hypertension Society (BHS).

Table 6.1. *Correlations of the Risk Factor for Hypertension of Black Seventh-day Adventists Living in London*

	SBP	DBP	HTN
BMI	.203*	.276*	.240*
WC	.326*	.329*	.313*

*Correlation significant at the 0.01 level

Rennie and Jebb (2005) reported that while BMI has been on the increase in the UK, the increase in waist circumference (WC) has been greater. Additionally, Gus et al. (2004) stated that as a measure of HTN risk, waist circumference (WC) is superior to BMI. In this study WC had a stronger association with BP levels and class of HTN than BMI (see Table 1).

Seventeen items were used to measure knowledge. Similar to the findings of Oliveria, Chen, McCarthy, Davis and Hill (2004), the respondents in this survey were knowledgeable about HTN. Seven individuals got 100% of the questions correct but, on average, respondents scored 73% on the knowledge scale. Over 90% of participants knew that they could do things to reduce their BP and that small reductions in BP improves health (see Table 2). Although the participants in this study had high levels of knowledge about HTN, this knowledge did not translate into behavior practices,

demonstrating an apparent disconnection between knowledge and personal risk in these subjects.

Table 6.2. *Scores for the Knowledge Items Concerning Hypertension of Black Seventh-day Adventists Living in London (%)*

Question	Response	
	Correct n (%)	"Don't know" n (%)
BP is considered normal when it is:…	136 (49.0)	94 (33.8)
Staying at normal weight helps control blood pressure.	264 (92.0)	13 (4.5)
Reducing stress helps control blood pressure.	293 (98.7)	2 (0.7)
Reducing salt helps control blood pressure.	290 (98.0)	5 (1.7)
Reducing alcohol helps control blood pressure.	251 (86.0)	31 (10.6)
Exercising helps control blood pressure.	279 (94.6)	11 (3.7)
Not smoking helps control blood pressure.	252 (85.1)	37 (12.5)
High blood pressure make the kidneys work harder.	189 (65.2)	81 (27.9)
High blood pressure can cause heart problems.	280 (94.6)	8 (2.7)
High blood pressure can cause strokes.	275 (94.2)	14 (4.8)
One can usually tell if ones blood pressure is high.	94 (33.1)	61 (21.5)
People can do things to control their blood pressure.	285 (96.6)	8 (2.7)
If blood pressure is high, lowering it even a little bit improves health.	268 (91.2)	15 (5.1)
It is best to measure your blood pressure:…	162 (54.5)	57 (19.2)
What does the top of the two numbers reported for BP mean?	141 (49.0)	132 (45.8)
What does the bottom number reported for BP mean?	137 (47.4)	137 (47.4)
Which measure(s) is (are) more important?	53 (18.2)	113 (38.8)

A possible explanation for the absence, in general, of preventive behaviors could be a result of conflict between individuals' motives to adapt behaviors to prevent HTN and being overwhelmed by all of the behaviors that need to be changed (Shiloh, Vinter &

Barak, 1997). Though the participants scored high on their perceptions of self-efficacy to adapt several preventative behaviors, 4.01 on a 5- point Likert scale (SD = .72), BMI and WC were the only risk factors where they were at decreased risk for HTN when compared to the national data for minorities.

Participants were to respond to one of the items on the survey indicating their beliefs concerning the danger of HTN: 226 (87.5%) felt that it was extremely dangerous while 35 (11.5%) felt that it was somewhat dangerous. Only two (.6%) felt that it was not dangerous at all and a single individual (.3%) said that they didn't know what the danger of HTN was.

Despite the fact that 94% knew that HTN could lead to strokes and heart problems, and that 87.5% said that it was extremely dangerous, the score for the perceptions towards the severity of the disease was 2.22 (disagree) on a 5-point Likert scale (SD. = .55). The health belief model (HBM) which was used in this study is cognitive in nature and, according to Gooding, Organista, Burack and Biesecker (2006), it incorrectly assumes that individuals make logical decisions whereby their behavior is guided by their beliefs. This could be the cause of the incongruence between the knowledge and beliefs concerning HTN and the perceived severity of it.

The feelings of the vast majority of the respondents (87.5%) were in agreement with the attitude of medical practitioners and health educators regarding the danger of HTN, yet, as demonstrated by the examination of their risk factors and current behavior, they were doing little to prevent the development of this serious disease. This could be explained by the fact that there is inadequate awareness of their susceptibility to HTN.

In this study, like others (McClenahan, Shevlin, Adamson, Bennett and O'Neill, 2007; King, Humen, Smith, Phan and Teo, 2001), the HBM variable of self-efficacy was significantly associated with behavior. When the RRE score was the dependent variable, self-efficacy, of all the HBM variables, was the only significant independent predictor.

B. Implications of Study for Health Education Practice.

The aim of health education is to effect change in the health profile of the population by targeting high risk groups within the population. While the rates for untreated HTN for the general population between 2003 to 2006 decreased from 20% to 18% in men and 16% to 13% in women (National Health Service, 2006), it still remains that Blacks are more likely than other ethic groups to have their HTN detected in the community (Lip et al., 2007). It is imperative then, that the programs in the community are effective in decreasing the burden of HTN within the Black population.

Health educators need to develop programs that will target the younger Black population helping them to gain a true understanding of their risk for developing HTN along with the severity of its consequences. Early intervention will provide the opportunity to motivate them to adopt lifestyle practices that will prevent HTN. Young Blacks could be encouraged as they understand that while their susceptibility to developing HTN is high, making small changes in diet and exercise can contribute to a decrease in the incidence of HTN.

Due to the multifactorial nature of the causes for HTN, as suggested by the findings of Strecher and colleagues (2002), it is easy for individuals to be overwhelmed by the number of behaviors that impact their risk. Care must be taken by educators to emphasize that all behaviors do not need to be changed at the same time, and to utilize

techniques that will harness the self-efficacy of individuals to make changes that will impact their HTN risk.

C. Recommendations

There is a great need for additional studies among populations at risk for developing HTN. These studies should continue to examine the attitudes and perceptions towards the prevention of HTN, particularly among young Blacks in the UK. This study was limited in that only 10% were African and consequently, the findings do not adequately reflect their beliefs and perceptions. More Africans need to be included in future studies. It would also be useful for future studies to also include SDAs from other large cities around England or the UK. This would also serve to provide a better comparison to the general Black population.

Further study to examine the actual variance for each of the risk factors measured in this study will be useful for the development of more targeted interventions: An approach that could limit the chances of being overwhelmed, and as discussed earlier, aid in the selection of the behaviors that will have the biggest impact in the prevention of HTN.

Very few of the respondents who were born in the UK indicated that their parents were also born there. Consequently, there are still very few generations of Blacks living in the UK. This presents an opportunity for prospective studies of Blacks born in the UK, to examine any similarities or differences of the onset and types of chronic illnesses compared to those of their immigrant parents.

D. Conclusion

This study has provided baseline characteristics, in terms of the knowledge beliefs, behaviors and perceptions of SDA Blacks living in London. While the findings may not be generalizable to the total Black SDA population or the general Black population, some results may provide a useful stepping stone towards developing an understanding of what is needed to impact the burden of HTN among Blacks in the UK.

REFERENCES

Agyemang, C., & Bhopal, R. (2003). Is the blood pressure of people from African origin adults in the UK higher or lower than that in European origin white people? A review of cross-sectional data. *Journal of Human Hypertension, 17,* 523-534.

Appleby, P. N., Davey, K. D., & Key, T. J. (2002). Hypertension and blood pressure among meat eaters, fish eaters, vegetarians and vegans in EPIC-Oxford. *Public Health Nutrition, 5,* 645-654.

