

The Impact of Social Support, Psychosocial Characteristics, and
Contextual Factors on Racial Disparities in Hypertension

By

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A dissertation submitted in partial fulfillment
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ABSTRACT

The Impact of Social Support, Psychosocial Characteristics, and Contextual Factors on Racial
Disparities in Hypertension

by

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Utah State University, 2014

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Hypertension is a serious medical condition. Although men and women of all racial groups in the US suffer from high blood pressure, black women have the highest rates of hypertension. For instance, the age-adjusted prevalence of hypertension among black women ages 20 and over is 44.3, compared to 28.1 among white women, 40.5 among black men, and 31.1 among white men.

Past research has focused on SES and behavioral factors as potential explanations for blood pressure disparities between black and white women. But, even after controlling for such factors, considerable disparities remain. The goal of this research is to examine cultural and social factors that have been shown to increase blood pressure. Specifically, I examine social support, psychosocial characteristics, and contextual factors associated with race/ethnicity and hypertension, in hopes of explaining some of the disparities in high blood pressure between black and white women.

Using data from Waves I, III, and IV of the National Longitudinal Study of Adolescent Health (Add Health), I estimated a sequence of multinomial logistic regression models predicting prehypertension and hypertension in young adulthood. Cross-sectional models show that racial disparities in hypertension remain after controlling for social support, psychosocial characteristics, and contextual factors. In fact, the only covariate that substantially reduced the racial disparity in hypertension was body mass index (BMI), a fairly reliable measure of body fatness for most people. I also estimated a set of multinomial logistic regression models predicting odds of prehypertension and hypertension by adolescent and cumulative social support, as well as psychosocial, contextual, and behavioral factors. These models were included to determine if early life and/or cumulative factors and conditions would help explain racial blood pressure disparities not explained by adulthood factors. Findings show that none of the early life or cumulative social support, psychosocial, contextual, or behavioral factors helped to explain racial differences in prehypertension or hypertension. Even after controlling for these factors, black women are still 1.18 times more likely than white women to have prehypertension and over two times more likely to suffer hypertension.

Indeed, my findings indicate that, of the factors included in all these models, only race, age, and BMI were significant predictors of blood pressure. Also, BMI was the only factor to explain some of the disparities between black and white women. These results are similar to other studies that have examined racial health disparities, suggesting that simply being a black woman in US society may be unhealthy. The health effects of racism, discrimination, and other sources of stress faced disproportionately by black women are not easily measured by social science research, which is possibly why racial disparities in blood pressure have yet to be

explained. Future research should also explore possible epigenetic effects introduced by the health conditions experienced by previous generations, as well as the influence of prenatal and early life environments.

(211 pages)

PUBLIC ABSTRACT

The Impact of Social Support, Psychosocial Characteristics, and Contextual Factors on Racial Disparities in Hypertension

E. Miranda Reiter

Hypertension is a serious medical condition that is suffered more by black women than members of all other racial groups (National Center for Health Statistics 2013). Because racial disparities in hypertension are not fully explained by behavioral or socioeconomic factors, this research examines the impact of cultural and social factors on the relatively high rates of hypertension among black women, as compared to whites.

First, I use Wave IV data from the National Longitudinal Study of Adolescent Health (Add Health) (Udry 1998) to determine the effects of social support, psychosocial characteristics, and contextual adulthood factors on hypertension. The only factor that somewhat explains the higher rates among black women is body mass index (BMI). Using Waves I, III, and IV Add Health data, I also examine the effect of adolescent and cumulative social support, psychosocial, and contextual factors on adulthood hypertension. None of these factors help to explain racial differences in blood pressure.

Similar to most research on racial disparities in hypertension, my findings indicate that only race, age, and BMI were significant predictors of blood pressure. Also, BMI was the only factor to explain some of the disparities between black and white women. This suggests that simply being a black woman in US society may be unhealthy. The health effects of racism, discrimination, and other sources of stress faced disproportionately by black women are not

easily measured by social science research, but seem to have real biological consequences.

These findings indicate the importance of eliminating racism, discrimination, and all other race-based forms of unfair treatment and stress in order to reduce racial health disparities.

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INTRODUCTION

High Blood Pressure in the US: Prevalence and Trends

Hypertension is a serious medical condition that affects men and women of all racial and ethnic categories in the US. For instance, in 1988-1991 nearly 25% of US adults suffered from hypertension (Yoon, Ostchega, and Louis 2010). More recent research indicates that the problem is growing, as one in three adults in the United States now has high blood pressure (American Heart Association 2013). Although people from all sex/race groups have experienced an increase in hypertension prevalence in recent decades, racial disparities remain, with blacks continuously affected much more than whites. The age-adjusted prevalence of hypertension among blacks and whites was 32.4% and 23.3%, respectively, in 1988-1991 (Yoon et al. 2010), and 40.4% and 27.4%, respectively, in 2009 (Yoon et al. 2012).

Sex Differences in the Etiology of Hypertension

Until very recently, it was believed that high blood pressure is not related to sex. But now, several studies indicate that the main determinants of blood pressure might vary for men and women (American Heart Association 2014). For instance, the use of birth control pills and pregnancy are associated with increased blood pressure in some women (American Heart Association 2014). Further, although the medical community originally believed that the causes of hypertension were generally similar for men and women, recent research suggests that sex-specific mechanisms are at work (Ferrario, Jessup, and Smith 2014). For instance, Ferrario et al. (2014) reported physiologic differences in the cardiovascular systems of men and women, including types and levels of hormones that regulate blood pressure. According to Dubey, et al. (2002), estradiol reduces blood pressure among women, as indicated by the relatively low blood

pressure during the luteal phase (when estradiol levels peak), compared to blood pressure during the follicular phase. Because estradiol increases 50-180-fold during pregnancy, it may lead to considerable reductions in blood pressure among women (Siamopoulos et al. 1996).

In addition, Seely et al. (1999) observed significant decreases in mean blood pressure and both nocturnal systolic blood pressure (SBP) (the pressure in your blood vessels when your heart beats (CDC 2010) and diastolic blood pressure (DBP) (the pressure in your vessels when your heart rests between beats (CDC 2010) in a group of postmenopausal women treated with estradiol and estradiol/progesterone. Others have also reported insignificant trends toward lower daytime or office SBP and DBP in patients on estradiol or estradiol/progestin compared to placebo (PEPI Trial Writing Group 1995; Cagnacci et al. 1999). With these recent findings, it is apparent that factors associated with hypertension differ between the sexes (Ferrario et al. 2014). These discoveries make research on blood pressure among women, such as this study, very important.

The High Prevalence of Hypertension among Black Women

According to the Third National Health and Nutrition Examination Survey (NHANES III) (1988-1994) and NHANES Continuous (1999-2004) data, the age-standardized and age-specific prevalence of hypertension among black women has continuously been among the highest of all race/sex groups in the US. As shown in Figure 1, disparities between black women and white women have persisted through recent decades. For instance, the age-adjusted prevalence of hypertension among black women aged 20 or older was 35.7% 1988-1994, compared to 21.7% among adult white women. This approximately 14% difference in prevalence of hypertension between black and white women persisted through the 1999-2004 time period, with black

women's prevalence reaching 40.8% and white women's prevalence increasing to 26.9% (Cutler et al. 2008).

Research also shows that although men and women from all racial groups have experienced increasing rates of hypertension in recent years, black women continue to have the highest age-adjusted prevalence of hypertension (47%) among black and white men and women in the United States. And white women continue to have the lowest (30.7%) (American Heart Association 2013). Further, these differences in hypertension prevalence between black and white women are greater than differences between black women and black men, between black women and white men, and between black men and white men.

In the US, the over-representation of black women with hypertension is a major public health concern. Because high blood pressure is associated with so many adverse health outcomes, including arterial damage, coronary artery disease, heart failure, stroke, dementia, kidney failure, and premature death (Mayo Clinic Staff 2013), such high rates of hypertension among black women deserve attention. It is imperative to identify the factors associated with the high prevalence of hypertension among black women relative to their white counterparts. Successful identification of such factors could ameliorate racial disparities, not only in hypertension, but also in associated health concerns.

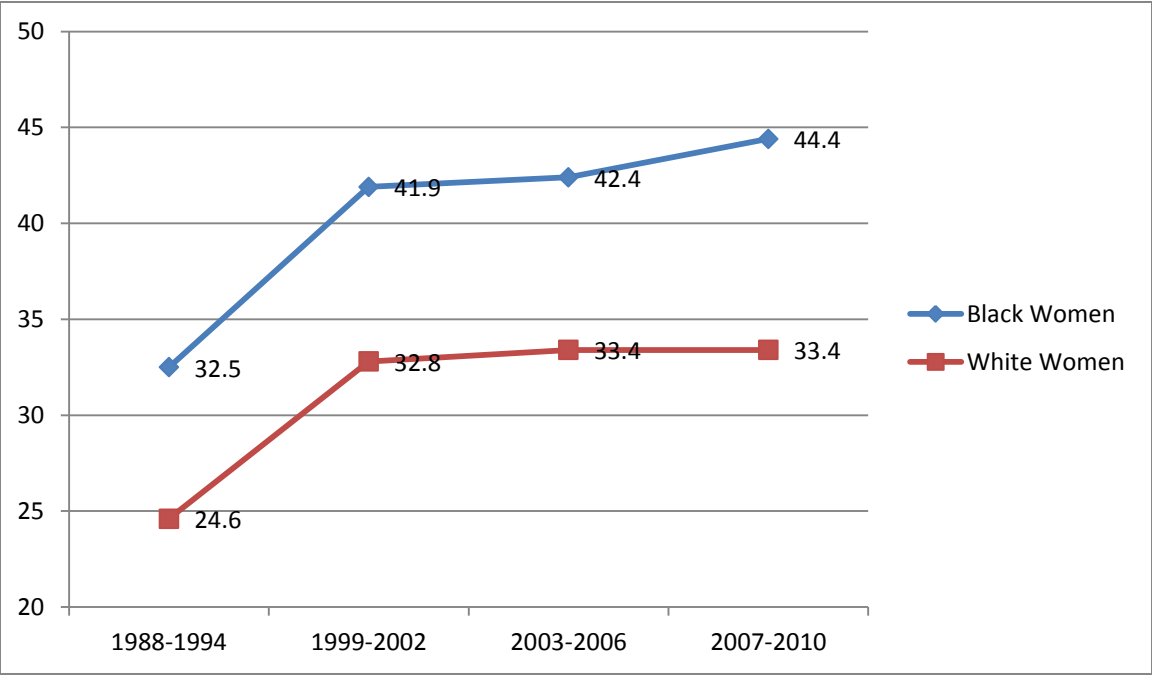
Present Study

Extant research on racial disparities in blood pressure tends to focus on socioeconomic (SES) explanations. It is well-known that health and SES are positively related. Similarly, those of higher SES tend to have lower blood pressure (Colhoun, Hemingway, and Poulter 1998; Brummett et al. 2011). On average, black women have significantly lower SES than white

women (Shapiro 2004; Monnat, Raffalovich, and Tsao 2012), which has been the traditional explanation for the higher prevalence of hypertension among black women. But, even after controlling for several measures of SES, including income and educational attainment, racial differences in blood pressure remain.

This study takes an integrated approach at explaining blood pressure disparities between black and white women, which to date have not been fully explained by SES or other factors. Because certain social support, psychosocial, and contextual factors have been associated with hypertension, and because black women tend to fare less favorably than white women with regard to these factors, I will attempt to explain some of the blood pressure disparities by examining their effects.

Figure 1. Hypertension among Women Aged 20 and over in the United States, 1988–1994 through 2007–2010



Source: National Center for Health Statistics 2013

Because, as discussed above, mechanisms related to hypertension differ for men and women, and because of the remarkable differences in hypertension prevalence between black and white women, I have chosen to focus my investigation on black and white women only. Therefore, in this study I examine some underexplored mechanisms of hypertension among the race/sex group with the highest prevalence, black women, and the race/sex group with the lowest prevalence, white women. I also explore the impact of certain social support, psychosocial, and contextual factors, which tend to be especially common and unfavorable among black women, on blood pressure disparities between these two groups.

I use data from Waves I, III, and IV of the National Longitudinal Study of Adolescent Health (Add Health) (Udry 1998), the largest and most comprehensive longitudinal survey of adolescents ever undertaken in the US. The survey involves a nationally-representative sample of adolescents in grades 7-12 in 1994-95 who are followed in a series of in-home interviews conducted in 1994-95, 1996, 2001-02, and 2007-08.

Using these data, I estimate two sets of multinomial logistic regression models predicting the odds of prehypertension and hypertension. The first set of models is cross-sectional, examining the effects of social support, as well as psychosocial, contextual, and behavioral factors on blood pressure in young adulthood. Because recent research shows lasting effects of early life circumstances on adult health, the second set of models includes adolescent and cumulative social support, psychosocial, contextual, and behavioral factors. My expectation is that these mechanisms will predict hypertension among young adults in both the cross-sectional and life course models, reducing racial disparities in blood pressure between black and white women. However, I anticipate that the life course models will explain a greater portion of hypertension disparities, as racial/ethnic inequalities likely accumulate over time.

This dissertation has important implications for the study of blood pressure among women, for whom hypertension is especially dangerous. Because black women have the highest age-adjusted rates of high blood pressure, and white women the lowest, this research promises to reveal some of the mechanisms underlying these differences, beyond SES and personal health behaviors. An examination of such mechanisms is especially important in examining hypertension disparities between black and white women, as black women generally have less favorable social support, psychosocial resources, and contextual conditions beginning in early life. These mechanisms may produce inequities across an array of adult outcomes, and among the most important of these for longevity and quality of life is high blood pressure.

BACKGROUND

The Traditional Explanation for Racial Disparities in High Blood Pressure: Socioeconomic Status

The traditional and most prominent explanation among epidemiologists and health researchers for health disparities concerns socioeconomic status (SES). Studies repeatedly show that SES influences health, and blood pressure is no exception (Colhoun et al. 1998; Brummett et al. 2011). In fact, because of this strong association, a majority of the research on blood pressure disparities in the US focuses on SES differences between groups. In the US, SES and race are also connected, as blacks continuously fall behind whites on virtually all measures of SES (Shapiro 2004; Monnat et al. 2012). Because SES underlies many major determinants of health, including health care, exposure to unhealthy environments, health behaviors, stress, and access to health resources, it has been suggested that reducing SES disparities between racial groups will reduce racial disparities in health (Kawachi, Daniels, and Robinson 2005).

Theory

Grand Theorists

Three of the major sociological traditions, Marxism, Weberian thought and Functionalism, have influenced the understanding of socioeconomic position in relation to health. According to Marxists, society is stratified into classes defined by one's relationship to the means of production (Lynch and Kaplan 2000). Weberians also posit that society is stratified, but in multiple ways. This tradition holds that class, status, and power all sort people into different and unequal strata which are associated with a corresponding unequal distribution of skills and economic resources (Lynch and Kaplan 2000). Finally, Functionalists view the

stratification of society as natural and essential in modern-day complex societies such as the US (Lynch and Kaplan 2000).

Marxism. According to Marx, social class reveals the hidden basis for the entire structure of a society (Lynch and Kaplan 2000). It is determined by one's relation to the productive means, or productive resources. In a capitalist society such as the US, people engage in commodity production through which they create not only what they and their families need for survival, but also surplus goods to be exchanged in the market. Social classes are created when a small group accumulates a surplus produced by a large class of laborers. And in a capitalistic society, this relatively small group of people is able to exploit those who work to produce the surplus (Lynch and Kaplan 2000). This domination of one group over another and this exploitative relationship between classes is not natural among humans, but it arises from the modes of production characteristic of a capitalistic society.

The Marxist tradition holds that social classes are established in the relationships between groups who are property-owners and control the means of production and those who merely produce and own no property (Lynch and Kaplan 2000). This results in a dichotomy between classes, namely between a dominant class of owners and a nonpropertied subordinate class. And these classes are always in opposition and conflict with one another. The dominant class and the subordinate class have different resources available to them according to their place in society, resulting in members of the dominant class having more health resources and more health knowledge available to them as well. Because, according to Marxian tradition, classes are based on relation to the means of production, with a large segment of the population laboring under difficult and even dangerous conditions, the health of people also

varies according to social class. Marx was concerned with the human cost of exploitation (Lynch and Kaplan 2000), including the health and well-being of those being exploited.

Weberian Tradition. The Weberian tradition focuses on a more diverse array of groups created by capitalism (Lynch and Kaplan 2000). For instance, the working class group has fewer skills, goods, and abilities to exchange labor for income, leaving it at a competitive disadvantage in the marketplace. According to Weber, people in the same class share “life chances,” or common sets of beliefs, circumstances, and values. Unlike the Marxist tradition, Weberian sociologists view class positions as determined by free-market opportunities, not by the relationship to productive resources. To Weberians, class situation refers to the typical set of group characteristics, including economic goods, living conditions, and personal life experiences (Lynch and Kaplan 2000). Class situation is therefore linked with health behaviors and health resources, as health is strongly affected by economic resources, living conditions, and life experiences and circumstances. Weberian thought has led epidemiologists to use measures of socioeconomic status (SES) such as education, occupation, and income because these resources impart knowledge, skills, and other resources that are important for health.

Functionalism. Functionalists suggest that social stratification is a natural and important part of society. Each sector of society is organized into strata according to expendability – i.e., the level of difficulty in finding replacements for workers in a particular sector (Lynch and Kaplan 2000). Menial laborers, for example, are more expendable because their skills are easily replaced – and so they tend to occupy lower social strata. Conversely, highly specialized surgeons are not easily replaced – and so they occupy higher strata.

Functionalists indicate that health disparities between groups coincide with those groups’ level of importance in society. They believe that inequality is not only inevitable, but

also necessary for social functioning. Functionalists suggest that poverty motivates people to take menial jobs associated with unhealthy working conditions, while poor health provides jobs for health care professionals (Trowler 1989). Further, the reason to intervene or to not intervene on behalf of the health of a certain group of people often depends on position in the social hierarchy, exacerbating social health disparities.

Although they take different views on the topic, the traditional sociological theories mentioned above each provide important insights into the associations between SES and health. However, more recent theories have also emerged to provide a framework for understanding these associations, which I turn to next.

Fundamental Cause of Health: Link and Phelan (1995)

Link and Phelan (1995) developed the theory of fundamental causes to explain the persistence of the association between SES and health outcomes, in spite of (a) drastic changes in diseases most prevalent in the population and (b) their proximal risk factors. According to the theory, SES embodies an array of resources, such as money, knowledge, and prestige that protect an individual's health regardless of other circumstances. Higher SES can provide access to resources that help individuals avoid disease risks and minimize the consequences of illness and disease when they occur.

As the theory states, the reason that health is so dependent on SES is that individuals who command the most resources are best able to escape risks, diseases, and the consequences of diseases. These resources affect the health of individuals by influencing whether or not they are aware of, can afford, have access to, and are motivated to participate in health-enhancing behaviors. It follows that, no matter what diseases and corresponding risk factors predominate,

those of higher social standing with the greatest share of important economic and social resources will be less affected by those diseases (Link and Phelan 1995).

The main tenet of fundamental cause theory is that SES-related resources and the utilization of these resources play *the* central role in creating and sustaining SES-based differences in disease and mortality (Phelan et al. 2004). To test this idea, Phelan et al. (2004) examined differences in mortality between different SES groups due to preventable and non-preventable causes and found a greater gap between lower SES and higher SES individuals in terms of preventable deaths, including deaths related to cardiovascular disease, than among non-preventable deaths. In other words, they found that mortality from preventable causes of death, as determined by physician-epidemiologists, was significantly and substantially more strongly associated with SES than mortality from less preventable causes. According to Phelan et al. (2004), these findings imply that when there is little that resources can do to eliminate a certain cause of death, SES has less effect on death rates.

Social Causation and Social Selection Theory

Two competing but ultimately compatible theories explaining the association between SES and health are the social causation theory and the theory of social selection. According to the social causation theory, stress associated with living in a low SES environment increases risk of mental illness and associated conditions. Support for this theory comes from research on the unemployed who have been shown to have an elevated level of distress and physical health problems (Hurst 2007), and experience more frequent uncontrollable life events, which increase the risk of mental illness (Perry 1996). The theory of social selection posits that poor health leads to lower SES attainment. Social selection, or the theory that a person's health can impact

her social mobility, and in turn her position in the social hierarchy, has been suggested as an explanation of social class differences in health (Blane, Smith, and Bartley 1993).

Associations between SES and Health

As indicated, one of the most well-established relationships in social epidemiology is that between health and SES. Studies repeatedly indicate that large socioeconomic disparities exist across a broad spectrum of diseases and illnesses in the US, and these inequalities are ever increasing (Adler and Ostrove 1999; House and Williams 2000). Research shows, again and again, an inverse relationship between SES and poor health outcomes (Salonen 1982; Chesney 1996; Ahnquist, Wamala, and Lindstrom 2012). Whether indicators of health are objective, such as clinically-diagnosed high blood pressure or diabetes, or subjective, such as self-assessed well-being, risk increases as SES decreases (Bailis et al. 2001; Franks, Gold, and Fiscella 2003; Bell, Adair, and Popkin 2004).

SES is such a major factor in health that those living in the poorest areas in the US can expect to live up to fifteen years less than those living in more advantaged areas (Resnick 2013). Whether assessed by education, income, occupation, or wealth, SES has a clear effect on individual health. Education has an impact on a person's career opportunities, which influences income and health care. Occupational status influences health by way of exposure to various types of work environments with varying levels of stressors and compensations (Marmot et al. 1991). And income and wealth afford people the means to purchase health insurance and other important resources, including healthy living environments, healthy foods, prestige and social connections, and memberships at gyms and health clubs. Other important health benefits enjoyed by individuals of higher SES are reduced stress, social prestige and social support, which are all associated with better health and lower blood pressure (Strogatz et al. 1997).

Like most health problems, hypertension is more prevalent among lower SES groups than higher SES groups in the US (Siegrist, Siegrist, and Weber 1986; Marmot and Feeney 1996). For decades, research has found an inverse association between blood pressure and measures of SES across diverse populations in the US (Colhoun et al. 1998). According to the CDC (2008), those living in poverty and close to living in poverty now account for 67.4% of the people suffering from high blood pressure, which is one of the most preventable and modifiable risk factors for heart disease. Present lifestyle modifications include achieving and maintaining a healthy body weight, regular leisure-time physical activity, healthy diet of reduced salt intake and increased potassium intake, smoking cessation, and stress management (Mayo Clinic Staff 2012).

According to the social causation theory, stress associated with living in low SES environments increases risk of mental illness, which is linked with hypertension. Social selection theory suggests that poor health, such as hypertension, leads to lower SES attainment. Finally, fundamental social cause theory indicates that resources and utilization of these resources dependent upon SES are crucial in sustaining SES-based differences in disease (Phelan et al. 2004). Because hypertension is often preventable with appropriate access to information and resources, it is likely that each of these SES-based theories is highly applicable to investigation of blood pressure disparities across SES or other demographic groups with strong SES associations, such as racial groups.