Bedi, M., Varshey, V. P., & Babbar, R. (2000). Role of cardiovascular reactivity to mental stress in predicting future hypertension. *Clinical and Experimental Hypertension, 22,* 1-22.

Beilin, L. J. (2004). Update on lifestyle and hypertension control. *Clinical and Experimental Hypertension, 26,* 739-746.

Bennett, G. G., Merritt, M. M., Sollers, J. J., Edwards, C. L., Whitfield, K. E., & Brandon, D. T. (2004). Stress coping, and health outcomes among African American: A review of the John Henryism hypothesis. *Psychology and Health, 19,* 369-383.

Berkow, S. E., & Bernard, N. D. (2005). Blood pressure regulation and vegetarian diets. *Nutrition Reviews, 63,* 1-8.

Bernaards, C. M., Twisk, J. W., Snel, J., van Mechelen, W., & Kemper, H. C. (2005). In a prospective study in young people, associations between changes in smoking behavior and risk factors for cardiovascular disease were complex. *Journal of Clinical Epidemiology, 58*, 1165-1171.

Bierhaus, A., Humpert, P. M., & Nawroth, P. P. (2004). NF-κB as a molecular link between psychosocial stress and organ dysfunction. *Pediatirc Nephrology, 19*, 1189-1191.

Bloomfield, R., Young, L.D., & Graves J. (1993). Racial differences in perceptions concerning hypertension and its consequences [Abstract]. *Southern Medical Journal, 86,* 767-770.

Bolad, I., & Delafontaine, P. (2005). Endothelial dysfunction: Its role in hypertensive coronary disease. *Current Opinion in Cardiology, 20*, 270-274.

Brathwaite, N., Fraser, H. S., Modeste, N., Broome, H., & King, R. (2003). Obesity, diabetes, hypertension, and vegetarian status among Seventh-day Adventists in Barbados: Preliminary results. *Ethnicity & Disease, 13,* 34-39.

British Nutrition Foundation. (2003). *Healthy Eating: A Whole Diet Approach* [Brochure]. London: Author. Retrieved June 8, 2006, from http://www.nutrition.org.uk/upload/BNF%20Health%20Eating(5).pdf

Brookes, L. (2005). Hypertension highlights: Significant new definitions, publication, risks, benefits—and gene therapy? *Medscape Cardiology, 9(2)*. Retrieved March 10, 2006, from http://www.medscape.com/viewarticle/514644

Brown, C. M., & Segal, R. (1996). Ethnic differences in temporal orientation and its implications for hypertension management. *Journal of Health and Social Behavior, 37*, 350-361.

Brown, C. M., & Segal, R. (1996). The effects of health and treatment perceptions on the use of prescribed medication and home remedies among African American and White American hypertensives. *Social Science and Medecine, 43,* 903-917.

Burt, V. L., Cutler, J. A., Higgins, M., Horan, M. J., Labarthe, D., Whelton, P. et al. (1995). Trends in the prevalence, awareness, treatment, and control of hypertension in the adult US population. Data from the health examination surveys, 1960 to 1991. *Hypertension, 26,* 60-69.

Campbell, N. R. C., Burgess, E., Taylor, G., Wilson, E., Cleroux, J., Fodor, G. et al. (1999). Lifestyle changes to prevent and control hypertension: Do they work?: A summary of the Canadian consensus conference. *Canadian Medical Association Journal, 160,* 1341-13443.

Centers for Disease Control and Prevention. (1997). *Eliminate Disparities in Cardiovascular Disease.* National Center for Health Statistics. Retrieved July 26, 2005, from http://www.cdc.gov/omh/AMH/factsheets/cardio.htm

Centers for Disease Control and Prevention. (2005). Racial/ethnic disparities in prevalence, treatment, and control of hypertension—United States, 1999-2002. *MMWR, 54*, 7-9.

Champion, V. L. (1984). Instrument development for health belief model constructs. *Advances in Nursing Science, 6*, 73-85.

Cohen, S., Kamarck, T., Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior. 24,* 385-396.

Colditz, G. A., Atwood, K. A, Emmons, K., Monson, R. R., Willet, W. C., Trichopoulos, D. et al. (2000). Harvard report on cancer prevention volume 4: Harvard cancer risk index. *Cancer Causes and Control, 11,* 477-488.

Colhoun, H. M., Hemingway, H., & Poulter, N. R. (1998). Socio-economic status and blood pressure: An overview analysis. *Journal of Human Hypertension, 12,* 91-110.

Connell, P., McKevitt, C., & Wolfe, C. (2005). Strategies to manage hypertension: A qualitative study with black Caribbean patients. *The British Journal of General Practice,* 55, 537-361.

Cooper R., Rotimi, C., Ataman, S., McGee, D., Osotimehin, B., Kadiri S., et al. (1997). Hypertension prevalence in seven populations of African origin. *American Journal Public Health, 87*, 160-168.

Cooper, R & Rotimi, C. (1997). Hypertension in Blacks. *American Journal of Hypertension, 10,* 804-812.

Cooper, R. S. & Zhu, X. (2001). Racial differences and the genetics of hypertension. *Current Hypertension Reports, 3,* 19-24.

Cooper, S. C., Wolf-Maier, K., Luke, A., Adeyemo, A., Banegas, J. R., Forrester, T., et al. (2005). An international comparative study of blood pressure in populations of European vs. African decent. *BMC Medicine.* Retrieved July 18, 2005, from http://www.pubmedcentral.gov/picrender.fcgi?artid=545060&blobtype=pdf

Covelli, M. M. (2007). Prevalence of behavioral and physiological risk factors of hypertension in African American adolescents. *Journal of Pediatric Nursing. 33*, 323-332.

Cruickshank, J. K., Mbanya, J. C., Wilks, R., Balkau, B., McFarlane-Anderson, N., & Forrester, T. (2001). Sick genes, sick individuals or sick populations with chronic disease? The emergence of diabetes and high blood pressure in African–origin populations. *International Journal of Epidemiology, 30*, 111-117.

Dalstra, J. A. A., Kunst A. E., Borrell, C, Breeze, E., Cambois, E., Costa, E. et al. (2005). Socioeconomic differences in the prevalence of common chronic diseases: An overview of eight European countries. *International Journal of Epidemiology, 34,* 316-326.

Daniels, P. R., Kardia, S. L., Hanis, C. L., Brown, C. A., Hutchinson, R., Boerwinkle, E., et al. (2004). Familial aggregation of hypertension treatment and control in the Genetic Epidemiology Network and Arteriopathy (GENOA) study. *American Journal of Medicine, 116*, 678-681.

Department of Health. (2006). *Health survey for England.* Retrieved June 22, 2006, from http://www.dh.gov.uk/PublicationsAndStatistics/PublishedSurvey/HealthSurveyForEngland/fs/en

Department of Health.(1999). *Saving lives: Our healthier nation.* The Stationary Office.

Desmond, S., Price, J., Roberts, S., Pituch, M., & Smith, D. (1992). Perception of hypertension in Black and White adolescents. *The Journal of Health Behavior, Education & Promotion, 16*, 3-10.

DeStefano, A. L., Gavras, H., Heard-Costa, N., Bursztyn, M, Manolis, A., Farrer, L. A., et al. (2001). Maternal component in the familial aggregation of hypertension. *Clinical Genetics, 60,* 13-21.

Dong, Y., Zhu, H., Sagnella, G. A., Carter, N. D., Cook, D. G., & Cappuccio, F. P. (1999). Association between the C825T polymorphism of the G protein β3-subunit Gene and hypertension in blacks. *Hypertension, 34,* 1193-1196.

Dressler, W. W., Bindon, J. R., & Neggers. Y. H. (1998). Culture, socioeconomic status and coronary heart disease risk factors in an African American community. *Journal of Behanvioral Medicine, 21*, 527-544.

Dundas, R., Morgan, M., Redfern, J., Lemic-Stojcevic, N., & Wolfe, C. (2001). Ethnic differences in behavioural risk factors for stroke: Implications for health promotion. *Ethnicity & Health, 6*, 95-103.

El-Atat, F., Aneja, A., McFarlane, S., & Sowers, J. (2003). Obesity and hypertension. *Endocrinology and Metabolism Clinics of North America, 32,* 823-854.

Erlinger, T. P., Vollmer, W. M., Svetkey, L. P., & Appel, L. J. (2003). The potential impact of nonpharmacologic population-wide blood pressure reduction on coronary heart disease events:Pronounced benfits in African Americans and hypertensives. *Preventive Medicine, 37,* 327-333.

Esler, M., Rumantir, M., Kaye, D., & Lambert, G. (2001). The sympathetic neurobiology of essential hypertension: Disparate influences of obesity, stress, and noradrenaline transporter dysfunction? *The American Journal of Hypertension, 14,* 139S-146S.

Fisher, N. D., Hurwitz, S., Jeunemaitre, X., Hopkins, P. N., Hollenberg, N. K., & Williams, G. H. (2002). Familial aggregation of low-renin hypertension. *Hypertension, 39,* 914-918.

Flack, J. M., & Nasser, S. A. (2003). Ethnicity and socioeconomic status in hypertension. In J. L. Izzo & H. R. Black (Eds.), *Hypertension Primer: The Essentials of High Blood Pressure* (3rd ed., pp. 261-264). Dallas, TX: American Heart Association.

Fønnebø, V. (1994). The healthy Seventh-day Adventist lifestyle: What is the Norwegian experience? *American Journal of Clinical Nutrition, 59,* 1124S-1129S.

Fraser, G. E. (1994). Diet and coronary heart disease: Beyond dietary fats and low-density-lipoprotein cholesterol. *American Journal of Clinical Nutrition, 59,* 1117S-1123S.

Fraser, G. E. (1999). Associations between diet and cancer, ischemic heart disease, and all-cause mortality in non-Hispanic white California Seventh-day Adventists. *American Journal of Clinical Nutrition, 70,* 532S-538S.

Fraser, G. E. (1999). Diet and primordial prevention in Seventh-day Adventists. *Preventive Medicine, 29,* S18-S23.

Fraser, G.E. (2003). *Diet, life expectancy, and chronic disease: Studies of Seventh-day Adventists and other vegetarians.* New York, NY: Oxford University Press.

Fuch, F. D., Gus, M., Moreira, L. B., Moraes, R. S., Wiehe, M., Pereira, G. M., et al. (2005). Anthrompometric indices and the incidence of hypertension: A comparative study. *Obesity Research, 13,* 1515-1517.

Gillum, R. F. (1979). Pathophysiology of hypertension in Blacks and Whites: A review of the basis of racial blood pressure differences. *Hypertension, 1,* 468-475.

Goldberg, G. (2003). FLAIR-FLOW 4: Synthesis report on obesity for health professionals. *Nutrition Bulletin, 28,* 343-354.

Gomez, G. B., & Cappuccio, F. P. (2005). Dietary salt and disease prevention: A global perspective. *Current Medicinal Chemistry. Immunology, Endocrine and Metabolic Agents, 5,* 13-20.

Gus, M.., Fuchs, S. C., Moreira, L. B., Moraes, R. S., Wiehe, M., Silva, A. F., et al. (2004). Association between different measurements of obesity and the incidence of hypertension. *American Journal of Hypertension, 17,* 50-53.

Haas, M. (2006) Hypertension, race, and glomerulli: More than simply a numbers game [commentary]. *Kidney International, 69,* 640-642.

Haase, A., Steptoe, A., Sallis, J. F., & Wardle J. (2004) Leisure-time physical activity in university students from 23 countries: Associations with health beliefs, risk awareness, and national economic development. *Preventive Medicine*, *39,* 182-190.

Hajat, C., Tilling, K., Stewart, J. A., Lemic-Stojcevic, N., & Wolfe, C. D. (2004). Ethnic differences in risk factors for ischemic stroke: A European case-control study. *Stroke, 35,* 1562-1567.

Harris, M. M., Stevens, J., Thomas, N., Schreiner, P., & Folsom, A. R. (2000). Associations of fat distribution and obesity with hypertension in a Bi-ethnic population: The ARIC study. *Obesity Research, 8,* 516-524.

He, F. J., & MacGregor, G. A. (1999). Potassium intake and blood pressure. *American Journal of Hypertension, 12*, 849-851.

He, F. J., & MacGregor, G. A. (2001). Beneficial effects of potassium. *British Medical Journal, 323*, 497-501.

He, F. J., & MacGregor, G. A. (2002). Effect of modest salt reduction on blood pressure: A meta-analysis of randomized trials. Implications for public health. *Journal of Human Hypertension, 16*, 761-770.

Henderson, L., Gregory, J., & Swan, G. (2002). *National diet and nutrition survey: Adults aged 19 to 64 years. Vol. 1: Types and quantities of foods consumed.* London: The Stationary Office.

Higginbottom, G. M. (2000). Heart health-associated health beliefs and behaviours of adolescents of African and African Caribbean descent in two cities in the United Kingdom. *Journal of Advanced Nursing, 32,* 1234-1242.

Higginbottom, G. M. (2006). 'Pressure of life': Ethnicity as a mediation factor in mid-life and older peoples' experience of high blood pressure. *Sociology of Health and Illness, 28*, 583-610.

Hooper, L., Bartlett, C., Davey Smith, G. & Ebrahim. (2004). Advice to reduce dietary salt for prevention of cardiovascular disease. *The Cochrane Database of Systematic Reviews, 1,* CD003656.

Jackson E. M., & Dishman, R. K. (2002). Hemodynamic responses to stress among black women: Fitness and parental hypertension. *Medicine and Science in Sports and Exercise, 34,* 1097-1104.

Jackson, A. S., Stanforth, P. R., Gagnon, J., Rankinen, T., Leon, A. S., Rao, D. C., et al. (2002). The effect of sex, age, and race on estimating percentage body fat from body mass index: the Heritage Family study. *International Journal of Obesity, 26,* 789-796.

Jackson, L., Leclerc, J., Erskine, Y., & Linden, W. (2005). Getting the most out of cardiac rehabilitation: A review of referral and adherence predictors. *Heart*, *91*, 10-4.

Jamnik, V. K., Gledhill, N., Touyz, R. M., Campbell, N. R., Logan, A. G., & Padwal, R. (2005). Lifestyle modifications to prevent and manage hypertension for exercise physiologists and fitness professionals. *Canadian Journal of Applied Physiology, 30,* 754-761.

Janssen, I., Katzmarzyk, P. T., & Ross, R. (2002). Body mass index, waist circumference, and health risk: Evidence in support of National Institutes of Health Guidelines. *Archives of Internal Medicine, 162,* 2074-2079.

Janz, N. K., Champion, V. L., & Strecher, V. J. (2002). The health belief model. In K. Glanz, B. K. Rimer & F. M. Lewis (Eds.), *Health behavior and health education: Theory, research, and practice (*3rd ed., pp. 485-509*).* San Francisco, CA: Jossey-Bass.

John, J. H., Ziebland, S., Yudkin, P., Roe, L. S., & Neil, H. A. W. (2002). Effects of fruit and vegetable consumption on plasma antioxidant concentrations and blood pressure: A randomized controlled trial. *The Lancet, 359*, 1969-1974.

Jones, D. W. (2004). Dietary sodium and blood pressure. *Hypertension, 43*, 932-935.