Income, Wealth, and Hypertension

Using data from Wave IV (2007–2009) of the National Longitudinal Study of Adolescent Health, Brummett et al. (2011) found a negative association between SES indicators and blood pressure among young adults. Their analyses indicate an inverse association between household

income and systolic blood pressure (SBP). This inverse association between SES and SBP remained even after adjusting for all measured covariates.

Several studies have examined the impact of income on women's hypertension and found a negative association. For instance, Hoang et al. (2007) report that women's hypertension is related to economic standing, as those in the low and middle income groups had a much greater risk of high blood pressure than women in the high income group (Hoang et al. 2007). Conen et al. (2009) also found an inverse association between hypertension and income among a cohort of female health professionals. After multivariate adjustments, women in the highest income category had an 11% lower risk of BP (blood pressure) progression after 48 months than women in the lowest income category. Adjustment for variables other than BMI and baseline BP had very little impact on these risk estimates, indicating that SES, as measured by income, is associated with blood pressure among women.

Education and Hypertension

It has been argued that education is the most basic component of SES because of its influence on lifetime occupational opportunities and earning potential, which are negatively associated with stress (Adler and Newman 2002). Education also provides life skills and knowledge that allow those with higher levels to gain more access to health-promoting resources and information (Ross and Wu 1995). This implies that educational attainment influences blood pressure via two mechanisms – stress and health-promoting resources.

Braveman, Egerter, and Williams (2011) discuss and elaborate upon these mechanisms, claiming that there are at least three interrelated pathways through which health and blood pressure are affected by education. First, as noted previously, education increases health knowledge and improves health behaviors. The second pathway is through more advantageous

employment opportunities afforded by higher levels of education that are characterized by health care benefits, healthier working conditions, and higher income. Finally, increased levels of education exert a positive influence on psychosocial factors, such as an improved sense of control, social support, and perceived social standing, which have all been associated with lower levels of blood pressure. Non, Gravlee, and Mulligan (2012) also suggest that education might influence BP through healthier personality traits associated with better health.

Consistent with these mechanisms between education and various health outcomes, Sorel et al. (1992) found a negative association between education and diastolic blood pressure among men and women using NHANES II and Hispanic Health and Nutrition Examination Survey data. In this study, associations between systolic blood pressure and education among all women, and between education and hypertension among white women, remained even after adjusting for BMI. Luepker et al. (1993) also reported a negative relationship between education and systolic blood pressure among participants in the Minnesota Heart Study.

A prospective study using data from the Women's Health Survey demonstrated that SES, as measured by income and education, has independent associations with blood pressure progression and incident hypertension among women in the US. After adjusting for multiple factors, both education and income were associated with blood pressure progression, while education was significantly associated with incident hypertension among women who were non-hypertensive at the baseline (Conen et al. 2009). This study reveals a robust relationship between education and blood pressure, even among women with a relatively narrow range of educational attainment. The researchers indicate that the results support the absence of a threshold effect. Even small differences in income and education are related to changes in hypertension risks (Conen et al. 2009). For instance, incident rates of hypertension were 34.9

per 100 among women with a Master's degree, and 27.7 per 100 among women with a doctorate.

Occupational Status and Hypertension

Occupational status is another measure of SES that researchers have linked to health. Occupations differ in terms of prestige levels, rewards, qualifications, and job characteristics, and each of these factors is associated with hypertension (Gregorio, Walsh, and Paturzo 1997). One reason behind this association is that workers in lower-status jobs tend to be exposed to both physical risks, such as occupational injuries and exposure to toxic substances, and psychosocial risks that are generally avoided in higher-status jobs. Lack of control at work and job strain are common among lower status occupations. For example, in the Whitehall study, differences in coronary heart disease incidence across occupational groups were due, in a large part, to differences in job autonomy (Marmot et al. 1997).

Howard and Holman (1970) found that hypertension mortality rates were highest among nonwhites of all ages in the lowest class occupations (laborers). And among whites, the lowest class was associated with the second-highest mortality rates. Further, they reported that, among whites and younger nonwhites, the two highest status occupations were associated with lowest mortality rates due to hypertension.

More recently, Hoang et al. (2007) found that, among a sample of 2000 Vietnamese adults, men in the lowest education category were 2.5 times more likely than men in the highest category to have hypertension. They also found that occupational status was predictive of hypertension among women. Grotto et al. (2006) reported an association between occupational rank and hypertension among a sample of male Israeli military officers between 1991 and 1999. The adjusted means of both systolic and diastolic blood pressure were higher among low-

ranking officers than mid-ranking and high-ranking officers, and these differences widened as ranking increased.

Using data from the Alameda County Study, Levenstein, Smith, and Kaplan (2001) found an association between occupational status and age-adjusted incident treated hypertension between 1974 and 1994 in men and women participants of all racial and ethnic categories. Among men, the odds of hypertension for clerical, sales, or blue-collar workers was 1.5 times higher than white collar, managerial, or professional workers. Among women, this same odds ratio was 1.4. This indicates that both men and women in lower status jobs were at an increased risk of incident treated hypertension in the 20 years following 1974 (Levenstein et al. 2001). When behavioral factors and education were added to the analyses, having a low status occupation was still predictive of hypertension among women.

Associations between Race and Socioeconomic Status

It is clear that socioeconomic status (SES) influences the incidence and prevalence of hypertension. Consequently, the most common explanation for racial disparities in hypertension involves differences in SES. In the US, SES is highly correlated with race, as blacks tend to be disadvantaged, especially compared to whites. For example, blacks are twice as likely as whites to be unemployed (16% vs. 8%) (US Bureau of Labor Statistics 2011), resulting in lower earnings, less health care coverage, and overall lower SES (US Bureau of Labor Statistics 2011). Blacks are also much more likely than whites to live in poverty. According to the US Census (2011), 27.6% of blacks and 9.8% of whites in the US lived in poverty in 2011, meaning that blacks are more than 2.8 times more likely than whites to live below the poverty line. Blacks are also more likely to live in a disadvantaged neighborhood, limiting access to quality schools and other institutions,

quality goods and services, and other important societal resources. No matter the indicator of SES, blacks continue to lag behind whites.

Race and Income

Although most of the 20th century saw a long decline in income inequality in the US, the 1970's brought a reversal in these trends, as income inequality began to rise again early that decade (Lindert 2000). And it has not decreased since. In fact, income inequality in the US is now at an all-time high. Data show that the top 1% of US households now earn 21.3% of all income, compared to only 38.6% received by the bottom 80% of American income earners (Monnat et al. 2012). Most of these disparities result from a drastic increase in top salaries and wages (Saez 2010). According to Saez (2010), a majority of the highest income earners today do not derive their incomes from past wealth but are "working rich," meaning that most of their assets come from current earnings, not from accumulated wealth.

As discussed above, race is highly correlated with SES in the US, as blacks are disproportionately disadvantaged. In 2009, 27.5% of black women and 23.9% of black men lived in poverty, which is much higher than poverty rates for white women (13.5%) and men (11.2%) (US Census Bureau 2009). The racial income gap is not a new phenomenon, as whites have always earned more than blacks in the US. But in recent years, more attention has been paid to income inequality and its important implications for social, mental, and physical well-being (McCall and Percheski 2010; Andrews, Jencks, and Leigh 2011).

Extant research shows that blacks generally earn lower incomes and own remarkably less income-generating wealth than whites (Conley 1999; Gittleman and Wolff 2004; Wolff 2010; DeNavas-Walt, Proctor, and Smith 2011; Taylor et al. 2011). In 1989, the real median household income was \$54,396 for whites and \$31,669 for blacks. Clear disparities persist in

more recent data, as the median income for whites in 2000 reached \$59,586, but rose to just \$38,747 among blacks. By 2007, whites' median income dropped by \$13, but blacks' median income fell by almost \$2,000 to \$36,790. Disparities have continued to grow in recent years; the median household income among US whites in 2011 was \$55,412, and the median income for black households was \$32,229 (current). Also, between 2009 and 2010, household income declined by 5.4% for whites and by 10.1% among blacks. In that year, black households experienced the greatest percentage of household income decline among all racial and ethnic categories in the US (DeNavas-Walt et al. 2011).

Generally, there have been three explanations for the racial earnings gap that persists in the US. The first explanation stresses the importance of human capital attributes, such as education, as determinants of earning potential (Fossett 1984; Farkas and Vicknair 1996; Neal and Johnson 1996; Farkas et al. 1997; Semyonov et al. 2000). Proponents of this theory maintain that blacks' lower earnings are the result of less advantageous human capital attributes. Insufficient human capital among black Americans substantially limits their ability to produce favorable economic outcomes (Monnat et al. 2012).

The second approach to explaining racial differences in earnings blames occupational segregation, suggesting that whites are disproportionately clustered in high status, high skill, and high paying occupations, while blacks are concentrated in occupations of lower status, skill, and pay. Further, as large numbers of minorities enter particular occupations, the wages of all workers in those occupations tend to decrease (Kaufman 1983, 2002; Tomaskovic-Devey 1993; Huffman 2004; Huffman and Cohen Philip 2004).

The third approach to explaining the racial earnings gap in the US considers the prospect that these disparities rise as class-based stratification increases. Research shows the most

dramatic wage increases are concentrated in high-paying occupations in the private sector, which is also where wider racial gaps in income are found (Semyonov and Lewin-Epstein 2009; Monnat et al. 2012).

Racial wage gaps also peak among those with the greatest amount of education (Tomaskovic-Devey, Thomas, and Johnson 2005), and as workers advance in the earnings hierarchy (Grodsky and Pager 2001; Huffman 2004; Morgan and McKerrow 2004; Pais 2011). Occupations at the top of the income ladder are generally client-based, including physicians, lawyers, management and finance. Placement in these types of positions tends to be based more on social networks than on labor production, which is the basis of many lower status occupations (Grodsky and Pager 2001). This gives whites an advantage in higher status occupations since whites are generally more likely to have social connections with others in such positions.

Instead of focusing solely on income from earnings, some measure SES by consumption potential, which is a family's ability to maintain a certain living standard, level of financial security, and security against poverty. The totality of the family's economic resources, not only finances gained from wages and employment income, factor into its consumption potential. So, consumption potential is affected by income from all assets, including property, land, homes, and so on, as well as transfer income.

In the US, there is a great deal of longstanding racial disparity in property ownership, specifically homeownership (Oliver and Shapiro 1995; Wolff 2010; Bocian et al. 2011; Bricker et al. 2011; Taylor et al. 2011), as whites continue to have the highest rates of homeownership, while blacks generally have the lowest. This has been the case for decades and has resulted in a wide racial gap in consumption potential. For instance, by the close of 1996, 71.8% of whites

owned their home, compared to only 44.4% of blacks. Homeownership has since increased for both groups, as 73.9% of whites were homeowners in 2000, compared to 47.8% of blacks. By 2010, nearly three out of every four whites owned a home (74.2%), compared to 44.9% of blacks. Between 1996 and 2010, the rate of homeownership increased by 2.4% among whites, compared to an increase of just 0.5% for blacks, resulting in a slightly increased ratio of white to black homeownership (1.63 vs. 1.64) (US Census Bureau 2013).

The financial advantages provided by homeownership are many. For instance, in the form of home equity, it can act as a source of consumption that can be traded for cash to provide educational advancement, healthcare, and other resources that serve as a form of insurance during times of unemployment or illness (Wolff 2010). This income cushion has clear economic and also likely psychological benefits (e.g., reduced levels of stress), potentially explaining part of the racial gap in hypertension between black and white women.

Race and Wealth

Financial wealth is income-producing assets, such as bonds, stocks, commercial real estate, and businesses. Those with an abundance of wealth enjoy economic independence from the labor market, power, and autonomy because it can be converted directly into cash in the short term, making it useful for investment or consumption (Monnat et al. 2012). In the US, like many modern affluent societies, there is substantial wealth inequality. In fact, wealth is highly concentrated among a small minority. In 2007, the most financially wealthy 1% of US households owned almost half of the financial wealth (47.7%), while the bottom 80% owned only 7% (Wolff 2010).

Although the racial income gap is very wide in the US, the racial wealth gap is even more pronounced. Whites have consistently owned more assets than blacks throughout US history.

For instance, the median wealth of white households in 1983 was \$82,900, compared to only \$5,500 for black households. The ratio of black to white median household wealth that year was 0.066, which was much lower than the ratio of black to white median household income (0.56 in 1982) (Wolff 2010). This indicates that, not only have blacks been disadvantaged in terms of wages and employment-based earnings, but they also own far less in terms of properties, bonds, and other assets that can provide cash flow.

Due to the declines in stock market indices and housing values, median household worth decreased by 35% from 2005 to 2010 for all US households (\$102,844 in 2005 and \$66,740 in 2010). The white-black gap widened greatly during the recent economic downturn, at which time whites fared better than blacks. By 2010, the median household worth of whites reached \$113,149, compared to \$5,677 for blacks (Kochhar, Taylor, and Fry 2011). This resulted in whites being approximately 20 times wealthier than blacks, on average, which is the largest racial gap since the government began collecting such data a quarter of a century ago, and two times the size of the gap before the start of the Great Recession (Kochhar et al. 2011).

There are many variables affecting the current racial wealth gap, as both contemporary and historical factors contribute. Blacks in the US have been deprived of property ownership and income opportunities for many decades due to their enslavement by whites and subsequent discrimination. So, some whites owned property and assets many years before blacks were permitted to do so, giving the former much more to pass along to future generations, which helped to produce and reinforce the racial wealth gap seen today. According to Shapiro, Meschede, and Sullivan (2010), public policies are also partly to blame for the disturbing fourfold increase in the racial wealth gap in recent decades. For example, tax cuts on income inheritances and investments benefit those who are already the wealthiest, shifting

wealth and opportunities away from the poor. Families earning higher incomes, which are disproportionately white, also benefit more from tax deductions on home mortgages, college savings, and retirement accounts.

Race and Education

Blacks also continue to fall behind whites in terms of educational opportunities and outcomes, despite dramatic improvements throughout the 20th century in educational opportunities for most racial and ethnic groups. For instance, almost half (43%) of black students attend schools in areas where household poverty rates exceed 80%, compared to only 4% of whites. Even within the same metro areas, whites generally attend schools with dramatically lower poverty rates than blacks (McArdle, Osypuk, and Acevedo-García. 2010). Lower income schools attended by blacks confer fewer educational advantages and opportunities than schools in higher SES areas, including adequate materials, books, technology, supervision, and instruction.

Poorer schools not only lack important educational resources, but research shows that higher achieving blacks are often exposed to less rigorous curriculums and have teachers with low expectations in terms of academic performance and achievement (Azzam 2008). Teacher expectations have a profound impact on academic performance. Using the Education Longitudinal Study of 2002, Wildhagen (2012) found that the average GPA of black seniors was 0.163 points below what would be expected based on 10th grade reading scores, compared to 0.076 points higher among white seniors. After controlling for student behaviors, attitudes, and characteristics, teachers' expectations of the students accounted for 42% of the difference between white and black students' realization of their academic potential. Failure to capitalize

on academic ability can lead to poorer educational outcomes, contributing to lower SES among blacks in the US.

Recent data indicate that considerable gaps persist in educational attainment between blacks and whites in the US. For example, in 2009, 9.1% of whites between the ages of 18 and 24 had not completed high school and were not enrolled in high school, compared to 11.6% of blacks (US Census Bureau 2012a). That same year, 90% of white adults had at least a high school education, compared to only 81.4% of blacks. Blacks were also much less likely than whites to have completed bachelor's or master's degrees, and almost three times less likely to have earned professional or doctorate degrees (Ryan and Siebens 2012).

Race and Occupational Status

Blacks in the US have a long history of filling positions with low occupational status, and this continues today (Danzinger and Gottschalk 1991; Bound and Freeman 1992; King 1992; Alonso-Villar and del Rio 2013). Data show that blacks are more highly concentrated in low status service sector jobs and less represented in high status managerial and skilled positions. In fact, blacks are employed at 2/5th the rate of whites in professional, managerial, and sales occupations, while their employment rate in service, private household, and laborer occupations is approximately twice that of whites. Further, blacks who do occupy prestigious and higher paying occupations often encounter the "glass ceiling" effect, which describes a blockage in promotion to the highest ranks of most professions (Farley and Allen 1987; Swinton 1987; West 1993). According to DiversityInc (2014), only 6 of Fortune 500 CEOs are black, representing a mere 1.2% of CEOs of Fortune 500 companies.

According to the US Census Bureau (2012b), 41% of employed white Americans worked in managerial, professional, and related occupations, compared to less than a third of employed

blacks. Conversely, blacks were much more likely than whites to be employed in service occupations, as 24% of blacks worked in service sector positions, compared to 14% of whites. Blacks are also overrepresented in production, transportation, and material-moving positions. Further, while blacks make up 10.8% of the working population in the US, only 0.3% of dentists, 5.8% of physicians and surgeons, 4.3% of lawyers, and 6.3% of postsecondary educators are black.

The glass ceiling theory is supported by comparing proportions of black and white workers in each occupational category, separately by educational attainment. For instance, 17.39% of whites with only a high school diploma work in upper-level positions (managerial, professional, and related occupations), as compared to only 12.21% of their black counterparts. And 72.23% of college-educated whites work in these positions, as compared to 68.52% of blacks with a college degree (US Census Bureau 2010). These data show that blacks are over-represented in lower status occupations and under-represented in higher prestige positions, even when controlling for educational attainment.

Associations between Race and Health Persist after Controlling for SES

As indicated, a common view is that because black people typically have lower levels of education (Newburger and Curry 2000) and higher rates of unemployment (Thomas and Hughes 1986) and poverty (Gilens 2009) than whites, racial disparities in hypertension would decrease greatly, or even disappear, if SES differences were eradicated (Markides and Mindel 1987). However, research repeatedly shows that the blood pressure gap between black and white women remains after controlling for SES. For instance, Delgado et al. (2012) found that, among a sample of older black and white women in the US, racial differences in rates of hypertension were reduced, but remained significant (odds ratio = 0.84) after adjusting for education and

income. Similarly, Rooks et al. (2008) found persistent disparities in systolic blood pressure between blacks and whites after controlling for several SES indicators (family income, home ownership, other financial assets, and education).

In a study investigating racial differences in blood pressure among black and white Medicaid recipients in North Carolina, Downie et al. (2011) found that socioeconomic factors did not explain higher rates of high blood pressure among blacks. Instead, racial disparities remained after controlling for SES, access to care, health care coverage, and frequency of office visits, suggesting that factors other than SES and resource availability play an important role in racial differences in blood pressure and hypertension. Finkelstein et al. (2004) also found racial differences in blood pressure between black and white women enrolled in the WISEWOMAN project. The average diastolic blood pressure was significantly higher for black women (79.9) than white women (76.4); after controlling for individual characteristics, such as SES, blacks' levels remained higher than whites' levels. Other research shows a greater prevalence of risk factors for CVD, including hypertension, among blacks than whites at all education levels (Sharma et al. 2004). This further indicates that higher blood pressure among blacks cannot be completely attributed to disadvantaged SES status, as large differences persist after accounting for such influences.

My Explanation for Racial Disparities in High Blood Pressure

Ample evidence indicates that racial disparities in hypertension are not due to SES disadvantages, and research shows that African American ancestry is not inherently related to high blood pressure (Non et al. 2012). Therefore, I argue that factors other than biology or SES must explain blood pressure differences between black and white women. Specifically, I propose

that differences in blood pressure between these two groups are likely due to social support, psychosocial characteristics, and contextual factors. Furthermore, I anticipate that while these factors have cross-sectional effects on blood pressure disparities, cumulative exposure to these factors throughout adolescence could exacerbate racial disparities in hypertension in early adulthood.

My Research: Mechanisms that May Explain the Effect of Race on Blood Pressure

As indicated above, one of the most perplexing and significant health differences between black and white women in the US is the disparity in hypertension prevalence. This disparity exists even among children, many of whom experience blood pressure levels considered dangerous for adults. As discussed, the most common viewpoint is that race is a proxy for social class and blacks' lower SES is the real cause of racial disparities in health. This theory helps explain certain health disparities between blacks and whites, but most disparities persist even when SES is held constant across groups. My approach does not treat race as a meaningful biological category or as just a proxy for SES. Instead, race is seen as a categorizing trait that, in the US, is associated with unhealthy contextual, social, and psychosocial factors that put members of the black "race" at higher risk of hypertension.

One major reason for the adoption of this theory is that race in the US is much more than a simple proxy for social class. Extant research indicates that racial disparities in health occur within each level of SES, as blacks suffer worse outcomes than whites and other racial groups (Reid and Lee 1977). Hypertension is no exception, as black women at all income and education levels are at higher risk than their white counterparts (Hypertension Detection and Follow-up Program Cooperative Group 1977; Cooper and Rotimi 1994), leaving the real causes of hypertension disparities unknown.

It is widely realized that stress is both antecedent to and concomitant with hypertension. Furthermore, increased levels of stress experienced by blacks may be attributable to factors not experienced by whites, such as racism (LaVeist 2002), which may contribute to racial differences in blood pressure in the US. The social oppression and lower relative status of blacks (Wilkinson 2000), along with unhealthy and stressful contextual, social, and psychosocial factors common among black females at all stages of the lifecourse, likely contribute heavily to black women's higher rates of hypertension. I hypothesize that these mediating factors explain a portion of black/white disparities in hypertension in the US.

In the following sections, I will discuss the three types of mediating factors I believe to be associated with disconcertingly high rates of hypertension among black women. These mediating factors include social support, psychosocial characteristics, and contextual factors. I offer theories explaining the associations between each type of factor and higher rates of increased blood pressure among blacks. I also offer evidence regarding the associations between each potential mediator and high blood pressure, as well evidence pertaining to associations between each mediator and race. In doing this, I hope to show how social support, psychosocial characteristics, and contextual factors in adolescence and adulthood may mediate the association between race and blood pressure, which will help explain why black women suffer higher rates of hypertension than their white counterparts.

Social Support

Social support is consistently linked to well-being, health, and decreased risks of mortality (Uchino 2006). It produces changes in immune, neuroendocrine, and cardiovascular function. Epidemiological research shows that social support tends to induce positive "biological

profiles” across these disease-relevant systems (Uchino 2006). Actually, perceived social support is one of the most well-documented influences on physical health outcomes (House, Landis, and Umberson 1988; Berkman et al. 2000; Uchino 2004). Lower levels of social support are associated with higher mortality rates, especially mortality due to cardiovascular disease (Uchino et al. 2012). These associations remain when other risk factors such as health behaviors and demographic characteristics are held constant.