Kaplan, N. M. (2004). Hypertension curriculum review: Lifestyle modifications for prevention and treatment of hypertension. *Journal of Clinical Hypertension (Greenwich), 6*, 716-719.

Kaplan, N. M., & Opie, L. H. (2006). Controversies in cardiology 2: Controversies in hypertension. *Lancet, 367,* 168-176.

Karlsen, S., Primatesta, P., & McMunn, A. (1999). Health survey for England: The health of minority ethnic groups '99. Retrieved October 10, 2004, from http://www.archive.offical-documents.co.uk/document/doh/survey99/hse99-07.htm

Khan, J. M., & Beevers, D. G. (2005). Management of hypertension in ethnic minorities. *Heart, 91,* 1105-1109.

King, K. M., Humen, D. P., Smith, H. L., Phan, C. L., &Teo, K. K. (2001). Psychosocial components of cardiac recovery and rehabilitation attendance. *Heart, 85,* 290-294.

Kornitzer, M., Dramaix, M., & De Backer. (1999). Epidemiology of risk factors for hypertension. *Drugs, 57,* 695-712.

Lane, D. A., & Lip, G. Y. H. (2001). Ethic differences in hypertension and blood pressure control in the UK. *QJM: An International Journal of Medicine, 94*, 391-396.

Lee, K. S., Park, C. Y., Meng, K. H., Bush, A., Lee, S. H., Lee, W. C., et al. (1998). The association of cigarette smoking and alcohol consumption with other cardiovascular risk factors in men from Seoul, Korea. *Annals of Epidemiology, 8*, 31-38.

Lemic-Stojcevic, N., Dundas, R., Jenkins, S., Rudd, A., & Wolfe, C. (2001). Preventable risk factors for coronary heart disease and stroke amongst ethnic groups in London. *Ethnicity & Health, 6,* 87-94.

Lip, G., Barnett, A. H., Bradbury, A., Cappuccio, F. P., Gill, P. S., Hughes E et al. (2007). Ethnicity and cardiovascular disease prevention in the United Kingdom: A practical approach to management. *Journal of Human Hypertension 21*, 183-211.

Livingstone, I. L. (1993). Stress, hypertension and young Black Americans: The importance of counseling [Electronic version]. *Journal of Multicultural Counseling and Development, 21,* 132-142.

Lopes, H. F., Bortolotto, L. A., Szlejf, C., Kamitsuji, C. S., & Krieger, E. M. (2001). Hemodynamic and metabolic profile in offspring of malignant hypertensive parents. *Hyptertension, 38,* 616-620.

Luft, F. C. (2004). Geneticism of essential hypertension. *Hypertension, 43,* 1155-1159.

Luke, A., Cooper, R. S., Prewitt, T. E., Adeyemo, A. A., & Forrester, T. (2001). Nutritional consequences of the African Diaspora. *Annual Reviews Nutrition, 21*, 47-71.

Luke, A., Kramer, H., Adeyemo, A., Forrester, T., Wilks, R., & Schoeller, D. (2005). Relationship between blood pressure and physical activity assessed with stable isotopes. *Journal of Human Hypertension, 19*, 127-132.

Mackey, J., & Mensah, G. A. (nd). *The atlas of heart disease and stroke.* World Health Organization in collaboration with the Centers for Disease Control and Prevention.

Malinski, M. K., Sesso, H. D., Lopez-Jimenez, F., Buring, J. E., & Gaziano, J. M. (2004). Alcohol consumption and cardiovascular disease mortality in hypertensive men. *Archives of Internal Medicine, 164*, 623-628.

McClenahan, C., Shevlin, M., Adamson, G., Bennett, C., & O'Neill. (2007). Testicular self-examination: A test of the health belief model and the theory of planned behaviour. *Health Education Research, 22,* 272-284.

McClenahan, C., Shevlin, M., Adamson, G., Bennett. C., & O'Neill B.(2007). Testicular self-examination: A test of the health belief model and the theory of planned behaviour. *Health Education Research 22*, 272-284.

Mead, M. (2004). British Hypertension Society guidelines 2004-BHS IV. Ten key comments for primary care. *British Journal of Cardiology, 11,* 246-250. Retrieved November 16, 2004, from http://www.bjcardio.co.uk/pdf/950Vol11_Num3_May-June_2004_p246-250.pdf

Melander, O. (2001). Genetic factors in hypertension - What is known and what does it mean? *Blood Pressure, 10,* 254-270.

Melby, C. L., Goldflies, D. G., & Toohey. (1993). Blood pressure differences in older Black and White long-term vegetarians and nonvegetarians. *Journal of the American College of Nutrition, 12,* 262-269.

Melby, C. L., Goldflies, D. G., Hyner, G. C., & Lyle, R. M. (1989). Relation between vetgetarian/nonvegetarian diets and blood pressure in Black and White Americans. *American Journal of Public Health, 7,* 1283-1288.

Melby, C. L., Toohey, M. L., & Cebrick, J. (1994). Blood pressure and lipids among vegetarians, semivegetarians, and nonvegetarian African Americans. *American Journal of Clinical Nutrition, 59,* 103-109.

Mendez, M. A., Cooper, R., Wilks, R., Luke, A. & Forrester, T. (2003). Income, education, and blood pressure in adults in Jamaica, a middle-income developing country. *International Journal of Epidemiology, 32,* 400-408.

Montgomery. S., Herring, P., Yancey, A., Beeson, L., Butler, T., Knutsen S, *et al*. (2007). Comparing self-reported disease outcomes, diet, and lifestyles in a national cohort of Black and White Seventh-day Adventists. *Preventing Chronic Disease* [serial online] Retrieved October 14, 2008, from http://www.cdc.gov/pcd/issues/2007/jul/06/06_0103.htm.

Morgan, M. (1995). The significance of ethnicity for health promotion: Patients' use of anti-hypertensive drugs in inner London. *International Journal of Epidemiology, 24*, S79-S84.

Morgan, M., & Watkins, C. J. (1988). Managing hypertension: Beliefs and responses to medication among cultural groups. *Sociology of Health and Illness, 10*, 561-578.

Nahcivan, N. O., & Secginli, S.(2007). Health beliefs related to breast self-examination in a sample of Turkish women. *Oncology Nursing Forum*, *34,* 425-432.

Nanchahal, K., Ashdon, W. D., Wood, D. A. (2000). Alcohol consumption, metabolic cardiovascular risk factors and hypertension in women. *International Journal of Epidemiology, 29,* 57-64.

National Centre for Social Research. (2005) *Health survey for England 2004: Volume 1: The health of minority ethnic groups.* Retrieved Jan 28, 2008, from http://www.ic.nhs.uk/webfiles/publications/healthsurvey2004ethnicfull/HealthSurveyforEnglandVol1_210406_PDF.pdf.

National Health Services. (2005). *Health survey for England 2004: The health of minorityethnic groups-Headline tables.* Health and Social Care Information Centre.

Nazroo, J. Y. (2001). *Ethnicity, class and health*. London. Policy Studies Institute.

Neiman, D. C. (2003). *Exercise testing and prescription: A health-related approach.* San Francisco: MaGraw-Hill.

Newell, M., Modeste, N., Hopp Marshak, H., & Wilson C.(2008) *Health beliefs and the prevention of hypertension a Black population living in London*. Unpublished manunscript.

Ohmori, S., Kiyohara, Y., Kato, I., Kubo, M., Tanizaki, Y., Iwamoto, H., et al. (2002). Alcohol intake and future incidence of hypertension in a general Japanese population: The Hisayama study. *Alcoholism: Clinical and Experimental Research, 26*,1010-1016.