Social epidemiological research on social support examines the quantity of social connections, types of primary relationships, frequency of interactions, and types and quantities of social roles performed. A sweeping review of the literature identified nearly 80 studies that reported negative associations between social support (operationalized as network size or social integration) and mortality (Uchino 2004). Over the past few decades, researchers have investigated the mechanisms through which social support works to improve physical and psychological health and well-being, both as a buffer of stress and through a more direct pathway (Thoits 2011).

Social Support Theories

Classical Theory

It is widely accepted that social support and social integration have positive effects on individual health (Cohen and Syme 1985; Staniute, Brozaitiene, and Bunevicius 2013). The theoretical roots that underlie this body of research can be traced back to the early sociologist, Emile Durkheim. According to Durkheim, individual pathology is a function of social dynamics. In *Suicide*, Durkheim (1897) lays the foundations for understanding the importance of social integration on health outcomes. He also explains how one of the most intimate and psychological acts, suicide, is deeply connected to the patterning of social facts; the underlying

reason for suicide is mostly related to an individual's level of social integration. Anomic suicide is especially related to pathology and is most common among individuals experiencing weak levels of social integration. It occurs when individuals feel alone and disconnected from others, as social values, beliefs, and norms fail to guide individual aspirations (Turner and Noh 1983). Durkheim also found that married people have lower suicide rates than unmarried people across different societies, which he attributes to attachment of the individual to families that offer protection against suicidal acts (Durkheim 1897).

According to Durkheim, individual stress caused by weak social ties promotes suicide, which can easily extend to other health outcomes, including cardiovascular disease and high blood pressure (Berkman et al. 2000). Conversely, social connections can also promote good health, as social integration reduces the risk of high blood pressure and other stress-related conditions by providing social support in times of personal stress. Durkheim suggested that both egoism and anomie weaken social integration, therefore increasing the likelihood of stress-induced health problems. Egoism, or the social isolation of an individual, occurs when an individual lacks social ties with others, such as friends, family members, intimate partners, and other connections (Durkheim 1897). A highly egoistic person is at increased risk for hypertension because she lacks ties to others that help buffer the effects of stressful personal circumstances.

Durkheim also emphasized the health impacts of *anomie*, or the absence of clear social norms and moral regulations, which is most present in times of intense social and personal change. Pathology occurs when, in times without moral guidance or regulation from others, individuals feel socially disconnected. Durkheim believed that drastic life changing events bring a host of unexpected personal issues. For instance, weakening of social integration can lead to poor health resulting from a lack of support necessary in times of intense personal or social

change. Further, anomie represents a major departure from a community's health, leading to a decline in its functioning, resulting in poor health of individual members (Fullilove 1996).

Feelings of powerlessness, alienation, and anomie have also been associated with poor health behaviors and less preventive care. So, following Durkheim's theory, individuals with more friends, more social involvements, and those who are more socially integrated will be better protected from stressors, decreasing the likelihood of experiencing high blood pressure and other stress-induced health concerns.

Contemporary Theories

More contemporary offshoots of Durkheim's theory of social support emphasize the health impacts of social ties. Social support is measured as assistance received, the perception that assistance exists, or the extent to which a person is integrated into a social network. Social support theories highlight four major types of social support: emotional support, companionship support, informational support, and tangible support. Emotional support is the provision of concern, empathy, affection, love, and so on (Slevin et al. 1996; Langford et al. 1997), and it lets people know they are valued and important (Slevin et al. 1996). Companionship support gives a person a sense of belonging (Wills 1991) and acceptance. Both of these types of social support have been theorized to improve cardiovascular outcomes such as hypertension (Uchino 2004). Informational support and tangible support could also limit hypertension incidence through moderating the effects of certain stressors, such as monetary stress, in predicting ABP (Bowen et al. 2013).

Though there are many pathways through which social support promotes health (Uchino, Cacioppo, and Kiecolt-Glaser 1996; Knox and Uvnäs-Moberg 1998; Berkman et al. 2000), of special relevance to this study are the psychological (Bowling and Browne 1991;

Holahan et al. 1997) and physiological mechanisms (Uchino 2006). For instance, evidence shows that insufficient social support is associated with depressive symptoms, which contribute to high blood pressure (Heard et al. 2011). Social support, especially perceived emotional support, is protective against the development of depressive symptoms in times of stressful life events (Paykel 1994). In other words, those who are more socially isolated, or those with fewer social ties and connections, are at increased risk of depression and associated cardiovascular outcomes, including hypertension (Henderson 1981).

Social support also has direct physiological effects that impact blood pressure levels. For example, Kamarck and Jennings (1991) found that, in the midst of stressful life events, the availability of social support decreased systolic and diastolic blood pressure levels among study participants. Other studies have demonstrated that social support alters the relationship between stress and hypertension (Uchino et al. 1996; Berkman et al. 2000). Those with more social ties are guarded against the harmful effects of stress, including hypertension, while individuals with fewer ties are not afforded such protection.

Social support theories generally include two major models to describe the association between social support and health: the buffering hypothesis and the direct effects hypothesis (Turner 1981; Cohen and Willis 1985). According to the buffering hypothesis, social support protects people from the harmful effects of stressful life events, such as financial struggles or the loss of a spouse (Cohen and Willis 1985). The theory is supported when associations between poor health and stressful events are stronger among those with inadequate social support than among those with adequate levels of social support. On the other hand, the direct effect hypothesis states that social support is beneficial at all times. So, regardless of stress levels, this model suggests that people with more social support are generally in better health

than people with less support (Cohen and Willis 1985). Research shows that perceived social support offers both buffering effects and direct effects for mental health outcomes (Lakey and Cronin 2008), which has implications for physical health and blood pressure in particular.

Stress and Coping Social Support Theory. The stress and coping social support theory explains the buffering effects of social support. It suggests that social support plays an important role in protecting an individual's health against stress by altering how she perceives and copes with it. Accordingly, events are stressful to the extent that they are accompanied by stressful and negative appraisals that are not dealt with successfully (Folkman 1984). Social support encourages healthy, adaptive appraisal and coping, minimizing harmful effects of stress (Cohen and Willis 1985; Thoits 1986). Research has shown that the buffering effects of social support are associated with a reduction in the prevalence of a host of cardiovascular diseases (Marmot and Syme 1976; Harburg, Blakelock, and Roeper 1979; Reed et al. 1982, 1983). The main mechanism through which this association occurs is that people with more social resources are better guarded against deleterious effects of stress (Cobb 1976), including hypertension (Dressier 1983).

Relational Regulation Theory (RRT). Relational regulation theory (RRT) explains the main, direct effects between perceived social support and mental health, which cannot be explained by the stress and coping theory (Lakey and Orehek 2011). Perceived social support, which is generally higher among individuals with more social ties and higher degrees of satisfaction with relationships, has been found to have both buffering and direct effects (Wethington and Kessler 1986). RRT hypothesizes that the experience of sharing commonplace conversations and activities with others, rather than through conversations concerning tactics to deal with stress, helps people regulate their emotions and affords mental health protection

(Lakey 2010). The providers of support, topics of conversation, and activities that aid in the regulation of emotions are mainly a matter of personal taste, which makes them relational, an important characteristic of perceived social support (Lakey 2010).

RRT differs from stress buffering theory in that the latter stresses enacted support, whereas RRT emphasizes normal, although affectively important, social interaction. Also, stress-buffering theory predicts that perceived support works as a stable resource that protects mental health in the face of difficult life events that span the life course. By contrast, RRT posits that changes in both perceived social support and mental health are the immediate byproducts of social interaction (Lakey and Cronin 2008).

Theories Explaining the Associations between Race and Social Support

Wilson (1987). In "The Truly Disadvantaged," Wilson (1987) argues that past discrimination and migration to large metropolitan areas have worked to keep the urban minority population relatively young and create a weak labor force among urban blacks. Particularly since 1970, these factors have made blacks especially vulnerable to the geographic and industrial changes in the economy. Despite the passage of antidiscrimination legislation and the creation of affirmative action programs, several features of the modern US economy affect blacks' labor force participation. For instance, the polarization of the labor market into high and low wage sectors, a shift from goods-producing to service-producing industries, the relocation of manufacturing industries out of central cities, innovations in technology, and episodic recessions have led to increased rates of joblessness among blacks (Wilson 1987).

As joblessness has increased, so has the concentration of economically disadvantaged people, the number of poor single-parent families, and welfare dependency, which are especially prevalent among impoverished minority populations living in less diversified

neighborhoods common in ghettos in large cities (Wilson 1987). The end of the 20th century has seen an especially large increase in outmigration of working-class and middle-class families from inner-city neighborhoods, as these families were previously restricted to the inner cities by discriminatory covenants in higher-status suburbs and city neighborhoods (Wilson 1996). This outmigration, combined with rising joblessness in inner cities, has severely concentrated poverty in inner-city neighborhoods (Wilson 1987).

According to Wilson (1987), the inner-city underclass is perpetuated by social isolation. Outmigration of whites and middle and upper class blacks has decreased contact between groups of different class and racial backgrounds, concentrating the adverse effects of living in impoverished neighborhoods among ethnic minorities and blacks in particular. The amount of social support available to inner city blacks is negatively affected by this concentration of poverty and disadvantage. For instance, insufficient job networks and access to jobs, lack of involvement in quality schools, the paucity of suitable marriage partners, and the lack of exposure to informal mainstream social networks and conventional role models severely limits the social support available to residents of these areas. So, as Wilson (1987) states, while the factors related to the recent increases in social dislocation of blacks in the US are multifaceted, they are tied to social (and economic) afflictions that limit social support within impoverished black populations.

Code of the Streets (Anderson 1999). According to Anderson's code of the streets theory, blacks in the US disproportionately live by codes and unwritten laws of the street. These informal rules dictate the everyday norms and mores of those living in inner city and low-income areas mostly inhabited by blacks. Interpersonal public behavior, including violence, relationships, and social interactions are all governed by these codes, which prescribe both a

proper demeanor and a proper way to respond if challenged by others. These rules control and encourage the use of violence and therefore allow aggressive individuals to legitimately precipitate violent encounters (Anderson 1999).

According to Anderson (1999), knowledge of the code is mainly defensive and literally necessary for navigating in the public. Families socialize their children into the code and encourage their familiarity with its norms and values to enable them to negotiate their neighborhood environments. The skills required for survival in such neighborhoods are primitive in nature, and are more related to rudimentary survival skills in comparison to the skill set required for mainstream survival and success. In fact, brutal savagery plays a central role in the daily politics of street survival, as the hostile environment occupied by many blacks in the US undermines humane and analytical processes (Anderson 1999). This hostility and defensiveness encourage a lack of trust and support among neighbors and residents of such areas, decreasing social support and healthy social connections.

The issue of respect, which is defined as being treated “right,” or granted the deference one deserves, is at the center of the code of the streets (Anderson 1999). In difficult urban environments occupied disproportionately by blacks in the US, people feel subjected to forces beyond their control. The amount of respect one deserves becomes problematic and ambiguous, further opening the issue of respect to forceful interpersonal negotiation (Anderson 1999). In street culture, especially among young people, respect must be guarded constantly, as it is seen as an external entity that is difficult to gain but easily lost. With the issue of respect being so important in the lives of these individuals, it is difficult to create and maintain meaningful and healthy social relationships, as people are constantly on the defensive against attacks on their sense of self and respect.

The code of the street provides a framework for earning, negotiating, and maintaining respect. For example, with an adequate amount of respect, one can evade "being bothered" in public. But if a person is "bothered," he is disgraced or "dissed" and disrespected (Anderson 1999). Because slights in mainstream society do not carry the same connotations or consequences as those occurring in inner city areas, those living by the code of the street are generally more defensive and sensitive to insults than the rest of society. So, cohesion, cooperation, and trust are relatively low in many inner city areas. Accordingly, blacks' socialization into the code of the streets discourages formation of supportive social ties and quality, healthy relationships.

Evidence Linking Social Support to Blood Pressure

Social support encompasses both the quality and quantity of a person's social contacts and support (including emotional support). Research shows that low levels of social support are associated with all-cause mortality and other adverse health outcomes. Much evidence shows that social support has a direct role in health, but research also suggests that it acts as a buffer against numerous environmental stressors to decrease disease susceptibility (Alloway and Bebbington 1987). Hemingway and Marmot (1999) reported that, of eight prospective cohort studies investigating associations between social support and coronary heart disease, five showed protective effects. Uchino et al. (1996) also reported associations between social support and cardiovascular outcomes, including hypertension. The potential mechanisms linking social support to cardiovascular health involve social (e.g., stress buffering), psychological (e.g., affective states), and behavioral (e.g., health-promoting) processes (Cohen and Willis 1985).

The association between blood pressure and social support is partly mediated by psychological reactions to stress. For example, in stressful times, social support helps people

reduce psychological distress, which otherwise could lead to anxiety, depression, and other adverse psychological conditions (Taylor 2011). Individuals with lower levels of social support report more clinical and sub-clinical symptoms of depression, anxiety (Cohen and Willis 1985), post-traumatic stress disorder (Brewin, Andrews, and Valentine 2000), and panic disorder (Huang, Yen, and Lung 2010) than those with higher levels of social support, and each of these psychological conditions has been linked with increased blood pressure.

There is much research suggesting that social support increases self-efficacy, and that self-efficacy is one of the psychological pathways through which social support minimizes negative health outcomes (Cutrona and Troutman 1986). Self-efficacy, defined as the level of confidence to perform certain tasks or behaviors, is associated with a number of health risks, including hypertension (Bandura et al. 1988). In fact, Bandura et al. (1985) found that participants with high self-efficacy had lower heart rates and lower blood pressure levels than those with low self-efficacy.

At a social psychological level, family social support has been shown to help regulate blood pressure (Uchino et al. 1996). For example, Spitzer et al. (1992) found associations between physical proximity to a family member and lower ambulatory SBP and DBF. Further, interventions with hypertensive patients that are directly supported by family members confirm the importance of familial sources of support on blood pressure regulation (Uchino et al. 1996). Dressier (1980) reported an interaction effect between number of siblings and levels of life stress for SBP and DBF, as individuals with more siblings and low levels of life stressors had the lowest blood pressure. Cohen and Willis (1985) also reported buffering effects of close interpersonal relationships on cardiovascular regulation.

At a more behavioral level, part of the association between social support and cardiovascular function may be a result of health-related lifestyle factors (Umberson and Montez 2010). For example, social support may be associated with better cardiovascular regulation because individuals high in social support engage in better health practices (healthier diets and more physical activity, and so on) (Uchino et al. 1996). Data from the Alameda County study indicate a steady gradient between social isolation and the prevalence of unhealthy behaviors that are associated with hypertension, including tobacco and alcohol use, obesity, and physical inactivity (Berkman et al. 2000).

Social Ties

The quantity and quality of social ties impact mental health, physical health, health behaviors, and mortality risk. Compared to their more isolated peers, socially connected individuals tend to live longer and healthier lives. For instance, House et al. (1988) found that individuals with few social ties were more likely to die than those with greater social involvement. Similarly, Berkman and Syme (1979) reported that the risk of death among men and women with the most social ties was more than two times lower than those with the fewest ties, even when taking other factors into account that influence mortality, such as socioeconomic status and health behaviors. Brummett et al. (2001) found that individuals with medical conditions also benefit from social connections. They reported that socially isolated adults with coronary artery disease had a risk of subsequent cardiac death almost 2.5 times greater than their counterparts with more social ties.

Not only are social ties associated with mortality, but also with several health conditions and their biomarkers. Several studies show that low quantity or quality of social ties increases the likelihood of cardiovascular disease, atherosclerosis, recurrent myocardial infarction,

autonomic dysregulation, cancer, and high blood pressure (Robles and Kiecolt-Glaser 2003; Everson-Rose and Lewis 2005; Uchino 2006; Ertel, Glymour, and Berkman 2009).

Behavioral explanations also suggest that social ties influence health behaviors. For example, Berkman and Breslow's (1983) Alameda County study linked formal and informal social ties with more positive health behaviors over a ten-year period. Social ties influence health behaviors partly because they impact health habits, for better or worse (Umberson and Montez 2010). Social connections tend to give individuals a sense of responsibility and concern for others, encouraging them to engage in behaviors that protect their health. Social ties also provide health information and establish health-related norms that can influence health habits, in turn influencing physical, mental, and emotional health, and mortality (Umberson and Montez 2010).

Other explanations argue that social ties influence health via a variety of psychosocial mechanisms, including social support, personal control, symbolic meanings and norms, and mental health (Umberson and Montez 2010). These mechanisms are related and complex, and their interconnections may explain the linkage between social ties and health better than any one can alone (Umberson and Montez 2010). Social support, or the emotionally sustaining qualities of relationships, such as a sense that one is loved and cared for, has been shown to be beneficial to mental and physical health (Cohen 2004). Social support has also been shown to impact health indirectly by improving mental health, reducing the impact of stress, and by adding meaning and purpose to life (Cohen 2004).

Physiological explanations emphasize research showing that social ties impact physiological functioning, including blood pressure, heart rate, and stress hormones (Uchino 2006). For instance, McEwen and Stellar (1993) reported that immune, endocrine, and

cardiovascular systems all benefit from supportive interactions. Social processes affect health beginning at birth and they unfold over the entire life course, as children raised in emotionally supportive environments benefit from long-term positive effects on health. Childhood environments impact the development of healthy regulatory systems, including metabolic, immune, and autonomic nervous systems (Taylor, Repetti, and Seeman 1997). Adults also benefit from continued social support as it reduces physiological responses, such as cardiovascular reactivity, to existing and unexpected stressors (Glynn, Christenfeld, and Gerin 1999).

Friends, family members, and other social ties likely impact health by encouraging health-promoting behaviors, health care utilization, and medication adherence through social control (Kinney et al. 2005; Molloy et al. 2008). More frequent interaction with others might also give rise to more opportunities to monitor or influence health behaviors, as network ties can provide health information (Kinney et al. 2005; Perry and Pescosolido 2010). For instance, “storytelling” among friends and family members about health experiences increases health knowledge (Kim et al. 2011).

Loneliness, or the lack of meaningful social ties, is also a major risk factor for hypertension among adults, which can lead to an increased risk of death from heart disease or stroke (Hawkey et al. 2006). In a diverse sample of 229 adults aged 50 to 68, Hawkey et al. (2006) found that those who perceived themselves as lonely had blood pressure levels as much as 30 points higher than those who were not lonely. This association remained even after taking other risk factors into account, including symptoms of stress and perceived stress. After examining data on weight, consumption of alcohol, blood pressure medication, smoking, and demographic factors, lonely people still had higher levels of blood pressure than non-lonely

participants. According to the data, increases in blood pressure associated with loneliness were similar in magnitude to reductions in blood pressure achieved through weight loss and physical activity among hypertensive individuals.

Research shows that loneliness is related to peripheral vascular resistance among young people (Cacioppo et al. 2000), which is associated with an increase in blood pressure (Manrique et al. 2009). In a study of 2,632 female and male undergraduate students, Cacioppo et al. (2000) found that, even though both lonely and non-lonely people experience stress, the groups differ in their reactions. Lonely people tend to perceive stressful circumstances as threatening rather than challenging. They also tend to cope with such circumstances passively rather than actively, as they are less likely than non-lonely people to solicit instrumental and emotional support from others. Lonely individuals are also more likely to withdraw from stress instead of attempting to solve their stressful problems. The stress response characteristics of lonely people cause increased resistance to blood flow, resulting in increased blood pressure among lonely people, as compared to non-lonely people (Cacioppo et al. 2000).

In a review of research on the association between social ties and blood pressure, Cacioppo and Hawkey (2003) found that social connectedness impacts health by buffering stress and by aiding in repair and maintenance. The studies showed that, although socially isolated individuals experienced no more everyday stressors than more connected people, they perceived daily events as more stressful. Socially isolated individuals also showed less efficient repair and maintenance of physiological functioning, as they tended to experience poorer sleep efficiency and slower wound healing (Cacioppo and Hawkey 2003).

While some effects of social ties are immediate, others slowly develop over time. For instance, at any given point in time, ongoing social ties affect mental health and health behavior

both positively and negatively. Although it is possible that these effects dissipate over time, recent work on the effects of disrupted, distressed, and emotionally unsupportive childhood environments on adult health shows that in some cases these effects resonate throughout the life course (Crosnoe and Elder 2004; Palloni 2006). Poor social ties and chronic isolation and loneliness in childhood take an increasing toll over time on a variety of health indicators, including allostatic load (Seeman et al. 2002) and blood pressure (Cacioppo et al. 2002).

Marital Status

For most adults, marriage is a central factor in their lives and has a substantial impact on well-being and health. Data show that married adults experience lower rates of mortality and morbidity than unmarried adults, and married individuals report greater satisfaction with life, more happiness, and lower risk of depression (Holt-Lunstad, Birmingham, and Jones 2008). Women who are married enjoy better physical and psychological health, while formerly married women report the worst health, and never married women tend to fall between these groups (McDonugh, Walters, and Strohschein 2002). Continuously married adults are at decreased risk of cardiovascular disease compared with those not married, which is partly due to psychosocial supports provided by marriage, as discussed above (Zhang and Hayward 2006).

Research has shown that marital histories shape a variety of health outcomes, including chronic conditions, mobility, self-rated health, mental health, and cardiovascular disease (Hughes and Waite 2009). The symbolic meaning attached to certain social ties, such as marriage and other personal relationships, might explain these associations (Umberson and Montez 2010). For example, meanings attached to marriage and relationships can foster an enhanced sense of accountability to a loved one, and an increased sense of responsibility to stay healthy in order to better provide emotional, physical, financial and other types of support, thus

encouraging healthier lifestyles (Umberson and Montez 2010). Partners can also impact health behaviors directly by monitoring, regulating, or facilitating certain behaviors (Waite 1995).

Married individuals have important advantages with regard to hypertension diagnosis. This is partly because married people tend to have better health insurance and they tend to use better hospitals than their nonmarried counterparts (Iwashyna and Christakis 2003; Montez, Angel, and Angel 2009). Therefore, hypertensive married people tend to get diagnosed sooner than their unmarried counterparts, providing married individuals with more favorable prognoses after the onset of disease (Reyes et al. 2007).

Marriage can reduce certain risky health behaviors tied to increased blood pressure. Because married people are generally in close daily contact with their spouses, they are in a unique position to persuade, monitor, or remind one another to adopt health-promoting behaviors (Umberson 1987; Lewis and Rook 1999). Spouses can also help one another in managing their hypertension medication, making important dietary changes (Gallant, Spitze, and Prohaska 2007) and encouraging healthy lifestyles (Gorin et al. 2008). For instance, Bachman et al.'s (1997) longitudinal research based on the Monitoring the Future Study shows that a decrease in the frequency of heavy drinking, smoking, and marijuana use are associated with entry into first marriage among men and women. Also, these behaviors increase at the time of divorce, then decrease again with remarriage. These effects of marriage and divorce have been shown to extend into the mid-thirties (Merline et al. 2004). In fact, marriage discourages smoking, drug use, and heavy drinking even after controlling for previous health behaviors. Duncan, Wilkerson, and England (2006) tested the effects of race on such associations and found that marriage discouraged risky health behaviors to a similar extent for blacks and whites.