Ohmori, S., Kiyohara, Y., Kato, I., Kubo, M., Tanizaki, Y., Iwamoto, H *et al*. (2002). Alcohol intake and future incidence of hypertension in a general Japanese population: The Hisayama study. *Alcoholism, Clinical and Experimental Research*; *26,* 1010-1016.

Okonofua, E. C., Cutler, N. E., Lackland, D. T., & Egan, B. M. (2005). Ethnic differences in older Americans: Awareness, knowledge and beliefs about hypertension. *American Journal of Hypertension, 18*, 972-979.

Oliveria, S. A., Chen, R. S., McCarthy, B.D., Davis, C. C., & Hill, M.N. (2004). Hypertension knowledge, awareness, and attitudes in a hypertensive population. *Journal of General Internal Medicine, 20,* 219-225.

Onal, A. E., Erbil, S., Ozel, S., Aciksari, K., & Tumerdem, Y. (2004). The prevalence of risk factors for hypertension in adults living in Istanbul. *Blood Pressure, 13*, 31-36.

Padilla, J., Wallace, J. P., & Park S. (2005). Accumulation of physical activity reduces blood pressure in pre-and hypertensives. [Electronic version] *Medicine and Science in Sports & Exercise*, 1264-1275. Retrieved March 10, 2006, from http://www.acsm-msse.org

Pausova, Z. (2006). From big fat cells to high blood pressure: Obesity-associated hypertension. *Current Opinion in Nephrology and Hypertension, 15,* 173-178.

Pescatello, L. S., Bairos, L., VanHeest, J. L., Maresh, C. M., Rodriguez, N. R., Moyna, N. M., et al. (2003). Postexercise hypotension differs between white and black women. *American Heart Journal, 145,* 364-370.

Pescatello, L. S., Franklin, B. A., Fagard, R., Farquhar, W. B., Kelley, G. A., & Ray, C. A. (2004). American College of Sports Medicine position stand. Exercise and hypertension. *Medicine and Science in Sports and Exercise, 36*, 533-553.

Peters, R. M., Aroian, K. J., & Flack, J. M.(2006). African American culture and hypertension prevention. *Western Journal of Nursing Research, 28,* 831-854.

Plante, G. E. (2002). Vascular response to stress in health and disease. *Metabolism, 51, Suppl 1,* 25-30.

Primatesta, P., Bost, L., & Poulter, N. R. (2000). Blood pressure levels and hypertension status among ethnic groups in England. *Journal of Human Hypertension, 14,* 143-148.

Primatesta, P., Brookes, M., & Poulter. (2001). Improved hypertension management and control: Results from the Health Survey for England 1998. *Hypertension, 38,* 827-832.

Raleigh, V. S. (1997). Diabetes and hypertension in Britain's ethnic minorities: Implications for the future of renal services. [Electronic version] *British Medical Journal, 314,* Retrieved December 6, 2007, from http://www.bmj.com/cgi/content/full/314/7075/209

Ransford, H. E. (1986). Race, heart disease worry and health protective behavior. *Social Science and Medicine 22,* 1355-1362.

Reniscow, K., Braithewaite, R. L., Dilorio, C. & Glanz, K. (2002). Applying theory to culturally diverse and unique populations. In K. Glanz, B. K. Rimer & F. M. Lewis (Eds.), *Health behavior and health education: Theory, research, and practice (*3rd ed., pp. 485-509*).* San Francisco, CA: Jossey-Bass.

Rennie, K. L., & Jebb, S. A. (2005). Prevalence of obesity in Great Britain. *Obesity Reviews, 6,* 11-12.

Rieder A. (2007). Getting into a healthy CV success zone: Effective strategies to prevent CVD. *European Heart Journal Supplements 9*, B4-B7.

Rimal, R. N. & Real, K. (2005). Assessing the perceived importance of skin cancer: How question-order effects are influenced by issue involvement. *Health Education and Behavior, 32,* 398-412.

Ross, S., Walker, A., & MacLeod, M. J. (2007). Patient compliance in hypertension: Role of illness perceptions and treatment beliefs. *Journal of Human Hypertension*, *18,* 607-613.

Ruesser, M. E., & McCarron, D. A. (2006). Reducing hypertensive cardiovascular disease risk of African Americans with diet: Focus on the facts. *Journal of Nutrition,136*, 1099-1102.

Sacks, F. M., Obarzanek, E., Windhauser, M. M., Svetkey, L. P., Vollmer, W. M., & McCullough, M. (1995). Rationale and design of the dietary approaches to stop hypertension: A multicenter controlled-feeding study of dietary patterns to lower blood pressure. *Annals of Epidemiology, 5,* 108-118.

Schwartz, A. R., Gerin, W., Davidson,. K. W., Pickering, T. G., Brosschot, J. F., & Thayer, J. F. (2003). Toward a causal model of cardiovascular responses to stress and the development of cardiovascular disease. *Psychosomatic Medicine, 65,* 22-35.

Scollan-Koliopoulos, M. (2005). Managing stress response to control hypertension in type 2 diabetes. *The Nurse Practitioner, 30,* 46-49.

Shiloh, S., Vinter, M., & Barak, A.(1997) Correlates of health screening utilization: The roles of health beliefs and self-regulation motivation. *Psychology and Health*, *12,* 301-317.

Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine. (2007) *Your Disease Risk: Relative Risks.* Retrieved October 14, 2007, from http://www.yourdiseaserisk.wustl.edu/pdf_files/rr_ydr.pdf.

Sluijs, E. M. F., Van Poppel, M. N.M., Twisk, J. W. R., Brug, J., & Van Mechelen, W. (2005). The positive effect on determinants of physical activity of a tailored, general practice-based physical activity intervention. *Health Education Research, 20,* 345-356.

Snijder, M. B., van Dam, R. M., Visser, M., & Seidell, J. C. (2006). What aspects of body fat are particularly hazardous and how do we measure them? *International Journal of Epidemiology, 35,* 83-92.

Snow, F. L. (1983). Traditional health beliefs and practices among lower class Black Americans. *The Western Journal of Medicine, 139*, 820-828.

Stein, M. C., Lang, C. C., Singh, I., He H. B., & Wood A. J. J. (2000). Increased vascular adrenergic vasoconstriction and decreased vasodilation in Blacks: Additive mechanisms leading to enhanced vascular reactivity. *Hypertension*, *36,* 945-951.

Strecher, V., Wang, C., Derry, H., Wildenhaus, K., & Johnson C. (2002). Tailored interventions for multiple risk behaviors. *Health Education Research, 17*, 619-626.

Svetkey, L. P., Erlinger, T. P., Vollmer, W. M., Feldstein, A., Cooper, L. S., Appel, L. J., et al. (2005). Effect of lifestyle modifications on blood pressure by race, sex, hypertension status, and age. *Journal of Human Hypertension, 19,* 21-31.

Svetkey, L. P., Simons-Morton, D., Vollmer, W. M., Appel, L, J., Conlin, P.R., Ryan, D. H., et al. (1999). Effects of dietary patterns on blood pressure: Subgroup analysis of the dietary approaches to stop hypertension (DASH): Randomized clinical trial. *Archives of Internal Medicine, 159,* 285-293.

Swift, P. A., Markandu, N. D., Sagnella, G. A., He, F. J., & MacGregor, G. A. (2005). Modest salt reduction reduces blood pressure and urine protein excretion in Black hypertensives: A randomized control trial. *Hypertension*; *6,* 308-312.

Timio, M., Saronio, P., Verdura, C., Schiaroli, M., Timio, F., & Monarca, C. (2001). A link between psychosocial factors and blood pressure trend in women. *Physiology and Behavior, 73,* 359-363.