In a study designed to evaluate the association between blood pressure and marital status among 2,271 Polish men, Lipowicz and Lopuszanska (2005) assessed the risk of hypertension after adjusting for BMI among otherwise healthy participants. Results from multifactorial logistic regression models showed independent effects of marital status (never married vs. currently married) on the risk of hypertension. Men who had never been married had an average SBP and DBP higher than the married men, even though the married men had higher BMIs than the never married men. Even after making adjustments for different lifestyle, demographic, and SES variables, never married status was significantly predictive of high blood pressure. Although controlling for such factors did not diminish the association between blood pressure and marital status among their participants, the researchers suggest that marital differences in dietary intake (especially sodium and potassium intake), economic aspects of living without a partner, and psychological status (prolonged stress and low social support) might help explain the marital disparities in blood pressure and the risk of hypertension in men (Lipowicz and Lopuszanska 2005).

Volunteer Activity

Volunteering gives individuals the opportunity to interact and work with others in the community. It is one of the best ways to meet new people, make new friends, and strengthen relationships through commitments to a shared activity. It can also strengthen one's ties to the community and widen one's support network while increasing exposure to people with similar interests, neighborhood resources, and fulfilling activities (Saisan, Smith, and Kemp 2013).

Recent research has shown that volunteering has a positive effect on both mental and physical health. According to Sneed and Cohen (2013), older adults were at a significantly lower risk of developing hypertension if they performed 200 hours or more of volunteer service in the

past year. During a 4-year follow-up, participants who volunteered had 40% lower odds for incident hypertension than those who did not volunteer, and this association was independent of race, age, baseline health, sex, education, marital status, baseline blood pressure, and other variables (Sneed and Cohen 2013).

To examine the association between volunteer activity and hypertension, Burr, Tavares, and Mutchler (2011) estimated regression models of hypertension status on volunteer activity, as well as psychosocial and health behavior risk factors for middle-aged and older adults. They found that volunteers had lower systolic and diastolic blood pressure and hypertension risk than non-volunteers. Neither psychosocial variables nor health behaviors mediated this relationship, and there was no evidence for the existence of moderating effects of volunteering for the associations between health behaviors and hypertension (Burr et al. 2011). Other research finds similar effects of volunteerism among white participants, but no statistically significant relationship between volunteering activity and hypertension among blacks, suggesting race differences in the effect of volunteerism on risk of hypertension (Tavares, Burr, and Mutchler 2013).

Employment Status

For many employed adults, workplace relationships evolve into friendships and a source of social support, especially in times of stress (Allan 1989). Particularly for those who live alone or are not involved in other social activities, the workplace can be a setting to meet friends, socialize, and gain important stress-buffering social support. Research shows that losing a job because of an establishment closure increases the odds of fair or poor health by 54%. Further, among respondents without preexisting health conditions, losing a job increases the odds of a new health condition by 83% (Strully 2009). Unemployed Americans are also more likely than

working Americans to experience adverse psychological conditions, such as depression, sadness, and worry (Claxton and Damico 2010).

Evidence Linking Race to Social Support

Research indicates that certain groups of people tend to have larger intimate networks than other groups. For instance, women generally have larger social networks than men, and whites' networks are usually larger than blacks'. Those of lower SES, who are disproportionately black, also tend to have fewer and less beneficial social ties, leaving blacks doubly disadvantaged (Umberson and Montez 2010). Those with more education are usually involved in larger networks than their less educated counterparts. Also, individuals who engage in more activities, such as those with higher levels of education, tend to be more socially engaged, leaving blacks at further disadvantage in terms of social connectedness (McPherson, Smith-Lovin, and Brashears. 2006). Variations in the quantity and quality of social ties influence health disparities because both size (Brummett et al. 2001) and diversity (Cohen et al. 1997) of social connections are beneficial to health, as more social ties give individuals more options from which to connect, receive social support, and gain health information (Umberson and Montez 2010). Racial differences in social support may help explain the racial gap in high blood pressure that persists after controlling for individual-level SES.

Almost 30 years ago, Stewart and Vaux (1986) suggested the importance of examining racial differences in social support because of the stressful environments faced by blacks in the US, which is partly due to their overrepresentation in the lower social strata. Studying social support among blacks is also important because blacks are less likely than other groups to use formal support services to help deal with the negative effects of stress on well-being and health. According to Stewart and Vaux (1986), the importance of social support for well-being might be

greater among blacks than whites, as they likely need, and can benefit more from, the support of others.

Social Ties

For decades, comparative studies have indicated that blacks' non-kin social networks tend to be smaller than those of whites (Ball et al. 1980; Gaudin and Davis 1985; Ellison 1990). Also, ethnographic research shows that blacks' social networks tend to lack supportiveness and durability (Liebow 1967). Racial differences in patterning and style of social penetration have also been uncovered (Altman and Taylor 1973), as research shows that blacks tend to deepen and broaden the content of disclosure to friends more slowly than whites during the early stages of friendship formation, hindering formation of social ties (Dimond and Hellcamp 1969; Littlefield 1974).

Data from the 1985 GSS show that whites had larger social networks than blacks (Marsden and Hurlbert 1988). In fact, of all races, whites' networks were the largest (mean size 3.1) and blacks' were the smallest (mean size 2.3). Pugliesi and Shook (1998) also found that, relative to whites, blacks have less frequent contact with friends, relatives, and neighbors.

In a study of 75 black and 101 white college students in the 1980s, researchers assessed whether or not race impacted the receipt of social support among men and women. Participants were asked to list network members who provided each of five types of support: practical, emotional, social, advisory, and financial. They were also asked to indicate the type and frequency of interaction with network members, perceived levels of support received, availability of supportive behaviors, and inclination to use support resources. Findings revealed that black women have fewer friends and less emotional support from friends than white women (Stewart and Vaux 1986).

More recent research suggests similar differences in social support between black and white women. For instance, Griffin et al. (2006) find that race significantly affects social support factors among women. Multivariate models indicate that, relative to white women, black women report fewer close relationships, mostly due to fewer close friends and fewer visits with friends. These findings are similar to previous findings on racial differences in social ties. For instance, Pugliesi and Shook (1998) found that blacks have smaller networks than whites and Roschelle (1997) reported low levels of social support among blacks.

Marital Status

Since the 1960's, there has been a retreat from marriage in the US. Over the past several decades, age at first marriage has increased and a greater proportion of the population is now expected to never marry (Fischer and Hout 2006). Shifts in the prevalence of marriage and the increasing age at entry into marriage have been far greater for blacks than whites, resulting in widening racial gaps in marital status (Fischer and Hout 2006). For instance, 81% of white women between the ages of 25-29 had married in 1980, compared to slightly over 63% of black women (Schneider 2011). Though the proportion of whites and blacks ever married declined at every age for the next 20 years, the decline was far greater among blacks, exacerbating previous disparities. By 2000, the percentage of white women ever married between the ages of 25-29 declined to 68%. The decline was much greater for blacks, however, as the prevalence of marriage among black women in this age range plummeted to 38% in 2000 (Schenider 2011).

Research shows that more than one-third of black women currently in their thirties will never marry (Teachman, Tredow, and Crowder 2000; Lichter and Qian 2004). Unfortunately, the documented health benefits of marriage also vary by race (Umberson and Montez 2010), as

blacks tend to experience more marital strain (Umberson et al. 2005) and benefit less financially from marriage than whites (Willson 2003). Nevertheless, because marriage generally provides some health advantages, the relatively low rates of marriage among black women might explain some portion of racial health disparities, including differences in hypertension rates (Green et al. 2012).

Volunteer Activity

Studies show consistent gendered and racialized volunteering practices among Americans. Women tend to volunteer more than their male counterparts, regardless of socio-demographic characteristics (White 2005). Also, whites are more likely than blacks to volunteer (Gallagher 1994; Musick, Wilson, and Bynum 2000; White 2005). However, among volunteers, the amount of time devoted to volunteering activities is higher among blacks than any other racial or ethnic group (Tang, Copeland, and Wexler 2012). In terms of different types of volunteer activities, whites are more likely than blacks to volunteer formally (Gallagher 1994). Higher rates of volunteerism among whites are likely due to the greater probability that they are asked to volunteer and to accept invitations to volunteer (Musick et al. 2000).

Nevertheless, blacks are more likely than whites to volunteer to help friends (Gallagher 1994). Blacks are also more likely than whites to volunteer in a wider variety of activities that are more discretionary in nature (Musick et al. 2000). For instance, blacks volunteer in church activities more often than whites, which is perceived by many blacks as obligatory (Musick et al. 2000).

The coupling of racialized volunteering practices along with the racialized prevalence of hypertension suggests that the relationship between health and volunteering might also be race-specific (Tavares et al. 2013). Because whites have more expansive opportunities and

requests for volunteering (Musick and Wilson 2008), they also have more opportunities to extend their social networks (Tavares et al. 2013). Increased social interaction and expanded networks among whites might contribute directly to healthier lifestyles and enhanced medical observance, as well as to a greater sense of perceived social support, leading to better health (Cohen 2004). However, research suggests that volunteering produces more psychosocial benefits for blacks than for whites (Tang et al. 2012). In addition, a stronger association between volunteering and self-reported health was found among older blacks compared to older whites, which suggests that older blacks have more to gain from volunteering. Older blacks also report stronger feelings of empowerment from community engagement compared to older whites, which likely contributes to improved physical and emotional well-being among older blacks (Tang et al. 2012).

Employment Status

Unemployment in the US is also a racialized phenomenon. In the noninstitutionalized population, US blacks at all education levels are consistently less likely to be employed than all other racial and ethnic groups. White women and men have had lower levels of unemployment than their black counterparts for decades. For instance, 50.7% of white women and 48.1% of black women were employed in 1985. In 1995, this slight disparity rose to 56.1% and 53.4%, respectively. By 2010, 54% of white women and 51.7% of black women were employed (US Department of Labor 2011).

Moreover, black women have had higher unemployment rates than white women for decades. As of 2010, the unemployment rate for black women was 13.8% and the unemployment rate for white women was 7.7% (US Department of Labor 2011). With the positive association between unemployment and blood pressure, the higher rates of

unemployment among black women are likely contributors to the higher rates of high blood pressure and hypertension among black women in the US.

Psychosocial Factors

Adverse psychosocial factors, such as depression, perceptions of discrimination, hostility, and negative attitudes have been linked with health, especially cardiovascular disease (Matthews, Gallo, and Taylor 2010). For instance, current depressive symptoms, major depressive symptoms, and a history of depression are all linked with risk of CVD morbidity and mortality. In addition, hostility and anger are associated with subclinical cardiovascular disease (Everson-Rose and Lewis 2005). Evidence shows that psychosocial factors might act alone or work in clusters, and they can affect health at various stages of the lifecourse (Kuh and Ben-Shlomo 1997).

Psychosocial factors affect health through more than one pathway. For instance, psychosocial conditions can influence health behaviors, including diet, alcohol consumption, smoking, and physical activity, which all affect cardiovascular health and hypertension (Pieper, LaCroix, and Karasek 1989). Psychosocial factors also affect physical health directly by causing acute and/or chronic pathophysiological changes (Hemingway and Marmot 1999).

Psychosocial Theories

Classical Theory

Although Max Weber's assertion that people behave according to their interpretations of the meaning of the world is the origin of symbolic interactionism, the perspective was introduced to the US and further developed by George Herbert Mead in the 1920s (Anderson and Taylor 2009). According to the symbolic interaction perspective, the symbolic meanings that

people develop and rely upon in the process of social interaction are more important than the actual events (Anderson and Taylor 2009). Those who adhere to this perspective analyze society by addressing the subjective meanings that people impose on objects, events, interactions, and behaviors. It is assumed that subjective meanings are paramount because individuals act based on what they believe and not just on what is objectively true. Therefore, society is socially constructed by individuals' interpretations called "definitions of the situation" which are used by people to understand what is expected of them and others in a situation (Anderson and Taylor 2009). Individuals' definitions of specific situations give them a sense of the roles and statuses involved so they know how to think, behave, and act. According to the theory, it is not what is actually occurring in society that is important in determining individual or group behavior, action, and perception, but rather interpretations of events that are most relevant.

Herbert Blumer (1969) identified three core principles of symbolic interactionism: meaning, language, and thought. These principles contribute to the creation of an individual's self and socialization into a larger community. The first core principle, meaning, suggests that people act toward other people and things based on the meanings that they have given to those people and things. According to symbolic interactionism, meaning is central in human behavior. Language, the second core principle, is the means by which humans negotiate meaning through symbols. Mead believed that meaning was assigned through naming, which is the basis for human society and the extent of knowledge (Griffin 1997).

The third core principle of symbolic interactionism, thought, determines each individual's interpretation of symbols. Based on language, thought is a mental conversation in which role taking is necessary. It entails people imagining different points of view. According to Blumer (1969), meaning itself is not inherent in objects or actions, as it arises when people

interact with one another (Griffin 1997). Meanings take place in the context of relationships within families, communities, and other groups. They are dealt with in and modified through an interpretive process used by individuals as they handle other people or things they encounter.

According to symbolic interactionism, people naturally use language to talk to themselves to sort out the meaning of situations. The emphasis on symbols of language, negotiated meaning, and social construction of society are related to the roles people play. Because of the improvisational quality and uncertainty of roles in social contexts, the burden of role-making is on the person in each situation and depends on her interpretations and perceptions. So, people are proactive participants in their environments, and they base their beliefs, thoughts, feelings, and actions on their own unique psychosocial factors, perceptions, and interpretations (Garfinkel 1967). Symbolic interactionism suggests that once people define a situation as real, it is real in its consequences.

Following this theory, psychosocial factors are important in every aspect of a person's life, including her thoughts, beliefs, and health. It has been reported that, compared to white women, black women in the US perceive more negative experiences daily, such as racism and discrimination in housing, medical care, and the workplace (Krieger and Sidney 1996). Although these perceptions might or might not be based entirely in reality, they have real consequences, such as their impact on blood pressure and other health measures.

Contemporary Theories

Relative Deprivation Theory (Wilkinson 2000). According to Wilkinson (2000), relative deprivation is central to both mental and physical health. Following the principles of symbolic interactionism, actual situations are not as important as individual perceptions. In societies where absolute deprivation is low, it is generally not the actual deprivation from resources that

is harmful, but rather perceptions of inferiority or deficiency that are most related to health and emotional problems.

As discussed previously, socioeconomic inequality is pronounced in the US and many other modern affluent societies. Income and especially wealth are highly concentrated among a small minority (Wolff 2010), which exacerbates relative deprivation. This leads to greater differences in social status between members, as well as an increase in authoritarian-type relationships between people of different classes (Wilkinson 2000). According to Wilkinson (2000), this type of social environment fosters social relationships based on power and coercion, in which most of the valuable political, social, and material resources go to the strongest, and distribution of the rest is established by power differentials based on potential for conflict (Wilkinson 2000). In contrast, more egalitarian societies, which are much less stratified than the US, have social relationships based on cooperation, social obligations, and equality.

According to Wilkinson (2000), attached to the social relationships within a society are corresponding social strategies that help members navigate the social system. The US and other highly unequal societies have social strategies that help people navigate relationships based on dominance. In these types of relationships, people are exploited by those more powerful whenever possible, the strong prey on the weak, and everyone strives to advance in social status (Wilkinson 2000). Such strategies are self-interested, highly antisocial, and very stressful, especially for those at the lower end of the social hierarchy. Unequal social environments are also likely to promote violence, weak community relations, and poor health, especially among those least advantaged.

The social environment created by economic inequality leads to a host of deleterious psychosocial conditions, such as stress, deprivation, depression, insecurity, aggression, shame,

and social anxiety, which are all associated with ill health, including elevated blood pressure. And although not everyone living at the lower end of the spectrum is living in dire poverty, the less advantaged suffer as a result of their relative deprivation. Even though most people work fewer hours in jobs that are less physically taxing than in the past, stress is the most common cause of sickness-related absences and the most common reason for consulting a physician. In fact, the most prescribed types of drugs are now psychoactive drugs or painkillers, which are used to combat depression, sleeplessness, anxiety, and other stress-related problems (Wilkinson 2000). All of these conditions related to relative deprivation have clear implications for hypertension, as discussed previously.

Reserve Capacity Model. Like most valuable resources, healthful environments and experiences are distributed unevenly in the US, causing disadvantaged groups and individuals to endure more frequent exposure to threats, risks, ambiguity, daily hassles, and major life events (Matthews et al. 2000; Hatch and Dohrenwend 2007). According to the Reserve Capacity Model developed by Gallo and Matthews (2003), low SES affects health partly through stress and concomitant negative emotions, which negatively influence bio-behavioral functioning. Further, low SES may cause increased physiological and emotional reactivity to stress, including heightened blood pressure, resulting from a lack of psychosocial resilience or “reserve capacity.” In addition, psychosocial resources might represent a direct mediational link from SES to health (Gallo 2009).

According to this model, social status affects psychosocial factors that are responsible for many health disparities in the US. Less privileged groups, including blacks, are not only forced to deal with more psychosocial stressors, but they are also more likely to experience negative appraisals of their situations, further increasing stress burden. In fact, it has been

shown that disadvantaged and lower SES individuals (Chen et al. 2004) and those with previous exposure to racial discrimination (Broudy et al. 2007) interpret even ambiguous social interactions and events in a negative light, and low SES individuals consider their social worlds as relatively unfriendly and hostile (Gallo, Smith, and Cox 2006).

As the Reserve Capacity Model suggests, enhanced vulnerability reflects insufficient psychosocial resource reserves that could potentially work to diminish negative appraisals or facilitate adaptive coping (Gallo et al. 2008). Of special importance are interpersonal and intrapersonal resources that may be particularly scarce among racial minorities and other disadvantaged groups. For instance, members in disadvantaged groups are more likely than others to be exposed to negative psychosocial factors, including discrimination, which could diminish trust and limit opportunities for supportive social interaction that would benefit their health and well-being (Gehlert et al. 2008). Evidence that psychosocial resources relate directly to physical and mental health and well-being (Singer and Ryff 1999; Cohen, Gottlieb, and Underwood 2001) suggests that they may partially explain health disparities between blacks and whites (Gallo et al. 2008).

A Theoretical Explanation for Associations between Race and Psychosocial Factors

According to the Code of the Streets theory created by Anderson (1999), minority status and social disadvantaged underlie the deleterious psychosocial conditions faced by blacks in the US. Anderson suggests that financial instability, social isolation, and racial discrimination encourage deviant, antisocial, and unhealthy attitudes and behaviors that give rise to the street code. These conditions are also related to perceived discrimination, low self-esteem, hostility, and anger experienced by blacks, and the negative work environments in which they often spend their days.

Anderson states that “street” families living in black neighborhoods have disorganized lives filled with anger, hostility, antisocial behavior, and physical altercations. Children experience and learn these attitudes and behaviors from an early age as parenting strategies often include verbal insults and harsh, inconsistent punishments entrenched in the code of the street. Children growing up in these environments are socialized to behave in such ways, encouraging their adoption of the attitude that violence can be used to gain and maintain respect.

According to the theory, racial discrimination against blacks in the US fosters the street code. In fact, the code is in part a cultural adaptation to a deep mistrust of police and the judicial system. The police are frequently perceived as representing the dominant white society, which is not concerned with protecting black, low-status residents. Regardless of whether or not it is actually the case, many blacks, especially those living in the inner city, believe that the police will not respond when they are called. This leads many blacks to believe that they must be prepared to defend themselves and their family members against aggressors.

With perceptions of inadequate police protection, the local status system shows deference to the strong, which translates into a sort of physical and psychological domination. So, “street justice” takes over where respect for the law is lost, emphasizing the cultural need for street credibility. This volatile situation, along with perceived discrimination, encourages perceptions of injustice and helplessness among blacks. And this environment leads to the development of hostile, angry attitudes, as well as low self-esteem and feelings of apathy and depression. Anderson states that individuals living in these conditions are victims of a lack of quality jobs, the stigma of belonging to the black race, the effect of widespread drug use and drug trafficking, and consequential alienation and lack of hope for the future. In sum, the

environment fostered by the code of the streets promotes negative psychosocial conditions among those living in such areas, who are disproportionately black.

Evidence Linking Psychosocial Factors to Blood Pressure

The effects of psychosocial risk factors on health, and on blood pressure in particular, are well documented. Research shows that such factors may influence health either directly, through biological responses to stress, or indirectly, through health-related behaviors (Siegrist and Marmot 2004). Studies generally indicate that favorable psychosocial conditions are related to better health, while poor conditions are damaging to health and contribute to health inequalities (Egan et al. 2003).

Evidence linking psychosocial factors to elevated blood pressure comes from a variety of sources. For instance, Marmot (1985) reports that hypertensives show heightened responsiveness to mental and emotional stimuli. In fact, the hemodynamic characteristics in unstimulated hypertensives are similar to those of stressed nonhypertensives. Hypertension rates vary by social class and racial group, and with societal modernization and with acculturation from rural to more modern environments (Marmot 1985).

According to Kamarck et al. (2002), a variety of psychosocial factors are associated with acute fluctuations in ambulatory blood pressure (ABP), or blood pressure measured at regular intervals, in healthy adults. This study also shows that psychosocial factors are associated with mean ABP differences between adults over a period of 6 days. Measures of psychosocial demands, including negative affect, arousal, task demand, decisional control, and social conflict, are each independently associated with fluctuations in ABP during the day, and these associations persist after adjustments for physical activity, posture, and substance abuse. In addition, measures of task demand and decisional control impact mean ambulatory SBP, and

these associations persist after controlling for DBP. Kamarck et al. (2002) argue that psychosocial factors could be used to predict ABP. It is also likely that psychosocial factors contribute to racial and social disparities in blood pressure.

Depression

Mental stress, or an adverse interaction between an individual and his or her environment, may play a role in the development of hypertension and coronary heart disease. This stress can originate from a variety of places, including the inner self (Pickering 2001). According to psychological health research, negative affect may manifest itself as depression, anxiety, anger, hopelessness, violence, or hostility – and is also related to hypertension and coronary heart disease. While a common factor linking all of these traits is a perceived loss of control over one's life and environment, the most important component of negative affect in terms of hypertension development is depression (Pickering 2001).

Several studies have provided convincing evidence for the causal link between depression and hypertension. For example, using NHANES follow-up data, Jonas, Franks, and Ingram (1997) found that anxiety and depression are associated with a markedly increased risk of hypertension among both blacks and whites. But the increase in risk was not equivalent, as it nearly doubled for whites, but almost tripled for blacks (Jonas et al. 1997). This was the first prospective study to show that anxiety and depression can predict hypertension many years into the future.

In a subsequent study, Jonas and Lando (2000) found that hypertension was influenced by negative affect among several groups, but its predictive power was greatest among black women. Other independent studies have provided support for increased risk of hypertension development among those with higher levels of depression. For instance, Davidson et al. (2000)

found that a high depression score doubled the risk of hypertension, relative to those with lower levels of depression. However, the relationship was dependent upon subjects' race; when the participants were stratified by racial category, it became clear that blacks were responsible for the strong positive relationship between depression and development of hypertension. Once stratified, the models showed that depression tripled the risk of hypertension among blacks, but had no effect among whites (Davidson et al. 2000).

Anda et al. (1993) examined associations between depression, hopelessness and ischemic heart disease in a cohort of US adults between the ages of 45 and 77 with no previous history of the disease or of serious illness. They found that after an average follow-up of 12.4 years, and after adjusting for demographic variables and several risk factors, depressed affect and hopelessness were both related to fatal ischemic heart disease. The relative risks of fatal ischemic heart disease among those who were moderately and severely hopeless were 1.6 (95% CI = 1.0-2.5) and 2.1 (95% CI = 1.1-3.9), respectively (Anda et al. 1993). Hopelessness and depressed affect also increased the risk of nonfatal ischemic heart disease, suggesting that both depression and hopelessness play a causal role in occurrence of fatal and nonfatal coronary diseases (Anda et al. 1993).

Personality Characteristics

Another aspect of negative affect is anger. Chronic anger often includes hostility, which consists of cynicism and mistrust. Hostility has predicted elevated blood pressure in various studies, and many have reported that it is an independent risk factor for coronary heart disease (Pickering 2001). Anger is a trait that is very difficult to measure, as it varies over time within the same individual. Everson et al. (1998) indicate that both anger-in and anger-out, which describe the two extremes of the anger expression scale, are associated with a nearly twofold risk of

developing hypertension. This means that people who are angry often, whether they express it or hold it inside, are at an increased risk of hypertension (Everson et al. 1998).

Research shows that trait anger, a personality trait characterized by persistent angry feelings (Spielberger et al. 1983), is associated with hypertension even among adolescents (Groër et al. 1994) and children (Hauber et al. 1998; Howell et al. 2007). In a study of 639 adolescent black males, Johnson et al. (1987) detected positive associations between trait anger and systolic blood pressure. Johnson (1990) then replicated this finding in another study of 489 adolescent males. Similarly, research on children has indicated a positive relationship between diastolic blood pressure and trait anger in boys (Howell et al. 2007).

Patterns of anger expression, including anger suppression, anger-out, and anger reflection/control, have also been associated with blood pressure in many studies (Siegel 1984; Johnson et al. 1987; Groër et al. 1994; Hauber et al. 1998; Mueller, Grunbaum, and Labarthe 2001; Starner and Peters 2004; Howell et al. 2007). For instance, Siegel (1984) and Starner and Peters (2004) found relationships between repeated anger directed outward and SBP and DBP. Others have detected associations between suppressed anger and both SDP and DBP (Johnson 1984; Johnson et al. 1987). Among a group of third-graders, Hauber et al. (1998) noted significant negative associations between diastolic blood pressure and anger suppression, and between both systolic and diastolic blood pressure and anger reflection/control.

Spicer and Chamberlain (1996) investigated the individual and combined effects of cynical hostility, anger-in, anger-out, and anger frequency on resting blood pressure among men and women. Results from multiple regression models indicate positive associations between DBP, SBP and hostility among women only. The authors suggest that this sex-specific association between hostility and blood pressure might reflect an ongoing incongruity between the social

cognitions of cynically hostile women and some of the cultural norms that govern women's social lives in the US (Spicer and Chamberlain 1996).

Perceptions of Discrimination

Research suggests that both the psychological and physiological responses to discrimination are comparable to those of other psychosocial stressors (Dion, Dion, and Pak 1992; Thompson 1996). For example, exposure to racist acts via viewing videos of discriminatory behavior in a laboratory setting is associated with psychological reactivity and increased cardiovascular responses among blacks (Jones et al. 1996; Morris-Prather et al. 1996). In a study designed to explain the black-white disparities in elevated blood pressure, Krieger and Sidney (1996) examined the relationship between self-reported experiences of racial discrimination and blood pressure among 4086 black and white men and women between the ages of 25 and 37 enrolled in the CARDIA study. They found that 80% of the black women and men reported experiencing racial discrimination and unfair treatment, which explained the racial differences in blood pressure among study participants under certain circumstances (Krieger and Sidney 1996).

Research has also shown that diminished nocturnal blood pressure dipping is tightly associated with self-reported perceptions of discrimination (Tomfohr et al. 2010). In order to understand this association between nocturnal blood pressure and discrimination, Tomfohr et al. (2010) assessed 24-hour blood pressure levels among hypertensive and normotensive black men and women, as well as their self-reported experiences of daily discrimination. Blacks in the sample had much higher sleeping DBP than whites, and they had slightly less SBP dipping, with significantly less DBP dipping. They also had higher rates of everyday discrimination than their white counterparts. The researchers found a significant inverse relationship between reports of

discrimination and dipping levels, suggesting that everyday discrimination mediates associations between race and blood pressure (Tomfohr et al. 2010).

According to some, the apparent link between racial discrimination and blood pressure involves anger stimulation in those who perceive discriminatory or racist acts (Arriola and Jacob 2002). Blood pressure might remain elevated after exposure to racist stimuli, increasing the likelihood of hypertension (Guyll, Matthews, and Bromberger 2001). A related hypothesis is that individuals who experience more incidents of racial discrimination also suffer increased blood pressure levels and have a greater likelihood of developing hypertension. This idea is based on conventional theories of stress and the potential for it to impact health negatively through deleterious physiological responses (Rahe, Mahan, and Arthur 1970; Folkman 1984). According to stress and coping theories proposed by Lazarus and others (Fumo et al. 1992; Profant and Dimsdale 2000), an individual's appraisals of, and coping behaviors associated with, stressors mediate their effects. Whatever the pathways may be, extant research shows an association between perceived discrimination and blood pressure.

Religiosity

A growing number of studies have detected significant associations between religious involvement and blood pressure (Buck et al. 2009). Higher degrees of religiosity (Hixson, Gruchow, and Morgan 1998; Walsh 1998), spirituality (Buck et al. 2009), and religious coping (Hixson et al. 1998; Steffen et al. 2001) are all associated with lower odds of hypertension. Further, people who indicate higher levels of religious involvement tend to have lower SBP and DBP and a decreased risk of hypertension (Buck et al. 2009). Others find that frequency of attendance at religious services inversely affects the odds of hypertension (Livingston, Levine, and Moore 1991; Gillum and Ingram 2006). Also, engaging in various religious activities, such as

praying and studying the Bible, are associated with lower blood pressure (Koenig et al. 1998). The ties between religiosity and blood pressure extend outside of the US, as research abroad finds similar associations (Timio et al. 1988; Fonnebo 1992).

However, many studies suggest that there is no connection between religiosity and hypertension, at least when considering certain indicators of religiosity. For instance, one study finds no association between church attendance and hypertension (Buck et al. 2009). Also, Koenig et al. (1998) fail to detect significant associations between hypertension and various organized and non-organized religious activities and intrinsic religiosity measures. Additionally, Brown and Gary (1994) report that religiosity, measured by affiliation, service attendance, and scores on a 10-point religiosity scale, is not related to self-reported hypertension among a sample of black males. Although findings are mixed, most research suggests an inverse association between religiosity and hypertension.

Evidence Linking Race to Psychosocial Factors

Many have suggested that racial differences in nocturnal BP dipping, when blood pressure drops below daytime values, and other racial differences in blood pressure levels, likely reflect psychosocial influences. This theory dovetails with explanations of minority health status in the US, in which sociocultural factors are stressed over genetic and biological influences in determining the greater prevalence of most major health problems among minority groups, and blacks in particular (Anderson, McNeilly, and Myers 1992; Johnson et al. 1995).

For psychosocial influences to result in racial differences in hypertension, they must be unequally distributed by race and they must be risk factors for increased blood pressure or CVD (Schwartz et al. 1994). Data show that blacks in the US experience negative psychosocial influences more often than whites. In fact, extant research suggests that racial differences in

psychosocial stress, brought about by difficult conditions commonly experienced by blacks in the US, including denial of respect, experiences of loss or failure, lack of common dignity and courtesy, and being perceived as inferior, may plausibly mediate associations between race and BP (Ituarte et al. 1999).

Depression and Self Esteem

Depression is a common and disabling psychiatric disorder in the US. In fact, its economic burden in the US alone was estimated to be \$83 billion in 2000 (Greenberg et al. 2003). Although the relationship between depression and race is complex, research suggests that blacks are more depressed and hopeless than whites (Anda et al. 1993). They are also in greater need of, have less access to, and tend to receive poorer quality mental health services than whites (US Surgeon General 2001). In fact, results from the National Comorbidity Survey (NCS) indicate that after diagnosis, blacks are more likely to be persistently depressed than whites (Breslau et al. 2005).

Williams et al. (2007) also report that depression tends to be more severe and persistent among blacks than in whites in the US. In this study of 3,570 black and 891 white adults, they found that when major depressive disorder affects blacks, it is usually left untreated and is generally more disabling and severe than the same disorder among whites. According to the study, the burden of mental health disorders in the US, especially depressive disorders, is likely higher among blacks than whites.

In addition to depression, blacks in the US may also suffer from lower self-esteem than whites. According to one study, the widening health gap between blacks and whites is influenced by low self-esteem among blacks, which is attributable in part to racism (Lee 1989).

In fact, the medical community has linked higher rates of cardiovascular problems, including hypertension, among blacks to self-defeating behaviors that may stem from poor self-esteem.

Personality Characteristics

Some attitudinal and dispositional characteristics appear to be racialized. Research suggests that blacks in the US are less satisfied with their lives, are less happy, and experience higher degrees of anomie than whites (Williams et al. 1997; Hughes and Thomas 1998). Black Americans also experience more negative emotions such as anger in everyday life (Ross and Van Willigen 1996; Mabry and Kiecolt 2005) and, consequently, black women tend to be more mistrusting than white women (Tindle et al. 2009). Blacks are also more likely than whites to express cynicism (Durel et al. 1989; Scherwitz et al. 1991), and this remains true even when economic hardship is held constant across groups (Ross and Van Willigen 1997). These differences are likely due to the historical and social circumstances that blacks have experienced in this country (Scherwitz et al. 1991).

Blacks also report the least agreeableness, the greatest negativism, and the greatest verbal hostility of all racial groups in the US (Maier et al. 2009). Research shows that blacks in the US have a generalized mistrust and a suspicion of whites (Terrell and Terrell 1981; Bullock-Yowell, Andrews, and Buzzetta 2011). This cultural mistrust (Bullock-Yowell et al. 2011) among blacks can affect interpersonal relationships between people of different racial groups, as well as feelings of self-efficacy among blacks. Relatedly, black teens tend to be more pessimistic than white teens, which is largely attributable to racial discrimination and perceived tensions in race relations. Specifically, black teens believe that racism will negatively impact their lives (Brown and Wallace 2001), creating pessimism about their futures.

Perceptions of Discrimination

According to a recent poll, 74% of blacks and 30% of whites in the US said they experience racial discrimination, and most blacks indicated that it happens occasionally or often (ABC News 2009). These perceptions are not without cause, as 51% of Americans expressed anti-black sentiments in a 2012 poll, which is an increase from 48% in 2008 (NBC News Associated Press 2013). In fact, blacks report discrimination and unfair treatment in many aspects of life. For instance, most blacks (76%) report that they are treated unfairly by the police and that they are made to feel unwelcome by store clerks based on their race (60%). Further, over one-third (35%) of blacks polled indicate that they were denied employment because of their race and one-fifth said their skin color was the reason why they were denied housing. A strong majority (76%) of blacks reported at least one type of racial discrimination, and 44% experienced two or more. In fact, most black and white Americans feel that we have yet to achieve racial equality in the US (80% and 62%, respectively) (ABC News 2009).

Associations between psychosocial stress and perceived discrimination and racism are possible explanations for persistently high rates of hypertension among US blacks (Krieger and Sidney 1996; Harrell, Merritt, and Kalu 1998; Clark et al. 1999). Researchers have suggested that social stress, especially as it relates to racism, may account for a portion of the difference in hypertension rates between blacks and whites (Thomas and Dobbins 1986; Krieger 1990; Anderson et al. 1992; Anderson and Armstead 1995; Williams and Collins 1995). Study findings suggest that perceived racism and discrimination influence acute elevations in vascular reactivity, eventually leading to hyperreactivity, changes in vasculature structure, baroreceptor alterations, and eventually hypertension (Anderson, McNeilly and Myers 1993).

In a study investigating associations between perceived racist treatment and hypertension, black women who generally accepted and kept quiet about unfair treatment were 4.4 times more likely to report hypertension than women who talked to others about their unfair treatment or took action against it (Krieger 1990). No such association existed among white women. The age-adjusted risk of high blood pressure among black women who reported one or more instances of race- and gender-biased treatment was 2.6 times lower than those who reported no such instances. According to the researchers, this suggests that not reporting race discrimination and responding to it internally might constitute risk factors for heightened blood pressure among black women (Krieger 1990). Given the pervasiveness of perceived race-based discrimination in the US and the connection between discrimination and increased levels of blood pressure, it is likely that the elevated blood pressure seen in black women is partly attributable to experiences of discrimination.

Religiosity

There is a host of well-established literature on racial differences in religiosity (Thompson, Thomas, and Head 2012). Research suggests a greater importance of the role of the church attendance and religiosity among black Americans when compared to whites (Musick, Wilson, and Bynum 2000; Krause 2003; Brown 2006; Fiori et al. 2006; Oates 2012). Blacks report higher service attendance, reading of religious texts, watching or listening to services, feeling close to God, and commitment to religious beliefs (Musick 2000; Hunt and Hunt 2001; Sherkat 2001; Taylor, Chatters, and Levin 2004). This relationship between race and religiosity seems to hold for adolescents, as well. For example, black adolescents in the US are more likely than white adolescents to attend church, describe themselves as very religious, and use religious coping styles (Molock and Barksdale 2013).

Many explanations for this emphasize the utility of religion as a coping mechanism for black Americans (Oates 2012), as religion has historically been an important institution supporting black Americans in the face of discrimination and lesser economic and social opportunities (Musick et al. 2000). Religiosity among blacks has also been useful in facilitating socioeconomic progress (Oates 2012), which historically has been thwarted by various manifestations of racism (Krause 2003; Schieman et al. 2006). Historically, the black church has served as a social hub for the American black community (Krause 2003), partly because it is the only American institution that is built, financed, and controlled exclusively by blacks (Krause 2003). It is also useful in facilitating and mobilizing community activism aimed at social and economic equality (Pattillo-McCoy 1998; Brown 2006) and it provides cultural values, such as harmony, collective responsibility, sameness, and cooperation among members (Krause 2003). Studies suggest that religious commitment enhances self-esteem, life satisfaction (Levin, Taylor, and Chatters 1994; Ellison 1998), and mental and physical health (Ellison 1995; Musick 1996) for black Americans.

Contextual Factors

Extant research indicates that certain neighborhood conditions impact health negatively, including blood pressure (Mujahid et al. 2008). Neighborhood problems such as noise, overcrowding, and violence may increase stress among residents (Elliot 2000), which can lead to increases in blood pressure by impeding physical activity and through direct physiologic stress responses.

In addition, exposure to communities with high levels of violence may affect cardiovascular health through physiological and psychosocial mechanisms (Wilson, Kliever, and

Sica 2004). Empirical evidence shows that exposure to violence contributes to the development of hypertension. Although the exact mechanisms underlying the positive association between violence and blood pressure are unknown, there is some evidence that elevated sympathetic nervous system activity might be involved in the process (Wilson et al. 2004).

Contextual Theories

Classical Theory

Many people have theorized about social and environmental inequalities between groups of people and the impact that these conditions can have on health. The seminal text on the influence of the environment on health is *Airs, Waters, Places*, written by Hippocrates in the fifth century BC (Wear 2008). According to Hippocrates, the environment is crucial in determining the types of illnesses, diseases, and health conditions a group of people will suffer. For instance, he suggests that the season of the year is very important, as each season has different effects on health. Other important aspects of the context in which one lives are the temperature of the winds, the quality of the waters, and its situation, in terms of its relation to the winds and the rising of the sun (Hippocrates 1988).

Hippocrates also indicates that the manner in which inhabitants live and their pursuits impact their health. For instance, eating and drinking habits and fondness of exercise and labor impact health of a community's residents (Hippocrates 1988). Even the type of political regime was important in determining the physical conditions of inhabitants, as Hippocrates considered those who lived under monarchy to be less competitive and more slavish than those who were independent. He also suggested that well-being, health, and strength could be improved by suitable laws affecting their regime (Hippocrates 1988). So, theorizing about the impact of context and environment on health began centuries ago.

Contemporary Theories

Beginning with its roots in the Hippocratic tradition, the notion that context impacts both individual and group health is centuries old (Macintyre and Ellaway 2003). However, the past two decades have seen a substantial increase in theoretical work investigating the role of contextual factors in the creation and maintenance of health and health disparities (Cummins et al. 2007). Because neighborhood context subsumes social relations and physical resources, sociologists and epidemiologists have argued that place of residence is relevant for variations in health between groups (Jones and Moon 1993; Kearns 1993; Macintyre, Maciver, and Sooman 1993).

According to Sampson (2003), it is important to understand neighborhood determinants of health and well-being. Social characteristics, such as SES, family structure, residential stability, racial/ethnic composition, resources, safety, and violence vary widely and systematically across communities. Social stratification (Massey 1996) and health conditions also vary across communities, suggesting that the two may be linked. In the 1920's, researchers found that urban areas characterized by residential instability, poverty, and dilapidated housing suffered from many problems, including high rates of infant mortality, mental illness, low birth weight, physical abuse, and other factors detrimental to health (Shaw and McKay 1942). Researchers continue to report similar findings today.

An increasing body of research links community characteristics to variations in individual-level health. Even after taking into account individual attributes and behaviors, many studies find evidence that health risks are linked to environmental context (Robert 1999). Relatively consistent findings in research examining community effects on health, especially for violence (Earls and Carlson 2001; Sampson, Morenoff, and Gannon-Rowley 2002), indicate that

the two are related. Such findings reveal considerable inequality between neighborhoods across several dimensions of socioeconomic status. Also, social dysfunctions and health problems, including but not limited to violence and high blood pressure (Sampson 2003), often cluster at the neighborhood level. These two phenomena are themselves related so that community predictors of individual health often include violence, as well as concentrated poverty and/or affluence, racial segregation, family disruption, residential instability, and poor housing quality.

The environmental differentiation of US society by factors such as social class, race, and health is a salient phenomenon that is apparent at multiple levels of geography, including neighborhoods, local communities, and even larger areas. Finally, the relationship between contextual factors and many health outcomes exists even after controlling for individual-level risk factors. In all, research suggests that there are important associations between health and context (Sampson 2003).

Structural Characteristics Model. According to the structural characteristics model, place of residence is linked to the prevalence of mental health conditions and associated physical health concerns, including high blood pressure. Structural characteristics include the demographic features of a population, such as the proportion of residents living in poverty, the percentage of families with high-risk characteristics, the distribution of racial and ethnic characteristics, and population turnover rate (Wandersman and Nation 1998). The simplest structural models compare variations in these neighborhood characteristics with variations in the rates of particular outcomes. More complex structural models include mediating variables to help explain how contextual factors influence health outcomes. The structural characteristics model has gained support from several studies examining the effects of distressed neighborhood conditions on social problems (Wandersman and Nation 1998).

Neighborhood Disorder Model. Another theory proposed to explain the link between contextual factors and mental and physical health is the neighborhood disorder model. This model posits that the physical and social deterioration of neighborhoods is linked with health outcomes. The model considers the effect of neighborhood incivilities on perceptions of safety and mental health (Wandersman and Nation 1998). Physical incivilities include markers such as litter, dilapidated and unsafe houses, abandoned buildings, unkempt areas, and vandalism. Social incivilities include activities and behaviors such as public drunkenness, street harassment, gangs, drug dealing, and noisy neighbors. Most of these activities and incivilities are called “soft crimes” (Wilson and Kelling 1982), as they lie somewhere between acceptable behavior and serious illegal activity.

Even though some behaviors might not be illegal, they are still problematic because they create obstacles to setting and enforcing appropriate norms associated with healthy environments. For instance, unpleasant neighbors who taunt others and who are loud and disrespectful in public might violate noise ordinances. Such offenses do not involve criminal intent and are potentially merely a reflection of differences in lifestyle and cultural preference among individuals (Wandersman and Nation 1998). However, because such behaviors are not necessarily illegal, there is usually no systematic response to these offenses by police, allowing them to persist and potentially affect the health of residents. Another characteristic of social disorders that hinders effective responses is that many observers are usually involved, which often diffuses responsibility to respond. And if someone does respond, the response is usually in the form of a general concern, decreasing the likelihood of a direct and immediate response. This is especially true for residents’ fear of crime and victimization (Lewis and Maxfield 1980; Skogan and Maxfield 1981; Box, Hale, and Andrews 1988; Perkins and Taylor 1996).

Adherents to the neighborhood disorder theory argue that fear of crime might itself be a mental health outcome because of its effect on behavior and health (Halpern 1995). Others suggest that anxiety and stress resulting from ongoing fear may result in psychopathological outcomes (White et al. 1987). In fact, research shows a positive relationship between crime perception and depression and anxiety, which are associated with high blood pressure. Data also show that exposure to neighborhood crime is strongly associated with symptoms of somatization (White et al. 1987).

Environmental Stress Model. Much research indicates that mental and physical health problems, including increased blood pressure, are associated with stress-related processes related to major life events, daily hassles, and catastrophes. The environmental stress model holds that contextual factors, such as elements of the ambient and built environment, are related to mental health outcomes (Baum, Singer, and Baum 1981; Wandersman et al. 1983). It focuses specifically on ambient stressors, which are relatively stable conditions in the physical environment, including crime, noise, violence, and crowding. These conditions are considered to be stressors because they inhibit important goals or adversely impact physical or psychological health (Wandersman and Nation 1998).

Theorists argue that these environmental characteristics are chronic stressors that result in the deterioration of residents' coping resources, leading to psychological problems (Selye 1950; Lazarus 1966). Evidence shows that environmental stressors do in fact impact health, as noise, for instance, has been associated with changes in physiological processes, cognitive performance, and social behavior (Wandersman and Nation 1998). Crowding and perceived violence also correlate with psychosocial and physical health outcomes which are

thought to be linked to chronic stress and anxiety (Wandersman and Nation 1998), including increased allostatic load and hypertension.