Tomson, J., & Lip, G. Y. H. (2005). Alcohol and hypertension: An old relationship revisited. *Alcohol and Alcoholism, 41*, 3-4.

Touyz, R. M., Campbell, N., Logan, A., Gledhill, N., Petrella, R., & Padwal, R. (2004). The 2004 Canadian recommendations for the management of hypertension: Part III—Lifestyle modifications to prevent and control hypertension [Abstract]. C*anadian Journal of Cardiology, 20,* 55-59.

Townes, E. M. (1998). *Breaking the fine rain of death.* New York: Continuum Publishing Company.

Twisk, J. W. R., Kemper, H. C. G., Van Mechelen, W., & Post, G. B. (2001). Clustering of risk factors for coronary heart disease. the longitudinal relationship with lifestyle. *Annals of Epidemiology, 11*, 157-165.

van der Sande, M. A., Walraven, G. E., Milligan, P. J., Banya, W. A., Ceesay, S. M., Nyan, O. A., et al. (2001). Family history: An opportunity for early interventions and improved control of hypertension, obesity and diabetes. *Bulletin of the World Health Organization, 79, 4,* 321-328.

Van Duyn, M. A. S., & Pivonka, E. (2000). Overview of the health benefits of fruit and vegetable consumption for the dietetics professional: Selected literature. *Journal* of t*he American Dietetic Association, 100*, 1511-1521.

Whelton, P. K., He, J., Cutler, J. A., Brancati, F. L. Appel, L. J., Follmann, D., et al. (1997). Effects of oral potassium on blood pressure: Meta-analysis of randomized controlled clinical trials. *Journal of the American Medical Association, 277*, 1624-1632.

Willett, W. (2003) Lessons from dietary studies in Adventists and questions for the future. *American Journal of Clinical Nutrition, 78,* 539S-543S.

Williams, B., Poulter, N. P., Brown, M. J., Davis, M., McInnes, G. T., Potter, J. F., et al. (2004). British Hypertension Society guidelines for hypertension management 2004 (BSH-IV): Summary. *British Medical Journal, 328*, 634-640.

Wilson, R. P., Freeman, A., Kazda, M. J., Andrews, T. C., Berry, L., Vaeth, P. A. C., et al. (2002). Lay beliefs about high blood pressure in a low-to-middle-income urban African-American community: An opportunity for improving hypertension control. *The American Journal of Medicine, 112,* 26-30.

Wolfe, C. (2002). *IS10: The incidence, natural history, resource use, and outcome of stroke [1 of 2]*. Retrieved November 16, 2004, from http://www.dh.gov.uk/PolicyAndGuidance/ResearchAndDevelopment/ResearchAndDevelopmentAZ/CardiovascularDiseaseAndStroke/CardiovascularDiseaseAndStrokeArticle/fs/en?CONTENT_ID=4001897&chk=8uIeVM

Wood, D. (2005). Risk factors for hypertension. *Butler Hospital.* Retrieved March 5, 2006, from http://www.butler.org/body.cfm?id=125&chunkiid=19606

Wrightson, K. J., & Wardle, J. (1997). Cultural variation in health locus of control. *Ethnicity and Health, 2*, 13-20.

Writing Group of the PREMIER Collaborative Research Group. (2003). Effects of comprehensive lifestyle modification on blood pressure control: Main results of the PREMIER clinical trial. *Journal of the American Medical Association, 28*, 2083-2093.

Yanek, L. R., Moy, T. F., Blumenthal, R. S., Raqueño, J. V., Yook, R. M., Hill, M. N., et al. (1998). Hypertension among siblings of persons with premature coronary heart disease. *Hypertension, 32,* 123-128.

APPENDIX A

Classification of Blood Pressure Levels of the British Hypertension Society

Category	Systolic blood pressure (mm Hg)	Diastolic Blood Pressure (mm Hg)
Blood pressure		
Optimal	< 120	<80
Normal	<130	<85
High Normal	130-139	85-89
Hypertension		
Grade 1 (mild)	140-159	90-99
Grade 2 (moderate)	160-179	100-109
Grade 3 (severe)	≥ 180	≥ 110
Isolated Systolic Hypertension		
Grade 1	140-159	< 90
Grade 2	≥ 160	<90

If systolic BP and diastolic BP fall into different categories, the higher value should be taken for classification (Mead, 2004)

APPENDIX B

Questionnaire

ID Code _ _ _
(3 digits)

Date (day/month/year) _____

KNOWLEDGE, PERCEPTIONS, BELIEFS AND BEHAVIORS RELATED TO THE PREVENTION OF HYPERTENSION AMONG BLACK SEVENTH-DAY ADVENTISTS LIVING IN LONDON

Thank you for taking part in this study. There are a total of 107 questions on this form and it should take you about 20 minutes to respond. Please read each question carefully and give the best response.

Section A: Demographic/ Family History
Instructions: This section asks general questions about your education, family history and employment, tick or fill in the correct response.

1. Ethnicity: ☐1 Caribbean ☐2 African ☐3 Other (Please explain)_____
2. What is your gender: ☐1 Male ☐2 Female
3. Date of birth (day/month/year) ____/____/____
(4 digits)
4. Were you born in the UK?
   ☐1 Yes (If "Yes" go to question 5)
   ☐1 No (If "No" go to question 9)

	Yes	No	Don't Know
5. Was your father born outside of the UK?	☐1	☐2	☐3
6. Was you grandfather born outside of the UK?	☐1	☐2	☐3
7. Was your mother born outside of the UK?	☐1	☐2	☐3
8. Was your grandmother born outside of the UK?	☐1	☐2	☐3

9. Which country were you born in? _____
10. What age were you when you came to the UK? _____
11. How many years have you been a Seventh-day Adventist? _____
12. What is your current marital status?
    ☐1 Single/Never Married ☐4 Divorced
    ☐2 First time married ☐5 Separated
    ☐3 Remarried ☐6 Widowed

ID Code _____

13. Do either of your biological parents have high blood pressure? (If either or both of your parents are deceased, please indicate whether or not they had high blood pressure.)

	Yes	**No**	**Don't know**
Father	☐1	☐2	☐3
Mother	☐4	☐5	☐6

14. Do any of your biological brothers or sisters have high blood pressure?

	Yes (If "Yes", how many?)	**No**	**Don't know**
Brother	☐1 _____	☐2	☐3
Sister	☐4 _____	☐5	☐6

15. Have you ever smoked? ☐1 **Yes** ☐2 **No**

16. Have you ever use alcohol? ☐1 **Yes** ☐2 **No**

17. Average household income for 2005.

☐1 Less than £10K

☐2 £10 - £20K

☐3 £20 - £30K

☐4 £30 - £40K

☐5 £40 - £50K

☐6 £50 - £75K

☐7 £75 - £100K

☐8 More than £100K

18. How many people live in your household who are over the age of 18? _____

19. How many people live in your household who are 17 and younger? _____

20. How many are currently employed? _____

21. What is your highest level of education completed?

☐1 Primary school

☐2 Secondary school

☐3 A course at a trade/vocational school

☐4 Undergraduate polytechnic or university

☐5 Graduate degree

ID Code_____

22. Are you currently employed? ☐1 **Yes** (Go to question 24) ☐2 **No** (Go to question 23)

23. Are you ☐1 Unemployed ☐2 Retired ☐3 Looking for work

24. What is your last or current occupation?

☐1 **Modern or professional occupations**
such as: teacher, nurse, physiotherapist, social worker, welfare officer, artist, musician, police officer (sergeant or above), software designer

☐2 **Clerical and intermediate occupations**
such as: secretary, personal assistant, clerical worker, office clerk, call centre agent, nursing auxiliary, nursery nurse