Theoretical Explanations for Associations between Race and Contextual Factors

Marx alluded to a process through which oppositional cultures can develop in response to social stratification and other inequalities, as found in the modern US. More recent oppositional theories utilizing the basic premise of Marx's conflict theory have been developed to describe behaviors, cultures, and conditions of certain marginalized and/or disadvantaged groups. For instance, Elijah Anderson (1999) indicates that many blacks and disadvantaged groups in the US have developed an oppositional culture to mainstream American culture due to the lack of respect, opportunities, and resources afforded to them by other groups, especially the police and other sources of authority. These oppositional groups tend to live by their own rules, such as the code of the streets, which Anderson describes as causing many of the cultural preferences and behaviors associated with blacks, especially those living in the inner city.

Code of the Streets (Anderson 1999). Elijah Anderson's Code of the Streets theory offers a compelling explanation for the high rates of violence within predominately black neighborhoods. As discussed previously, Anderson argues that the social isolation, economic disadvantage, and racial discrimination faced by many blacks in the US foster antisocial and deviant attitudes and behaviors he calls a street code. These conditions are also related to the development of criminal and violent behavior. Many blacks in the US live by codes and unwritten laws of the street, placing them in violent contexts where aggressive individuals feel inclined to engage in violent interactions and behaviors (Anderson 1999). Following this theory, the code fosters unsafe and violent environments in which blacks disproportionately live and

work, and which have been linked with many health concerns, including elevated blood pressure (Wilson et al. 2004).

Evidence Linking Contextual Factors to Blood Pressure

Extant research suggests that enduring contextual, or environmental, stress is associated with the development of hypertension through a variety of pathways. As Livingston (1993) explains, stress reactions involve increased sympathetic nervous system activity and discharge of corticosteroid hormones. Anderson et al. (1992) suggest a contextual model in which regular exposure to chronic stressors, such as violence, racism, and poverty, promotes hypertension. In this model, interactions between chronic stressors and behavioral, biological, and psychological risk factors work to increase activity of the sympathetic nervous system, prompting further release of neuroendocrine hormones. If such stress-induced episodes of elevated vascular reactivity occur repeatedly, over long periods of time they can result in structural changes of the vascular wall, which can induce the development of hypertension (Anderson et al. 1992).

Community and neighborhood violence is a major hazard to mental health in the US, especially in urban neighborhoods. Threats of violence and actual violence damage psychological functioning and physical health, including cardiovascular outcomes like hypertension (Margolin and Gordis 2000; Ruggiero et al. 2006). Research shows that living in an urban environment engenders mental health problems through social processes commonly found in urban contexts (Wandersman and Nation 1998). For instance, urban adolescents who are disproportionately black show an unusually high prevalence of witnessing violence (Ruggiero et al. 2006). Exposures to victimization and violent events, such as knife attacks and shootings, are associated with a range of mood disorders and distress, including anxiety and depression

(Singer et al. 1995; Gorman-Smith and Tolan 1998; Kennedy and Bennett 2006), which are linked with hypertension. In fact, depressive and anxiety symptoms are leading causes of ambulatory care visits in urban populations, especially among black women and women of low SES (Olson et al. 2000; Harman et al. 2002; Stein et al. 2005).

Even in young adult populations in university settings, which are considered “low-risk” contexts, Scarpa et al. (2002) found that depression, trait anxiety, and posttraumatic stress symptoms are associated with hearing about or witnessing violence, even when participants were not directly victimized. This effect was especially strong among girls and young women (Scarpa et al. 2002, 2006). Community violence might be particularly damaging to mothers, as they likely experience depression and feelings of frustration and helplessness resulting from the fear that they might not be able to protect their children (Aisenberg 2001).

Others also report that fear induced by violent neighborhoods causes anxiety, severe stress and other psychopathological outcomes linked to hypertension. For instance, White et al. (1987) found a negative relationship between perception of crime and mental health among a group of 337 black and Hispanic women. According to the study, while neighborhood crime was linked with mental health indexes, including depression and anxiety, it was most strongly associated with somatization symptoms.

Exposure to violence can also increase blood pressure by eroding a sense of safety and security. Violence challenges beliefs that the world is fair and just, increasing stress and anxiety. According to many studies involving children and adolescents in the US and abroad, exposure to violence rattles core beliefs and robs children of security and a sense of fairness. For instance, in a study of 2,200 urban US children, Schwab-Stone et al. (1995) found that almost 75% felt

unsafe in at least one common environmental context. In turn, feeling unsafe was linked to increased symptomology for depression, anxiety and increased blood pressure.

In research involving inner-city youth in Chicago, Garbarino et al. (1992) found that concerns about neighborhood security and safety cause youth to be more cautious and alert in their daily lives, heightening physiologic responses to stress. Wilson et al. (2002) examined associations between ABP and daytime and nighttime epinephrine and norepinephrine secretion, and exposure to violence in 56 inner-city black youth. Findings show that nondipping status at nighttime was associated with victimization, while merely hearing about violence was linked with elevated daytime epinephrine excretion and nondipping status among boys. The researchers suggested that the participants who feared that bullets might enter their homes at night experienced less restful sleep because they felt the need to remain alert all night. They also slept in areas in their homes that were less conducive to sleep, such as bathtubs, in order to avoid bullets that might potentially pass through their homes (Wilson et al. 2002).

As argued by motivational theorists, all humans need to feel competence, relatedness, and autonomy (Skinner and Wellborn 1994). Exposure to violence can threaten these needs by producing feelings of helplessness and incompetence, and potentially by eroding social support. When needs for relatedness, competence, and autonomy are threatened, people may adopt less effective coping behaviors, such as isolation coping, submission or opposition coping, or escape (Skinner et al. 2003). Research shows that physical well-being is also affected by coping (Wolchik and Sandler 1997). In fact, coping behaviors that directly engage problems, as opposed to avoiding them, are linked with better physical and mental health (Connor-Smith et al. 2000; Moos 2002). As violence in the neighborhood threatens basic needs for relatedness, competence, or autonomy, people tend to participate in coping strategies that disengage them

from the problem. This affects physiologic arousal, which in turn increases blood pressure (Wilson et al. 2004).

Brown, Hill, and Lambert (2005) examined associations between intimate violence, community violence, and mental health among a group of urban black women and found that exposure to community violence (witnessing and victimization combined) was significantly related to traumatic stress symptoms. They also found an interaction between intimate partner violence and community violence so that women with exposure to both types of violence had increased rates of traumatic symptoms, relative to women with exposure to only one type of violence. This suggests that exposure to violence in multiple contexts is extremely damaging to health (Brown et al. 2005).

Evidence Linking Race to Contextual Factors

Exposure to violence is a serious concern in many areas in the US. For instance, approximately 70% of inner-city children and adolescents have been victims of violent acts, and around 85% of these children have witnessed them (Wilson et al. 2004). Blacks in the US are at an increased risk of exposure to stressful environments, including violent neighborhoods. In fact, blacks have higher overall lifetime rates of exposure to violence than almost all other racial groups (Kilpatrick, Smith, and Saunders 2003). According to Peterson and Krivo (2009), rates of violence are much higher in predominantly black neighborhoods than predominantly white neighborhoods. One reason behind this racial difference is that levels of violence are higher in areas that are disadvantaged and residentially unstable because such environments encourage criminal and violent acts. Also, these areas tend to lack social control mechanisms that normally discourage violent crime because it is difficult for these types of communities to organize around common goals and facilitate the control of violence (Peterson and Krivo 2009).

According to the Federal Bureau of Investigation (1992), violent crime is not equally distributed across the country, as inner-city and low SES areas have rates two to four times higher than other areas. For instance, research investigating the safety of playgrounds in Boston in 2000 found that census block groups with higher proportions of black residents had playgrounds characterized as more dangerous than those in areas with a higher proportion of whites (Cradock et al. 2005). Indeed, the inverse association between the proportion of black residents and the level of safety ($p = 0.013$) was independent of the census group block's educational attainment and numbers of youth ($p < 0.0001$) (Cradock et al. 2005).

In a study examining neighborhood characteristics and fear of crime and criminal activity, Covington and Taylor (1991) found that those living in neighborhoods comprised of over 90% black residents are more fearful than those living in neighborhoods with a lower proportion of blacks. Black neighborhoods were also more likely to have higher rates of criminal activity and more incivilities (Covington and Taylor 1991). Data show that blacks are six times more likely than whites to die by homicide (Fox and Jawitz 2003) and are more likely to be killed by other blacks than members of other racial groups (Rennison 2001). In fact, the leading cause of death among young blacks is homicide (Anderson 2002), and blacks have a disproportionately high level of involvement in serious violence (Hawkins et al. 1998). Police statistics also show that rates of violence are highest in neighborhoods characterized by disadvantage and high concentrations of minorities (National Research Council 1993). In all, decades of research suggests that the unsafe, violent contexts in which many blacks in the US live are probable contributors to the greater prevalence of high blood pressure among black women, as compared to white women.

Possibility of Effect Modification

As alluded to in the previous discussion, there is a possibility of effect modification among certain variables in this study. Extant research suggests that some risk factors affect the risks of hypertension differently for black and white women. For instance, research has shown that religiosity (Ferraro and Koch 1994) and volunteering (Tang et al. 2012) are possibly more beneficial to the health of black women than white women.

In addition, depression is more strongly associated with increased blood pressure among blacks than whites (Jonas et al. 1997). Similarly, Bell, Adair, and Popkin (2002) found that blacks at every level of BMI had a higher prevalence of hypertension than their white counterparts. Furthermore, the effect of social support on blood pressure has also been shown to vary by race. For instance, Cooper et al. (2009) found that as perceived social support increased, whites experienced enhanced nocturnal dipping of BP, while blacks nocturnal BP dipping was blunted.

Summary and Hypotheses

The traditional explanation for disparities in hypertension between black and white women concerns differences in socioeconomic status and/or health behaviors. But, as indicated above, these disparities in blood pressure remain after controlling for such factors. More recent research on racial health disparities has begun to examine other variables, such as social support, religiosity, exposure to violence, stress, and access to health care. To my knowledge, no previous research has simultaneously examined both cross-sectional and longitudinal effects of social support, psychosocial characteristics, and contextual factors, beginning in adolescence and extending into adulthood, on disparities in hypertension between black and white women.

Much research shows that childhood and adolescent environments and circumstances affect health in adult life. As described above, studies have linked social support, psychosocial factors, and environmental conditions to hypertension in both black and white women. Most of these factors associated with high blood pressure are more prevalent among black women, compared to their white counterparts. The goal of this dissertation is to build upon extant research in the area and examine the impact of these factors on racial hypertension disparities in young adulthood. This study has two major aims: (1) to determine what adulthood factors explain adulthood blood pressure disparities between black and white women and (2) to investigate what adolescent and cumulative factors may account for hypertension disparities between black and white women in the US. To address my first aim, I will examine cross-sectional effects using adulthood factors. To address my second aim, I will examine life course effects using adolescent and cumulative factors.

Based upon theory and past research in the area, I have derived the following hypotheses regarding the effects of social support, psychosocial characteristics, and contextual factors on adult hypertension and disparities in hypertension between black and white women.

Descriptive Analyses:

Hypothesis 1: Black women in my sample will have higher rates of hypertension and higher mean SBP and DBP than white women. Studies consistently show that black women have higher rates of hypertension than all other racial and sex groups in the US (Cutler et al. 2008).

Hypothesis 2: In young adulthood, black women will have less social support, worse psychosocial characteristics, and live in more difficult environments than white women.

Research has shown that black females tend to have less healthy social support networks (Brummett et al. 2001; Umberson and Montez 2010) than their white counterparts. Similarly,

black women are at greater risk of psychosocial disturbances than white women (Gabbidon and Peterson 2006), and they tend to live and work in environments characterized by unhealthy contextual factors, such as violence (Kilpatrick and Acierno 2003), noise, and chaos.

Hypothesis 3: Black women will have less social support, worse psychosocial characteristics, and live in more difficult environments throughout the life course, compared to their white counterparts. Research has shown that black adolescents tend to have less social support than white adolescents by receiving less emotional social support from friends and more relationship strain (Yuan 2002). Similarly, black women are at greater risk of psychosocial disturbances and racial discrimination than white women (Seaton and Yip 2009), which puts them at an increased risk of lower self-esteem, lower life satisfaction, and other psychosocial risks. Black children are also more likely than white children to live in less healthy contexts, as children exposed to violence in their neighborhoods are more likely to be black and poor.

Aim 1: What adulthood factors help explain hypertension disparities between black and white women?

Hypothesis 4: Higher odds of hypertension among black women will remain after controlling for SES, as measured by income and education. Statistics show that, even after controlling various measures of socioeconomic status, black women consistently have higher rates of high blood pressure than white women (Downie et al. 2011).

Hypothesis 5: Racial disparities in hypertension will diminish when Wave IV social support factors are added to a cross-sectional (Wave IV) multinomial logistic regression model. As discussed above, social support is associated with a decrease in blood pressure (Uchino et al. 1996), and black women tend to have less social support. It follows that including measures of social support in the model will decrease racial differences in hypertension.

Hypothesis 6: Racial disparities in hypertension will diminish when Wave IV psychosocial factors are added to a cross-sectional (Wave IV) multinomial logistic regression model.

According to Kamarck et al. (2002), a variety of psychosocial factors are associated with acute fluctuations in ambulatory blood pressure (ABP) among healthy adults. In fact, psychosocial factors including negative affect, arousal, task demand, decisional control, and social conflict, were each shown to be independently associated with fluctuations in ABP during the day, and these associations remained after controlling for activity, posture, and substance abuse, which suggests that suggest psychosocial factors could account for some of the distinctive predictive value associated with ABP and they could contribute to racial disparities in blood pressure (Kamarck et al. 2002).

Hypothesis 7: Racial disparities in hypertension will diminish when Wave IV contextual factors are added to a cross-sectional (Wave IV) multinomial logistic regression model.

Contextual or environmental stress has been associated with hypertension through a variety of pathways, and black women are generally exposed to higher levels of negative contextual factors. It follows that the inclusion of such factors in the regression model will decrease racial hypertension disparities.

Hypothesis 8: Racial disparities in hypertension will diminish further when Wave IV social support, psychosocial, and contextual factors are all included in the same cross-sectional (Wave IV) multinomial logistic regression model. Because each groups of factors is thought to affect blood pressure independently, including all factors in a single model will explain a greater portion of racial disparities in hypertension than previous models.

Hypothesis 9: Racial disparities in hypertension will diminish to the greatest extent for all cross-sectional models when Wave IV behavioral factors, namely BMI and tobacco use, are included in the multinomial logistic regression model.

Aim 2: What adolescent and cumulative factors explain hypertension disparities between young black and white women?

Hypothesis 10: Racial disparities will diminish but not disappear when adult and adolescent SES factors (education and household income) are used to predict the odds of Wave IV hypertension. Research shows that socioeconomic factors during childhood are important predictors of adult health, especially cardiovascular morbidity, cardiovascular mortality, and mortality resulting from a range of causes (Cohen et al. 2010).

Hypothesis 11: Racial disparities in hypertension will diminish when adolescent and cumulative measures of social support are added to a cumulative (Waves I, III, and IV) multinomial logistic regression model. Many studies have shown that life course events are extremely important in the development of adult health problems. For instance, Hemingway and Marmot (1999) reported that five of eight prospective cohort studies investigating various aspects of social support detected significant associations with coronary heart disease.

Hypothesis 12: Racial disparities in hypertension will diminish when adolescent and cumulative psychosocial factors are added to a cumulative (Waves I, III, and IV) multinomial logistic regression model. For instance, Landsbergis et al. (2003) found that psychosocial factors across the life course have cumulative effects on systolic blood pressure. So, it is likely that factors from adolescence will contribute to the odds of hypertension among the young adult women in the study.

Hypothesis 13: Racial disparities in hypertension will diminish when adolescent and cumulative measures of environmental conditions are added to a cumulative (Waves I, III, and IV) multinomial logistic regression model. Studies have shown that when elevated vascular reactivity occurs regularly, structural changes of the vascular wall can occur over time, which can induce the development of hypertension (Anderson et al. 1992).

Hypothesis 14: Racial disparities in hypertension will diminish further when the life course effects of social support, psychosocial characteristics, and contextual factors are all included in a cumulative (Waves I, III, and IV) multinomial logistic regression model. Because I hypothesize that each of these sets of factors will independently diminish the race odds of hypertension, I anticipate that including them all in one model will reduce the odds ratio even greater.

Hypothesis 15: Racial disparities in hypertension will diminish to the greatest extent for all models considered in these analyses when lifetime behavioral factors are added to life course measures of social support, psychosocial characteristics, and contextual factors.

METHODS

Data and Sample

For my analyses, I used the National Longitudinal Study of Adolescent Health (Add Health) (Udry 1998), the largest and most comprehensive longitudinal survey of adolescents ever undertaken in the US. It was initiated in 1994 and funded and supported by three grants from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) with co-funding from 23 other federal agencies and foundations. The survey involves a nationally-representative sample of US adolescents in grades 7-12 in 1994-95 who are followed through a series of in-home interviews conducted in 1994-95, 1996, 2001-02, and 2007-08. Add Health data are also collected from questionnaires for parents, siblings, fellow students, and school administrators, as well as from interviews with romantic partners. Information about respondents' communities and neighborhoods are linked to preexisting databases.

Respondents in Add Health were selected by multi-stage stratified sampling techniques. First, all high schools in the US were given unequal probabilities of selection, based on degree of urbanization, region, proportion of white students, and enrollment size, resulting in a total of 80 high schools and 52 sister schools, which sent students to those high schools. In 1994, all students present at each chosen school on the day of the survey were given questionnaires to complete (in-school survey, N=90,118). Approximately six months later, a subset of respondents participated in in-depth, structured interviews (in-home survey, N=20,745). In 16 of the selected schools, all students were asked to participate in the in-depth survey; approximately 200 students were chosen from each of the remaining schools. Students from certain ethnic categories were oversampled for the in-home sample, including black students from well-

educated families and Chinese, Cuban, and Puerto Rican students. This sample was also stratified by grade level and gender.

Wave I (conducted from September 1994 through December 1995) focuses on the factors that likely influence the health and risk behaviors of participants, who were adolescents when they were surveyed. Survey items focus on forces such as families, personal traits, friends, peer groups, romantic partners, schools, communities, and neighborhoods. Wave II data collection, conducted from April 1996 through August 1996, includes follow-up in-home interviews with approximately 15,000 of the adolescents surveyed in Wave I. All respondents from the Wave I in-home interview were selected for Wave II, except for those who were in 12th grade at Wave I and were not part of the genetic sample, and those who were in only the Wave I disabled sample.

The in-home Wave III survey, conducted between August 2001 and April 2001, consists of 15,170 respondents from Wave I who could be located and re-interviewed. Most were between the ages of 18 and 26 years old at the time of the interview. Wave III examines characteristics of respondents, such as relationships, marital status, childbearing, and educational histories, as well as key labor force events. Although many of the Wave I and II questions were unchanged, new sections focusing on topics relevant to young adults were added to the Wave III questionnaire to enhance longitudinal assessment.

Wave IV in-home interviews, which include physical measurements and biospecimen collection, were conducted in 2008 and 2009 with 80.3% of the eligible sample members. It was designed to study developmental and health characteristics of young adults who participated in the original study. At the time of the interview, most of the Wave IV participants were 24-32 years of age and assuming adult responsibilities and roles and developing critical health habits

and lifestyle choices that would impact future adult health and well-being. The combination of longitudinal social, behavioral, and environmental data collected over 10 years with new biological data, including the blood pressure measures being used in this study, widens the scope of research questions that can be addressed using Add Health data. These data also allow for objective measurement of certain health characteristics (e.g., body mass and blood pressure), which is an important advantage over some previous studies.

Wave IV biological data, along with the longitudinal social, psychosocial, and contextual data collected over 10 years, allow for a wide range of research questions to be addressed regarding disease pathways, associations between health and social ties, factors that contribute to resilience and wellness, and environmental and longitudinal sources of health disparities. This makes data from Waves I, III, and IV perfect for my investigation of the various social, psychosocial, and contextual factors which may account for some of the disparities in high blood pressure between black and white women in the US.

This study utilizes the public-use Add Health dataset. Although both males and females of a variety of ethnic and racial categories participated in the Add Health study, my investigation includes only non-Hispanic black and non-Hispanic white females, resulting in a total of 1963 participants (529 black women and 1434 white women). I did not include males, or females from other racial/ethnic categories, because I am limiting my current investigation to blood pressure disparities between black and white women in the US.

Measures

Hypertension

The dependent variable in this study is hypertension. In Wave IV, Add Health researchers collected several cardiovascular and anthropometric measures, including systolic blood pressure (SBP, mmHg) and diastolic blood pressure (DBP, mmHg). The Add Health Wave IV data set also includes a constructed measure of hypertension derived from the indicators of blood pressure. Field investigators (FIs) administered three separate readings of blood pressure for each respondent in 30-second intervals using the factory calibrated Microlife BP3MC1-PC-IB oscillometric blood pressure monitor. If the Microlife blood pressure monitor delivered an error message instead of a viable blood pressure reading, interviewers recorded the result as “999 - equipment malfunction.” In this case, FIs followed the recommended course of action of one of seven possible error codes noted in the Job Aids Booklet.

Using the blood pressure readings taken by the FIs, Add Health constructed three blood pressure variables: systolic blood pressure, diastolic blood pressure, and a summary classification of blood pressure. SBP and DBP variables for each respondent were constructed as the average of the second and third blood pressure readings taken by the FIs. In the case when either the second or the third measure was missing, the other measure was used alone. If both the second and third measures were missing, the first measure was used. The blood pressure classification variable was constructed based on guidelines from the Seventh Report of the Joint National Committee on Prevention Detection, Evaluation, and Treatment of High Blood Pressure (JNC7). Categories used are JNC7 Category SBP (mmHg) DBP (mmHg): Normal (<120 SBP and <80 DBP); Pre hypertension (120–139 SBP or 80–89 DBP); Hypertension, Stage 1 (140–159 SBP or 90–99 DBP); Hypertension, Stage 2 (\geq 160 SBP or \geq 100 DBP).

I used a three-category measure of hypertension in my analyses, constructed from the JNC7 Categories used in Add Health. The hypertension variable is coded as 1 for Normal blood pressure (systolic <120, diastolic <80), 2 for Pre-Hypertension (systolic 120-139 or diastolic 80-89), and 3 for either Hypertension Stage 1 (systolic 140-159 or diastolic 90-99) or Hypertension Stage 2 (systolic above 159 or diastolic above 99). Missing values were recorded for respondents who refused to have their blood pressure read and for those with invalid readings.

Race

Respondents' race was determined by their responses to questions in Wave I. First, respondents were asked if they were of Hispanic origin. Then, participants were asked if they were white, black, Asian, and so on. Respondents who indicated that they were not of Hispanic origin, but were white were coded as non-Hispanic white. And those who indicated that they were not of Hispanic origin and that they were black were coded as non-Hispanic black. All other respondents not included in these two categories (non-Hispanic black or non-Hispanic white) were excluded from the study, as the focus of my research is on blood pressure disparities between non-Hispanic black and non-Hispanic white women in the US.

Sex

Respondents' sex was determined by the interviewers' assessment of each respondent. If the interviewer was unsure of the respondent's sex, the respondent reported his or her sex. Males were not included in the study, as the study concerns disparities in blood pressure between black and white women only.

Age

Respondent age was determined using the Wave IV interview completion date and date of birth variables. Because only the month and year of birth are available, 15 is used as the estimated day of birth to facilitate the calculation of age.

Cross-sectional Measures (Adult Measures)

Adulthood SES

Adulthood Household Income. Adult household income was determined in Wave IV by respondents indicating their own income and the income of everyone else in the household before taxes and deductions. They were told to include all sources of income, including non-legal sources. Incomes were placed into the following categories: (1) Less than \$20,000 (2) \$20,000-\$39,999 (3) \$40,000-\$74,999 and (4) \$75,000 and more. A separate category for missing data was included because of the relatively large amount of respondents (5.81%) with no reported adulthood household income.

Adult Education Level. Respondents' educational levels in Wave IV were determined by telling the interviewer how far they went in school. Responses were placed into the following categories: (1) less than high school, (2) high school degree or equivalent, (3) bachelor's degree, or (4) graduate or professional degree.

Proximate Determinants of Hypertension

Adult BMI. BMI at Wave IV was constructed with direct measures of height and weight, using the following formula: $\text{Weight in pounds} / [\text{height in inches} \times \text{height in inches}] \times 703$. Participants with BMIs of 30 or above were categorized as "obese."

Adult Tobacco Smoking. Wave IV respondents were asked on how many of the past 30 days they smoked cigarettes. Responses were coded (0) if they did not smoke at all in the past 30 days and (1) if they smoked at least once. This has become a standard way of assessing current smoking status in social epidemiological research (Wakefield et al. 2000).

Adult Social Support Factors

Marital Status. At Wave IV, respondents indicated if they were in a current intimate relationship or not. And if so, they were asked what type of relationship it was. If respondents indicated that they were currently in a relationship and that it was a marriage relationship, they were coded as being currently married (1). Otherwise, they were coded as not being currently married (0).

Close Friends in Adulthood. Wave IV respondents were asked how many close friends they had, including people with whom they feel at ease, can talk to about private matters, and can call for help. A code of (1) indicates that the respondent had at least one close friend and a code of (0) indicates that the respondent had no close friends.

Adult Volunteer Activity. Wave IV respondents were asked if they had performed any volunteer work or community service within the past 12 months. Participants who indicated at least some volunteer service within the past year were coded as (1), and those with no volunteer service were coded as (0).

Adult Employment. Wave IV respondents were asked if they were currently working for pay for at least 10 hours a week. Participants who indicated that they worked at least 10 hours a week were coded as (1), and participants indicating less than 10 hours per week of work were coded as (0).

Adult Psychosocial Factors

Attractiveness of Personality. Wave IV attractiveness of personality was determined by interviewers' ratings. Respondents whose personalities were rated as very unattractive or unattractive were coded as (0) and those receiving a rating of average attractiveness, attractive, or very attractive were coded as (1).

Adult Depression. Depression scores for Wave IV were determined by adding scores from 9 items from the Center for Epidemiologic Studies Depression Scale (CES-D). These 9 items were chosen because they were consistent across Waves I, III, and IV. The complete CES-D inventory includes 20 items comprising six scales reflecting major dimensions of depression: depressed mood, feelings of helplessness and hopelessness, guilt and worthlessness, psychomotor retardation, sleep disturbance, and loss of appetite (Radloff 1977). For each of the 9 items included in the study, respondents were asked to indicate how often certain things were true during the past 7 days. For instance, they were asked how often they enjoyed life, felt sad, and felt people disliked them. A score of (0) indicates that the respondent never or rarely felt this way, a (1) indicates that the respondent sometimes felt this way, a (2) indicates that the respondent felt this way a lot of the time, and a (3) indicates that the respondent felt this way most or all of the time. Scores for each of the 9 items were added together. Scores that were at least one standard deviation above the mean score for all respondents in each wave were considered above the cut-off for depression and coded as (1), while scores below this cut-off were coded as (0). This method of determining cut-off scores is common in social science and clinical research (La Cour et al. 2004; Fawcett 2013).

Adult Religiosity. Wave IV religiosity scores were determined by adding scores for 3 items reflecting different dimensions of religiosity. Items include: "How often do you pray privately, that is, when you're alone in places other than a church, synagogue, temple, mosque,

or religious assembly?,” “How important (if at all) is your religious faith to you?,” and “How often have you attended church, synagogue, temple, mosque, or religious services in the past 12 months?” For each of the 3 items, scores range from 0 to 3, with 0 indicating that the respondent never or rarely participates in such activities, and a 3 indicating that the respondent participates in such activities very frequently. Scores for each of the 3 items were summed and totals that were at least one standard deviation from the mean score for all respondents were considered above the cut-off for high religiosity and coded as (1), while scores below this cut-off were coded as (0).

Perceptions of Discrimination. Respondents’ perceptions of discrimination in Wave IV were determined by responses to the item, “In your day-to-day life, how often do you feel you have been treated with less respect or courtesy than other people?” Responses indicating that the respondent never, rarely, or sometimes felt this way were coded as (0) and responses indicating that respondents felt this way a lot of the time, most of the time, or all of the time were coded as (1).

Adult Contextual Factor

Safeness of Neighborhood in Adulthood. Wave IV interviewers were asked, “How safe did you feel when you were in the sample member's/respondent's neighborhood?” Responses indicating that the interviewer felt very safe or moderately safe were coded as (0) and responses indicating the interviewer felt moderately unsafe or very unsafe were coded as (1).

Cumulative and Adolescent Measures

Adolescent Socioeconomic Status (SES)

Adolescent Household Income. Adolescent household income was measured in Wave I by asking respondents' parents how much total income, before taxes, their families received in 1994, the year before the survey was taken. They were told to include their own income, the income of everyone else in the household, and the income from welfare benefits, dividends, and all other sources. Incomes were placed into the following categories: (1) Less than \$20,000 (2) \$20,000-\$39,999 (3) \$40,000-\$74,999 and (4) \$75,000 and more. Because a considerable amount of data was missing (13.5%), I included a missing data category.

Mother's Education Level. Participants' mothers reported their educational attainment during data collection in Wave I. Responses were placed into the following categories: (1) less than high school, (2) high school degree or equivalent, (3) bachelor's degree, and (4) graduate or professional degree. A missing data category was included because a relatively large percentage (12.02%) of respondents' mothers did not provide their education levels in Wave I.

Cumulative Proximate Determinants

Cumulative BMI. Respondents' heights and weights were directly measured in Wave III, and BMI was determined via the following formula: $\text{Weight in pounds} / [\text{height in inches} \times \text{height in inches}] \times 703$. BMI at Wave IV was constructed using the same formula. Participants with BMIs of 30 or above at Waves III and IV were categorized as "continuously obese," and cumulative obese scores were determined by adding categorization of "obese" over the two waves. Possible scores were 0 (not obese at either Wave III or Wave IV), 1 (Obese at either Wave III or Wave IV), or 2 (Obese at both Wave III and Wave IV). BMI at Wave I was not included in this measure of cumulative BMI because BMI classifications for children and adolescents differ by sex and age. This means that the criteria for child and adolescent obesity are not

equivalent to adult measures, complicating direct comparisons and making index construction that adjoins these measures somewhat questionable.

Cumulative Tobacco Smoking. In Waves I, III, and IV, respondents were asked on how many of the past 30 days they smoked cigarettes. In each wave, responses were coded (0) if they did not smoke at all in the past 30 days and (1) if they smoked at least once. Scores from each wave were added to determine the cumulative tobacco smoking score for each respondent. Possible scores were 0 (not smoking during any of the three waves), 1 (smoking at least once during the past 30 days in only one of the waves), 2 (smoking at least once during the past 30 days in two of the waves), or (smoking at least once during the past 30 days in all three waves).

Adolescent and Cumulative Indicators of Social Support

Adolescent Romantic Relationship. Respondents were asked in Wave I if they had been in a romantic relationship within the past 18 months. Responses were coded (0) if they had not and (1) if they had been in such a relationship.

Adolescent Contact with Friends. Wave I respondents were asked how many times they “just hung out” with friends during the past week. If they answered that they hung out with friends at least once during the past week, their responses were coded as (1). If they did not hang out with friends at all, their responses were coded as (0).

Cumulative Volunteer Activity. In Waves III and IV, respondents were asked if they had performed any volunteer work or community service within the past 12 months. Responses indicating at least some volunteer service within the past year were coded as (1), and no volunteer service was coded as (0). An index for cumulative volunteer activity was constructed by adding the scores for Waves III and IV together. Possible cumulative volunteer activity scores

were 0 (no volunteer activity in either wave), 1 (at least some volunteer service, but in only one of the waves), or 2 (at least some volunteer service in both Wave III and Wave IV).

Cumulative Employment. Wave III and IV respondents were asked if they are currently working for pay for at least 10 hours a week. At each wave, respondents indicating that they are currently working at least 10 hours a week were coded as (1), and respondents indicating less than 10 hours per week of work were coded as (0). Cumulative employment scores were determined by adding employment scores across Waves III and IV.

Cumulative Indicators of Psychosocial Characteristics

Cumulative Attractiveness of Personality. In Waves I, III, and IV, interviewers were asked to rate the attractiveness of the respondents' personalities. Respondents whose personalities were rated as very unattractive or unattractive were coded as (0) and those receiving a rating of average attractiveness, attractive, or very attractive were coded as (1). Cumulative attractiveness of personality was determined by adding scores from each of the three waves and ranged from 0-3.

Cumulative Depression. Depression scores for Waves I, III, and IV were determined by adding scores from nine items from the Center for Epidemiologic Studies Depression Scale (CES-D) (which includes 20 items comprising six scales reflecting major dimensions of depression: depressed mood, feelings of helplessness and hopelessness, guilt and worthlessness, psychomotor retardation, sleep disturbance, and loss of appetite) (Radloff 1977). These nine items were chosen because they were consistent across Waves I, III, and IV. For each of the nine items, respondents were asked to indicate how often certain things were true during the past 7 days. For instance they were asked how often they enjoyed life, felt sad, and felt people disliked them. A score of (0) indicates that the respondent never or rarely felt this way, a (1) indicates

that the respondent sometimes felt this way, a (2) indicates that the respondent felt this way a lot of the time, and a (3) indicates that the respondent felt this way most or all of the time. Scores for the nine items were added together in each wave and then summed into a single composite index (range = 0-62; SD = 10.06). As before, scores that were at least one standard deviation above the mean score for all respondents were considered above the cut-off for depression and coded as (1), while scores below this cut-off were coded as (0).

Cumulative Religiosity. Religiosity scores for Waves I, III, and IV were independently determined by adding scores from three items from each wave reflecting different dimensions of religiosity, such as “In the past 12 months, how often did you attend religious services?” and “How often do you pray?” For each of the three items, scores range from 0 to 3, with (0) indicating that the respondent never or rarely participates in such activities, and a (3) indicating that the respondent participates in such activities very frequently. Scores for each of the three items in each of the waves were added together. Scores that were at least one standard deviation from the mean score for all respondents were considered above the cut-off for high religiosity and coded as (1), while scores below this cut-off were coded as (0). Respondents’ values for each of the three waves were totaled to determine cumulative depression scores. Possible scores were 0 (if scores for none of the waves met criteria), 1 (if scores for one of the waves met criteria), 2 (if scores for two of the waves met criteria), and 3 (if scores for all three waves met criteria for religiosity).

Adolescent and Cumulative Indicators of Environmental Conditions

Adolescent Neighborhood Safety. In Wave I, respondents were asked if they usually feel safe in their own neighborhoods. Responses indicating that they did not feel safe were coded as (0) and responses indicating that they felt safe were coded as (1).

Cumulative Safeness of Neighborhood. In Waves I, II, and IV, interviewers were asked to rate how safe they felt while interviewing the respondents. For instance, in Wave IV, interviewers were asked, “How safe did you feel when you were in the sample member's/respondent's neighborhood?” Responses indicating the interviewer felt very safe or moderately safe were coded as (0) and responses indicating the interviewer felt moderately unsafe or very unsafe were coded as (1). Scores for each of the three waves were summed to determine the cumulative safeness of neighborhood score for each respondent. Possible scores were 0 (if the interviewer felt unsafe at none of the waves), 1 (if the interviewer felt unsafe at one of the waves), 2 (if the interviewer felt unsafe at two of the waves), and 3 (if the interviewer felt unsafe at all three waves).

Adolescent Perceptions of Neighborhood Safety. In Wave I, respondents were asked if they usually feel safe in their own neighborhoods. Responses indicating that they did not feel safe were coded as (0) and responses indicating that they felt safe were coded as (1).

Analysis Plan

Using SAS 9.2, I first applied weights to correct for oversampling of certain populations (i.e., blacks from well-educated families). My analysis plan addresses my two main study aims:

Aim 1: What adulthood factors help explain hypertension disparities between black and white women?

Aim 2: What adolescent and cumulative factors help explain hypertension disparities between black and white women?

Descriptive Analyses

I first ran descriptive statistics to determine the distributions of demographic characteristics and other key variables in my sample. This included various measures of social support, psychosocial characteristics, and contextual factors, as well as my Wave IV measure of hypertension. These analyses also evaluated racial differences in the prevalence of high blood pressure between black and white women, differences in BMI between black and white women, and other factors of interest.

Cross-sectional Analyses

Next, I conducted a series of multinomial logistic regression analyses to help explain disparities in hypertension between black and white women in Wave IV. I named the cross-sectional models A4-F4 to indicate that they include factors from Wave IV data. I first regressed the three-category measure of hypertension on race, age, education level, and household income to determine the effect of race on blood pressure in Wave IV, after controlling for SES and basic demographic characteristics (Model A4). Model B4 builds on Model A4 by including Wave IV measures of social support to determine if they diminish the effect of race on blood pressure. Similarly, Models C4 and D4 build on Model A4 by including Wave IV psychosocial and contextual measures, respectively, to determine if they explain some of the racial disparities in odds of hypertension. Model E4 includes all of these variables, including Wave IV SES, demographic traits, social support, psychosocial characteristics, and contextual factors in one model. Model F4 is identical to Model E4, with the addition of proximate determinants of blood pressure, namely BMI and tobacco smoking.

Longitudinal Analyses

My next set of analyses was conducted with the aim of explaining hypertension disparities between black and white women in Wave IV by simultaneously examining the effects of adolescent and cumulative factors. In order to examine possible life course effects on Wave IV hypertension, I constructed several multinomial logistic regression models through which I regressed three-category hypertension variable on social support, psychosocial characteristics, and contextual factors in both adolescence and, where possible, across multiple waves of Add Health data. I named these models AC-FC to indicate that they include cumulative factors, as opposed to models A4-F4 which include only factors from Wave IV. The first of these longitudinal analytic models is Model AC, which estimates the odds of hypertension in Wave IV by race, age, and both adult and adolescent measures of socioeconomic status (education and household income). The next longitudinal model (Model BC) builds upon Model AC by adding social support factors from Waves I and IV, as well as cumulative measures of social support. Models CC and DC are similar to Model BC, but instead of social support they include adolescent, adult and cumulative measures of psychosocial and contextual factors, respectively, as predictors of Wave IV hypertension. Model EC predicts the odds of hypertension in Wave IV by including all of the factors in Models AC, BC, and CC. Finally, Model FC includes all variables from Model EC, plus the proximate determinants of blood pressure [BMI (cumulative measure of Waves II and IV) and tobacco smoking (cumulative measure from Waves I, III, and IV)].

Stratified Models

In order to determine if social support, psychosocial characteristics, and contextual factors affect blood pressure differently for black and white women, I estimated a series of

racially-stratified multinomial logistic regression models. They are identical to the models described above, except that I omitted the “race” variable and then ran separate models for black and white women. For each group of women, the first set of stratified models examines the effect of adult factors on blood pressure and the second set of models examines the impact of adolescent and cumulative factors on blood pressure.

Technical Considerations

The statistical significance of variables included in the models will be determined by a 0.05 cutoff ($p < 0.05$) and overall model fit will be measured using likelihood ratio χ^2 tests. Changes between the models will be assessed primarily by attenuation in the coefficient for race. For instance, a smaller race coefficient in one model relative to the race coefficient in a previously-estimated model will indicate that the variables included in the more elaborate model help explain some of the differences in blood pressure between black and white women not explained by the factors included in the previous model. In order to determine possible racial differences in the effects of various factors on blood pressure, I will compare the coefficients for variables – especially social support, psychosocial characteristics and contextual factors – in separate models for white and black women. Although this approach is statistically less rigorous than formal interaction effects, it permits the simultaneous comparison of a large number of variables and their coefficients, which can become quite unwieldy when a large number of formal interaction terms are introduced into the same model.

RESULTS

Descriptive Analyses

Adulthood Characteristics

As shown in Table 1, almost three in four participants were white (n=1,434; 73.05%), and a little over a quarter were black (n=529; 26.95%). The average age among all women was 28.18 (SD=1.81). Black women in the study tended to have lower levels of education, as 58.41% had only a high school diploma, compared to 52.58% of whites. Also, 23.25% of blacks had at least a bachelor's degree, compared to 29.36% of whites. Almost one-quarter (24.20%) of black adult women reported a total household income of less than \$20,000, compared to less than 10% (9.69%) of whites. Whites tended to earn much more than blacks, as 35.77% reported a total household income between \$40,000 and \$74,999 and 29.71% reported incomes over \$75,000, compared to just 28.36% and 13.99% of blacks, respectively. Blacks were more likely than whites to be obese in Wave IV (51.81% and 34.86%, respectively), but whites were more likely than blacks to have smoked in the past 30 days (35.24% and 24.32%, respectively).

Adulthood Hypertension

Almost half of the participants (48.8%) in the study had normal blood pressure, 38.72% were prehypertensive, 9.53% had stage 1 hypertension, and 2.95% had stage 2 (severe) hypertension (Table 1). While blacks were less likely than whites to have normal blood pressure levels (41.40% and 51.53%, respectively), the two groups were almost equally represented among prehypertensives (39.13% of blacks and 38.56% of whites). However, black women in the study were much more likely to meet criteria for both stage 1 and stage 2 hypertension, as

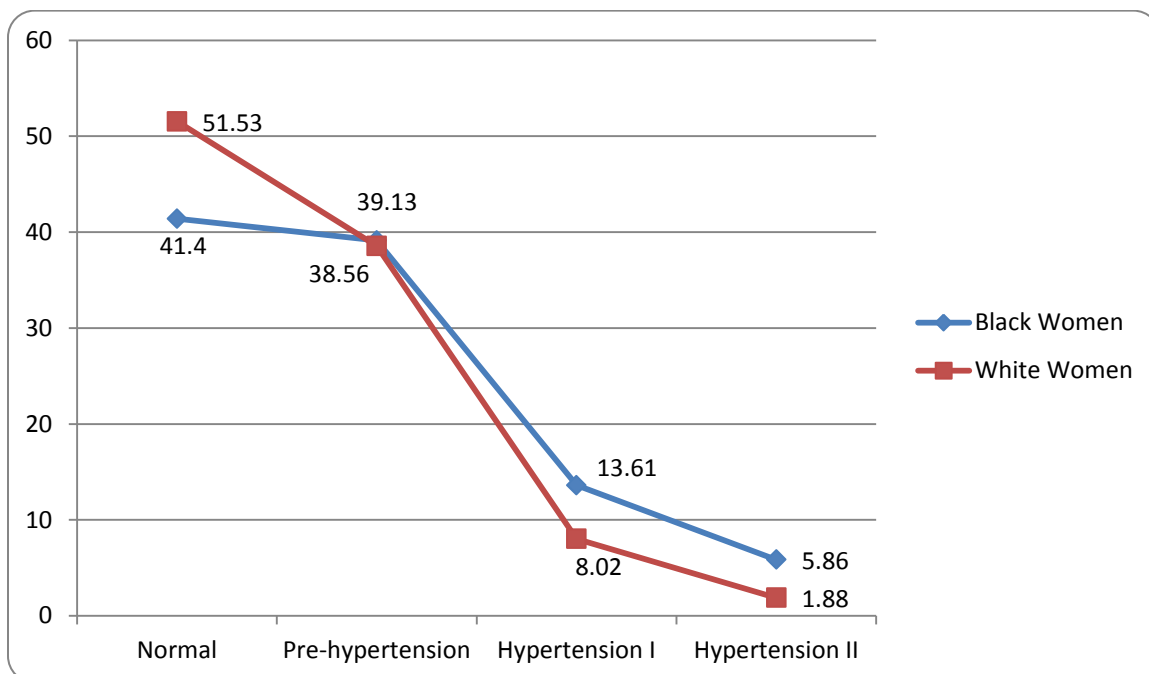
Table 1. Adulthood Characteristics of the Wave IV Sample of Black and White Women

	All Women N= 1963 (100%)	Black Women N = 529 (26.95%)	White Women N=1434 (73.05%)
Mean Age	28.18	28.16	28.19

Socioeconomic Status			
Household Income Level			
Less than \$20,000	267 (13.60)	128 (24.20)	139 (9.69)
Between \$20,000 and \$39,999	419 (21.34)	136 (25.71)	283 (19.74)
Between \$40,000 and \$74,999	663 (33.77)	150 (28.36)	513 (35.77)
\$75,000 or more	500 (25.47)	74 (13.99)	426 (29.71)
Education Level			
Less than High School	117 (5.96)	36 (6.81)	81 (5.65)
High School Degree or Equivalent	1063 (54.15)	309 (58.41)	754 (52.58)
Bachelor's Degree	544 (27.17)	123 (23.25)	421 (29.36)
Graduate or Professional Degree	239 (12.18)	61 (11.53)	178 (12.41)
Proximate Determinants			
BMI (Obese)	768 (39.43)	272 (51.81)	496 (34.86)
Tobacco Smoking (Not smoking within past month)	1318 (67.66)	392 (75.68)	926 (64.76)
Blood Pressure			
Hypertension			
Normal Blood Pressure: systolic <120, diastolic <80	958 (48.80)	219 (41.40)	739 (51.53)
Prehypertension: systolic 120-139 or diastolic 80-89	760 (38.72)	207 (39.13)	553 (38.56)
Hypertension I: systolic 140-159 or diastolic 90-99	187 (9.53)	72 (13.61)	115 (8.02)
Hypertension II: systolic 160+ or diastolic 100+	58 (2.95)	31 (5.86)	27 (1.88)
Social Support Measures			
Marital Status (Married)	835 (42.54)	134 (25.33)	701 (48.88)
Friends (Having at least one friend)	1895 (97.53)	500 (95.42)	1395 (98.31)
Volunteer Activity (Volunteering within past year)	829 (42.32)	189 (35.86)	640 (44.69)
Employment (Currently working at least 10 hours per week)	1537 (78.34)	407 (77.08)	1130 (78.80)
Psychosocial Measures			
Depression (Above cut-off score)	326 (16.62)	112 (21.12)	214 (14.92)
Attractiveness of Personality (Attractive personality; rated by interviewer)	1845 (94.04)	490 (92.80)	1355 (94.49)
Religiosity (Above cut-off score)	420 (21.47)	169 (32.13)	251 (17.55)
Perceptions of Discrimination (Experiencing daily discrimination)	466 (23.74)	151 (28.54)	315 (21.97)
Contextual Measures			
Environmental Safety (Living in unsafe home; rated by interviewer)	109 (5.93)	66 (13.78)	43 (3.17)

shown in Figure 2. So, Hypothesis 1 (Black women in my sample will have higher rates of hypertension and higher mean SBP and DBP than white women) is supported ($\chi^2 = 49.27, p < 0.001$).