☐3 **Senior managers or administrators**
such as: finance manager, chief executive

☐4 **Technical and craft occupations**
such as: motor mechanic, fitter, inspector, plumber, printer, tool maker, electrician, gardener, train driver

☐5 **Semi-routine, manual and service occupations**
such as: postal worker, machine operative, security guard, caretaker, farm worker, catering assistant, receptionist, sales assistant

☐6 **Routine manual and service occupations**
such as: HGV driver, van driver, cleaner, porter, sewing machinist, messenger, labourer, waiter/waitress, bar staff

☐7 **Middle or junior managers**
such as: office manager, retail manager, bank manager, restaurant manager, warehouse manager, publican

☐8 **Traditional professional occupations**
Such as: accountant, solicitor, medical practitioner, scientist, Civil/mechanical engineer

25. Do you rent or own your home?

☐1 Rent

☐$_2$ Own

☐$_2$ Other (Please explain) _____

ID Code_____

26. Do any of your biological brothers or sisters have high blood pressure?

	Yes (If "Yes", how many?)	**No**	**Don't know**
Brother	☐$_1$ _____	☐$_2$	☐$_3$
Sister	☐$_1$ _____	☐$_2$	☐$_3$

27. Have you ever smoked?

☐$_1$ **Yes** ☐$_2$ **No**

28. Have you ever use alcohol?

☐$_1$ **Yes** ☐$_2$ **No**

Section B: High Blood Pressure Knowledge Survey
Instructions: Tick **one** response only.

29. Blood pressure is considered normal when it is:

☐$_1$ Less than 130/85 mm Hg

☐$_2$ Less than 140/90 mm Hg

☐$_3$ Less than 160/90 mm Hg

☐$_4$ Less than 120/80 mm Hg

☐$_5$ Don't know

	True	**False**	**Don't Know**
30. Staying at normal weight helps control blood pressure.	☐$_1$	☐$_2$	☐$_3$
31. Reducing stress helps control blood pressure.	☐$_1$	☐$_2$	☐$_3$
32. Reducing salt helps control blood pressure.	☐$_1$	☐$_2$	☐$_3$
33. Reducing alcohol helps control blood pressure.	☐$_1$	☐$_2$	☐$_3$
34. Exercising helps control blood pressure.	☐$_1$	☐$_2$	☐$_3$
35. Not smoking helps control blood pressure.	☐$_1$	☐$_2$	☐$_3$
36. High blood pressure makes the kidneys work harder.	☐$_1$	☐$_2$	☐$_3$
37. High blood pressure can cause heart problems.	☐$_1$	☐$_2$	☐$_3$
38. High blood pressure can cause strokes.	☐$_1$	☐$_2$	☐$_3$
39. One can usually tell if ones blood pressure is high.	☐$_1$	☐$_2$	☐$_3$

40. People can do things to control their blood pressure. ☐1 ☐2 ☐3

41. If blood pressure is high, lowering it even a little bit improves health? ☐1 ☐2 ☐3

ID Code _____

42. It is best to measure your blood pressure (tick **one**)

☐1 Anytime that it is convenient.

☐2 Immediately after strenuous activities, such as, climbing stairs and jogging.

☐3 After you have been sitting quietly for at least five minutes.

☐4 Immediately before going to bed.

☐5 Don't know.

43. How dangerous is high blood pressure to health? (Tick **one**)

☐1 Extremely ☐2 Somewhat ☐3 Not at all ☐4 Don't know

44. What do the two numbers reported for blood pressure mean?

Top number: ☐1 Systolic ☐2 Diastolic ☐3 Don't know

Bottom number: ☐4 Systolic ☐5 Diastolic ☐6 Don't know

45. Which measure(s) is (are) more important?

☐1 Top ☐2 Bottom ☐3 Both ☐4 Don't know

Section C:

Instructions: Following is a list of statements regarding hypertension and health. Please indicate how much you agree or disagree by circling **one** number for each statement

1 = Strongly Agree (SA) 2 = Agree (A) 3 = Neither Agree nor Disagree (NAD) 4 = Disagree (D) 5 = Strongly Disagree (SD)

	SA	**A**	**NAD**	**D**	**SD**
46. Blacks tend to have more high blood pressure than other ethnic groups	1	2	3	4	5
47. I am more likely to develop high blood pressure because of my age	1	2	3	4	5
48. I am more likely to develop high blood pressure because of my sex (gender)	1	2	3	4	5
49. I am more likely to develop high					

blood pressure if I limit my salt intake	1	2	3	4	5
50. I am more likely to develop high blood pressure if I am not careful about what I eat	1	2	3	4	5

ID Code _____

1 = Strongly Agree (SA) 2 = Agree (A) 3 = Neither Agree nor Disagree (NAD) 4 = Disagree (D) 5 = Strongly Disagree (SD)

	SA	**A**	**NAD**	**D**	**SD**
51. I am less likely to develop high blood pressure if I have lots of stress in my life	1	2	3	4	5
52. If I had a stroke because of my high blood pressure, I could be handicapped for the rest of my life	1	2	3	4	5
53. If I had high blood pressure it would cause severe headaches	1	2	3	4	5
54. It is likely that I will develop high blood pressure in the future	1	2	3	4	5
55. The thought of high blood pressure scares me	1	2	3	4	5
56. Problems I would face with high blood pressure would last a long time	1	2	3	4	5
57. I am less likely to develop high blood pressure if one of my brothers or sisters has (had) high blood pressure	1	2	3	4	5
58. If I had high blood pressure it could cause a heart attack.	1	2	3	4	5
59. If I have my blood pressure checked regularly it will decrease my chances of developing high blood pressure	1	2	3	4	5
60. I am less likely to develop high blood pressure if my parents do (did) not have high blood pressure	1	2	3	4	5
61. Having a stroke as a result of having high blood pressure could kill me	1	2	3	4	5
62. If I had high blood pressure my whole life would change.	1	2	3	4	5

ID Code _____

NOTE: When the word "control" is used in questions 63-76, it refers to your lifestyle, not the use of medicine

1 = Strongly Agree (SA) 2 = Agree (A) 3 = Neither Agree nor Disagree (NAD) 4 = Disagree (D) 5 = Strongly Disagree (SD)

	SA	A	NAD	D	SD
63. If I control my blood pressure I will be healthier	1	2	3	4	5
64. If I had high blood pressure it could cause me to have a stroke	1	2	3	4	5
65. If I control my blood pressure it will help me to live longer	1	2	3	4	5
66. If do not control my blood pressure I will feel better	1	2	3	4	5
67. If I do not control my blood pressure I will have a stroke	1	2	3	4	5
68. Controlling my blood pressure means that I will not have to take medicine	1	2	3	4	5
69. Having my blood pressure checked regularly Would make me worry about it	1	2	3	4	5
70. Having my blood pressure checked takes too much time	1	2	3	4	5
71. Controlling my blood pressure means that I can't eat foods that I enjoy	1	2	3	4	5
72. It is difficult to avoid eating salt	1	2	3	4	5
73. Finding the time to exercise is difficult	1	2	3	4	5
74. Finding a place to exercise is difficult	1	2	3	4	5
75. The only way that I can have my blood pressure checked regularly is by going to my doctor's office	1	2	3	4	5
76. I don't want to worry about controlling my weight	1	2	3	4	5

ID Code _____

If you decided that you wanted to decrease the chances of developing high blood pressure how confident are you that you could do the following behaviors

1 = Strongly Agree (SA) 2 = Agree (A) 3 = Neither Agree nor Disagree (NAD) 4 = Disagree (D) 5 = Strongly Disagree (SD)

	SA	A	NAD	D	SD
77. I am confident that I can get my blood pressure checked regularly	1	2	3	4	5
78. I am confident that I can limit the amount of salt in my diet	1	2	3	4	5
79. I am confident that I can eat five or more servings of fruit and vegetables each day	1	2	3	4	5
80. I am confident that I can exercise for at least 30 minutes on 4 or more days of the week	1	2	3	4	5
81. I am confident that I can control my weight	1	2	3	4	5

Section D: Stress

The questions in this section ask you about your feeling and thoughts **during the last month**. In each case you will be asked to indicate by circling how often you felt or thought a certain way.

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

82. In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
83. In the last month, how often have you felt that you were unable to control the important things in you life?	0	1	2	3	4
84. In the last month, how often have you felt Nervous and "stressed"?	0	1	2	3	4
85.In the last month, how often have you felt confident about you ability to handle your personal problems?	0	1	2	3	4

86. In the last month, how often have you felt that things were going your way?	0	1	2	3	4

ID Code _____

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

87. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
88. In the last month, how often have you been able to control the irritations in your life?	0	1	2	3	4
89. In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
90. In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
91. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

Section E: Behaviour

The questions in this section (82 - 97) ask about your habits concerning what you eat and how often you exercise. Tick **one** answer for each.

92. Are you a practicing vegan (no animal products in your diet)?

☐1 Yes (If "Yes" go to question 97)

☐2 No (If "No" go to question 93)

93. Are you a practicing vegetarian (plant-based diet which includes dairy and eggs)?

☐1 Yes (If "Yes" go to question 97)

☐2 No (If "No" go to question 94)

	Less than 1	**1-2**	**3-4**	**5-6**	**7**
94. On average how many days a week do you eat red meat?	☐1	☐2	☐3	☐4	☐5
	Less than 1	**1-2**	**3-4**	**5-6**	**7**
95. On average how many days a week do you eat white meat (i.e. Turkey and chicken)?	☐1	☐2	☐3	☐4	☐5

96. On average how many days a week do you eat fish? ☐1 ☐2 ☐3 ☐4 ☐5

97. Do you generally add salt during cooking? ☐1 Yes ☐2 No

ID Code_____

NOTE: You can only respond "Yes" to **one** of the questions from 98 - 101

	Yes	**No**
98. Do you generally add salt at the table without tasting your food?	☐1	☐2
99. Do you generally taste your food and then add salt at the table?	☐1	☐2
100. Do you taste your food and occasionally add salt at the table?	☐1	☐2
101. Do you rarely, or never, add salt to your food at the table?	☐1	☐2

How many days of the week, on average…

	Never Or rarely	**1-2**	**3-4**	**5-6**	**7**
102. do you get at least 30 minutes of moderate to vigorous exercise, i.e. sports?	☐1	☐2	☐3	☐4	☐5
103. do you take a walk for at least 30 minutes?	☐1	☐2	☐3	☐4	☐5
104. do you do heavy housework for at least 30 minutes?	☐1	☐2	☐3	☐4	☐5
105. do you do heavy manual work, i.e. DIY or gardening for at least 30 minutes?	☐1	☐2	☐3	☐4	☐5
106. do you get any sort of physical activity, not listed above, for at least 30 minutes a day? Describe_____	☐1	☐2	☐3	☐4	☐5

107. On average, how many portions of fruit and vegetables do you eat each day?

☐1 Less than 1 portion

☐2 1-2

☐3 3-4

☐4 5 or more

Thank you for your time. Please put the questionnaire back in the envelope and proceed to Station 5.

APPENDIX C

Advertisement of Study

WE NEED YOUR HELP!

IF YOU ARE: **BLACK**
SDA
BETWEEN THE AGES OF 25 AND 79
LIVE IN LONDON
NOT BEING TREATED FOR HIGH BLOOD PRESSURE

BE PART OF A STUDY THAT WILL HELP US TO UNDERSTAND THE RISK OF HIGH BLOOD PRESSURE OF BLACK SDAs

GIVE US ABOUT ONE HOUR OF YOUR TIME

DATE: _____

TIME: _____

PLACE: _____

FOR MORE DETAILS CALL: _____

This study is being conducted as part of a student research project with Loma Linda University School of Public Health, Department of Health Promotion and Education

Loma Linda University
Adventist Health Sciences Center
Institutional Review Board
Approved _____
_____ Chair R. L. Rigby, DrPH

APPENDIX D

Enrollment Card for High Blood Pressure Study

Name: _____

Age: _____ Sex: ___Male ___Female

Tel No.: Home ( ) - Mobile -

Address: _____
_____
_____
_____

APPENDIX E

Informed Consent

LOMA LINDA UNIVERSITY

Health

Loma Linda, California 92350
(909) 558-4546
FAX: (909) 558-4387

Knowledge, Perceptions, Beliefs and Behaviors related to the prevention of Hypertension among Black Seventh-day Adventists Living in London

Participant Information and Consent Form

PURPOSE AND PROCEDURES:

You are invited to participate in this study conducted as part of a student research project to gather information about the blood pressure status of Black Seventh-day Adventists Christians in London. The intention of this study is to identify beliefs and practices related to blood pressure of Seventh-day Adventist Blacks. Your participation in this study will involve completing a questionnaire on factors about blood pressure and your current lifestyle habits. You will also have your blood pressure, height, weight and waist circumference measured by a nurse. These procedures will take about one hour.

RISKS:

Participating in this study exposes you to minimal risk—no more than that encountered in day-to-day living. You may become tired or feel uncomfortable having your blood pressure taken.

BENEFITS:

There are no direct benefits to you. Your participation will, however, provide you with knowledge of your blood pressure, weight and height measurements. The expected benefits to humanity are that the findings will provide information to health educators and other health professionals to improve the health care of Blacks in London.

COST/ REIMBURSEMENT:

There is no cost to you for participating in this study, nor is there any reimbursement for your effort.

Initial_____

Date _____

PARTICIPANT'S RIGHTS:

Participation in this study is totally voluntary. You have the right to refuse to answer any question. You also have the right to decide at any time that you do not want to have any or all of the measurements taken. If you choose not to participate there is no penalty.

CONFIDENTIALITY:

Your identity will be protected because you will not be required to put your name on the questionnaire and any other documents will be matched to your questionnaire by a non-identifying code. The responses on the questionnaires along with the measurements will be analyzed and reported as general information.

QUESTIONS/COMPLAINTS:

If you have any questions regarding this study, you may contact Naomi Modeste, DrPH, Chair, Department of Health Promotion and Education, School of Public Health, Loma Linda University (909) 558-4575

If you wish to contact an impartial third party not associated with this study regarding any question or complaint you may have about the study, you may contact: The office of Patient Relations, Loma Linda University Medical Center, Loma Linda, CA 92354, phone (909) 558 4647, email jfanhanel@ahs.llumc.edu or Victor Hulbert, Executive Secretary, South England Conference of Seventh-day Adventists, 25 St John's Road, Watford, Herts. WD17 1PZ, phone 01923 232728, email vhulbert@secadventist.org.uk

INFORMED CONSENT STATEMENT:

By agreeing to participate in this study after having been given the information entailed in this form, I acknowledge I have read and have had the content of this document explained to me. I understand the purpose of this study and all of my questions have been answered to my satisfaction.

I have been given a copy of this document.

Participant's signature _____ Date _____

I have reviewed this consent form with the person signing above. I have explained potential risks and benefits of the study.

Investigator's signature _____ Date _____

APPENDIX F

Form to Record Participants' Measurements

ID CODE _____

Blood Pressure Measurement:

First BP reading: Left arm _____ Right arm_____

Second BP reading: Left arm_____ Right arm_____

Average of the two highest readings: _____

Weight _____ Stones and lbs

Height _____ Inches

WC _____