Figure 2. Racial Disparities in the Prevalence of Hypertension in Add Health, Wave IV



Adulthood Social Support

White women were more likely than black women to indicate higher levels of social support across all measures included in the study (Table 1). About half as many black women as white women were currently married (25.33% and 48.88%, respectively) and whites were also slightly more likely than blacks to report having at least one friend (98.31% and 95.42%, respectively). And as shown in Table 1, whites were considerably more likely than blacks to have volunteered in the past year (44.69% and 35.86%, respectively) and slightly more likely to be currently employed (78.08% and 77.08%, respectively).

Adulthood Psychosocial Characteristics

As Table 1 indicates, whites in the study generally reported better psychosocial health than blacks. For instance, only 14.9% of whites met criteria for depression, compared to 21.12% of black women. Almost 29% (28.54%) of black women indicated that they experienced

discrimination daily, compared to 21.97% of white women. However, interviewers reported that blacks' and whites' personalities were almost equally attractive, as 94.49% of whites and 92.8% of blacks were perceived to have attractive personalities. Also, almost a third (32.13%) of black women met criteria for high levels of religiosity, compared to only 17.60% of white women.

Adulthood Contextual Factors

While most respondents did not live in an unsafe neighborhood as rated by the interviewers, black women were over four times more likely than white women to live in interviewer-rated unsafe neighborhoods (3.17% of whites and 13.78% of blacks).

Adolescent Characteristics

Table 2 shows adolescent and cumulative characteristics of participants. As indicated, many more black women than white women grew up in households earning less than \$20,000 a year (24.48% of white women and 42.53% of black women). And many more white women than black women lived in adolescent homes with annual incomes at least \$40,000 (44.07% of white women and 23.44% of black women). White women's mothers also reported higher levels of education than black women's mothers. As shown in Table 2, only 8.02% of white women had mothers with less than a high school degree, compared to 13.61% of black women. Although many more black women (33.80%) than white women (21.27%) were classified as obese in waves III and IV of data collection, black women (71.04%) were also more likely than white women (48.07%) to report no tobacco smoking in the past month in Waves I, III, and IV.

Adolescent and Cumulative Social Support Factors

Although almost the same percentage of white and black women reported hanging out with friends at least once a week during Wave I data collection, disproportionately more white girls (59.61%) than black girls (49.05%) reported being in romantic relationships within the past 18 months. Approximately 20% of black and white women reported volunteering within the past year during both Waves III and IV. On the other hand, blacks were less likely than whites to meet criteria for cumulative current employment status, as only 48.39% of blacks were employed at both times of data collection, compared to 58.23% of whites.

Adolescent and Cumulative Psychosocial Factors

Depression and religiosity across all three waves of Add Health were more common among black women than white women. As shown in Table 2, 3.62% of black women and 2.45% of white women met the criteria for cumulative depression, while 10.53% of black women and 7.05% of white women met criteria for high religiosity over all three waves. However, white women were more likely than black women to leave a positive personality impression on interviewers in Waves I, III, and IV.

Adolescent and Cumulative Contextual Factors

Most of the respondents did not meet criteria for consistently living in an unsafe neighborhood. But as shown in Table 2, black women were almost twice as likely as whites to live in an unsafe area, as rated by the interviewer, across all waves (12.48% and 6.42%, respectively).

Table 2. Adolescent Characteristics of Black and White Women in Add Health, Wave IV

	All Women N = 1963 (100%)	Black Women N = 529 (26.95%)	White Women N=1434 (73.05%)
Socioeconomic Status			
Childhood (Wave I)			
Household Income Level			
Less than \$20,000	576 (29.34)	225 (42.53)	351 (24.48)
Between \$20,000 and \$39,999	366 (18.64)	97 (18.34)	269 (18.76)
Between \$40,000 and \$74,999	500 (25.47)	89 (16.82)	411 (28.66)
\$75,000 or more	256 (13.04)	35 (6.62)	221 (15.41)
Mother's Education Level			
Less than High School	187 (9.53)	72 (13.61)	115 (8.02)
High School Degree or Equivalent	1056 (53.8)	260 (49.15)	796 (55.51)
Bachelor's Degree	271 (13.81)	66 (12.48)	205 (14.30)
Graduate or Professional Degree	213 (10.85)	51 (9.64)	162 (11.30)
Proximate Determinants			
Cumulative			
BMI (Obese; Waves III and IV)	464 (24.59)	169 (33.80)	295 (21.27)
Tobacco Smoking (Not smoking within past month; Waves I, III, and IV)	1047 (54.14)	363 (71.04)	684 (48.07)
Social Support Measures			
Cumulative (Waves III and IV)			
Volunteer Activity (Volunteering within past year)	412 (21.07)	103 (19.28)	309 (21.62)
Employment (Currently working at least 10 hours per week)	1091 (55.58)	256 (48.39)	835 (58.23)
Childhood (Wave I)			
Romantic Relationship (Being in a romantic relationship within last 18 months)	1112 (56.76)	259 (49.05)	853 (59.61)
Contact with Friends (Hanging out with friends regularly)	1778 (90.58)	468 (88.47)	1310 (91.35)
Psychosocial Measures			
Cumulative (Waves I, III, and IV)			
Depression (Above cut-off score)	54 (2.77)	19 (3.62)	35 (2.45)
Attractiveness of Personality (Attractive personality; rated by interviewer)	1675 (85.59)	428 (81.37)	1247 (87.14)
Religiosity (Above cut-off score)	153 (7.98)	54 (10.53)	99 (7.05)
Contextual Measures			
Cumulative (Waves I, III, and IV)			
Environmental Safety (Living in unsafe neighborhood; rated by interviewer)	158 (8.05)	66 (12.48)	92 (6.42)

Summary of Descriptive Findings

As indicated above, hypothesis 1 (Black women in my sample will have higher rates of hypertension and higher mean SBP and DBP than white women) was supported, as black women in the study were much more likely to meet criteria for both stage 1 and stage 2 hypertension I (13.61% and 5.86%, respectively) than whites (8.02% and 1.88%, respectively). Also, hypothesis 2 (In young adulthood, black women will have less social support, worse psychosocial characteristics, and live in more difficult environments than white women) was partially supported. White women were significantly more likely than black women to have at least one close friend ($\chi^2 = 13.25, p < 0.001$), to volunteer ($\chi^2 = 12.30, p < 0.001$), to be married

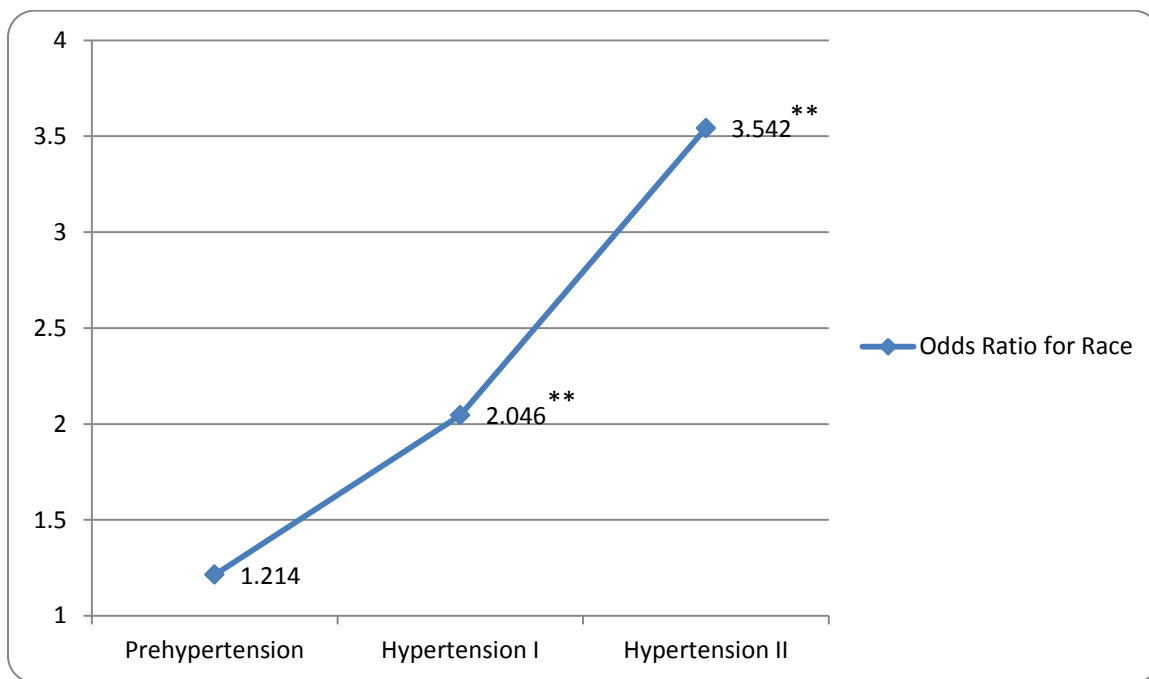
($\chi^2 = 87.71, p < 0.001$), and to live in a safe neighborhood ($\chi^2 = 71.45, p < 0.001$). Whites were significantly less likely than blacks to meet the criteria for depression ($\chi^2 = 11.02, p < 0.001$) and to perceive discrimination ($\chi^2 = 9.24, p < 0.01$). However, blacks were significantly more likely than whites to meet criteria for high religiosity ($\chi^2 = 48.46, p < 0.001$). And there were no statistically significant differences between blacks and whites in terms of being currently employed ($\chi^2 = 0.6706, p > 0.05$) or having an attractive personality ($\chi^2 = 1.96, p > 0.05$).

Hypothesis 3 (Black women will have less social support, worse psychosocial characteristics, and live in more difficult environments throughout the life course, compared to their white counterparts) was also partially supported. As adolescents (during Wave I data collection), white girls were significantly more likely than black girls to have had a romantic relationship in the past 18 months ($\chi^2 = 17.51, p < 0.001$) and to have hung out with friends in the past week ($\chi^2 = 3.77, p > 0.05$). White girls were also significantly more likely than black girls to feel that their neighborhood is safe ($\chi^2 = 61.57, p < 0.001$). Also, whites were significantly more likely than blacks to be employed in both Waves III and IV ($\chi^2 = 40.88, p < 0.001$), to have an attractive personality across all three waves ($\chi^2 = 13.98, p < 0.001$), to live in a safe neighborhood across all three waves ($\chi^2 = 126.42, p < 0.001$), and to volunteer in Waves III and IV ($\chi^2 = 10.40, p < 0.01$). White women were significantly less likely than black women to meet criteria for depression in Waves I, III, and IV ($\chi^2 = 17.05, p < 0.001$). However, blacks were significantly more likely than whites to meet criteria for high religiosity across all three waves ($\chi^2 = 96.25, p < 0.001$).

Although the models I ran to address the two major aims of my study include a three-categorical measure of blood pressure as the outcome, I also estimated a multinomial logistic regression model using a four-category measure of hypertension (normal blood pressure, prehypertension, hypertension I, and hypertension II). This model predicted odds of hypertension by race, age, and adulthood SES, as measured by household income and education level of the respondent. Even though these results are not a main part of my study, they are important because they show the vast differences in blood pressure between black and white women, particularly in the hypertension II category. As shown in Figure 3, black women were more likely than white women to have all forms of hypertension, including prehypertension.

The odds ratios for race increased as the level of hypertension increased in severity, showing that black women were at particularly high risk for more advanced forms of hypertension (Figure 3). For instance, the odds of prehypertension among black women were around 21% greater than the odds of prehypertension among white women. For hypertension I, the odds ratio increased from 1.21 to slightly over two. Racial differences in blood pressure were widest at the most severe category of blood pressure, hypertension II. As shown on Figure 3, black women were 3.5 times more likely than white women to suffer hypertension II. For the regression analyses, I used a 3-category measure of a 4-category measure because the sample size was too small in certain categories of the 4-category measure.

Figure 3. Age- and SES-Adjusted Odds Ratios for Race in Add Health, Wave IV



* $p < 0.05$; ** $p < 0.01$

White is the reference category

Results from Cross-sectional Models

I conducted a series of multivariable analyses to address my first aim, which is to determine what adulthood factors help explain hypertension disparities between black and white women. The first model (A4) predicted odds of three-category hypertension by race, age, and SES, as measured by education and income. The likelihood ratio chi-square of the model was 84.14 ($p < 0.001$), indicating that the model as a whole fits significantly better than a null model. As shown in Tables 3 and 4, the odds ratio (OR) for race predicting prehypertension was 1.213 (95% confidence interval (CI) = 0.967-1.522), and the OR for race predicting hypertension was 2.328 (95% CI = 1.707-3.176). This indicates that after adjusting for age and SES, blacks had significantly higher odds of suffering hypertension, and (non-significantly) higher odds of suffering prehypertension, as compared to white women. Therefore, hypothesis 4 (Higher odds

of hypertension among black women in will remain after controlling for SES, as measured by income and education level), was supported, as race remained a significant predictor of hypertension in Model A4 (Tables 3 and 4).

In the subsequent models, additional factors thought to be associated with race and blood pressure were included to determine their role in racial differences in hypertension. Model B4 included social support factors: having at least one close friend, volunteering within the past year, being currently employed, and being currently married. The likelihood ratio chi-square of this model was 87.63 ($p < 0.001$), indicating that the model as a whole fits significantly better than a null model. In comparing model B4 to model A4, which included no social support factors, using a χ^2 difference test, it is determined that Model B4 did not fit the data significantly better than Model A4.

As indicated in Tables 3 and 4, none of the social support factors included in Model B4 was a significant predictor of either prehypertension or hypertension. The addition of these factors into the model did little to help explain disparities in prehypertension and hypertension between black and white women. Consequently, hypothesis 5 (Racial disparities in hypertension will diminish when Wave IV social support factors are added to a cross-sectional (Wave IV) multinomial logistic regression model) was not strongly supported, as odds ratios for race diminished, but only to a small degree, when social support factors were added to the model.

Model C4 included psychosocial factors: having an attractive personality (as rated by the interviewer), not meeting criteria for depression, meeting criteria for religiosity, and not feeling as though she is being treated with less respect than others daily. The likelihood ratio chi-square of the model was 101.7889 ($p < 0.001$), indicating that the model as a whole fit significantly

better than a model with no predictors. A χ^2 difference test shows that this model did not fit the data better than model A4. It did, however, fit the data better than model B4.

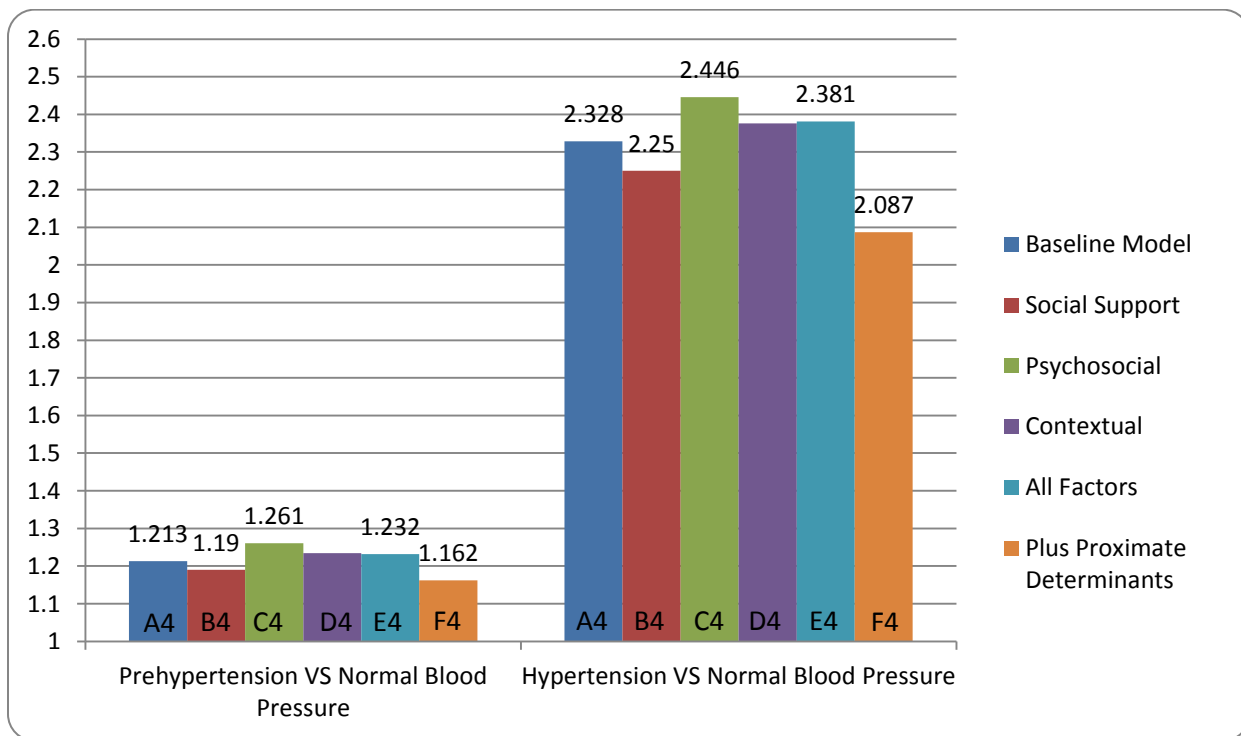
As shown in Tables 3 and 4 (Model C4), race remained a significant predictor of both prehypertension and hypertension. A couple of the psychosocial factors included in Model C4 were significant but weak predictors of blood pressure, although not in the direction expected. For instance, an unattractive personality was negatively associated with prehypertension. Also, depression was negatively associated with prehypertension (Table 3).

Prehypertension and hypertension disparities between black and white women in Model A4, which controls for age and SES, did not decrease, but actually increased, with the addition of psychosocial factors in Model C4. As displayed in Figure 4, the OR for race in Model A4 is 1.213 (95% CI = 0.967-1.522) for prehypertension, compared to an OR of 1.261 (95% CI = 1.000-1.591) in Model C4. Also, the OR for race in Model C4 was 2.446 (95% CI = 1.782-3.358) for hypertension, which is somewhat higher than the corresponding OR for race in model A4 (OR = 2.328, 95% CI = 1.707-3.176) (Figure 4). Therefore, hypothesis 6 (Racial disparities in hypertension will diminish when Wave IV psychosocial factors are added to a cross-sectional (Wave IV) multinomial logistic regression model) was not supported by the data.

Model D4 included the contextual factor, safeness of the neighborhood as rated by the interviewer. The likelihood ratio chi-square of Model D4 was 77.6723 ($p < 0.001$), which indicates that this model did not fit the data significantly better than model A4 or model C4. But a χ^2 difference test shows that it did fit the data better than model B4, which included social support factors.

Safeness of the neighborhood was not a significant predictor of either prehypertension or hypertension (Tables 3 and 4). Further, as shown on Figure 4, the OR for race in Model D4

Figure 4. Odds Ratios for Race in Cross-Sectional Multinomial Logistic Regression Models A4 to F4



White is the reference category

was 1.234 (95% CI = 0.970-1.570) for prehypertension, which was slightly higher than the OR for race in prehypertension in Model A4. And the OR for race for hypertension in Model D4 was 2.376 (95% CI = 1.709-3.302), which was slightly higher than the OR for race for hypertension in Model A4 (OR = 2.328, 95% CI = 1.707-3.176).

These values indicate that the association between race and hypertension and prehypertension actually increased slightly and remained significant in Model D4, as compared to Model A4. So, hypothesis 7 (Racial disparities in hypertension will diminish when Wave IV contextual factors are added to a cross-sectional (Wave IV) multinomial logistic regression model) was not supported.

Model E4 included all of the social support, psychosocial, and contextual factors included in Models B4, C4, and D4. The likelihood ratio chi-square of the model was 93.5760 ($p < 0.0001$), signifying that the model as a whole fit significantly better than a null model. According to χ^2 difference tests, model fit did not improve between any of the previously described models (A4, B4, C4 and D4) and model E4.

Almost none of the social support, psychosocial, or contextual factors in the model were significant predictors of prehypertension or hypertension. The only significant predictors among these factors of prehypertension were personality and depression. As shown in Table 3, an unattractive personality was significantly associated with lower odds of prehypertension (OR = 0.665, 95% CI = 0.430-1.028). Also unexpectedly, meeting the criteria for depression was negatively and significantly associated with prehypertension (OR = 0.679, 95% CI = 0.509-0.905).

The inclusion of all of the social support, psychosocial, and contextual factors in Model E4 actually increased the ORs for race, as compared to the ORs for race in Model A4. As displayed on Figure 4, the OR for race for prehypertension in model A4 was 1.213 (95% CI = 0.967-1.522), as compared to the somewhat higher 1.232 (95% CI = 0.958-1.586) OR in Model E4. The OR for race for the model predicting hypertension in Model E4 was also somewhat higher than the OR for race predicting hypertension in Model A4 [2.381 (95% CI = 1.686-3.364) and 2.328, (95% CI = 1.707-3.176), respectively]]. These slight increases in the ORs for race from the models in A4 to the models in E4 indicate that even after controlling for social support, psychosocial, and contextual factors, black women were still more likely than white women to suffer from prehypertension and hypertension. So, hypothesis 8 (Racial disparities in hypertension will diminish further when Wave IV social support, psychosocial, and contextual

Table 3. Coefficients from Multinomial Logistic Regression Models for Prehypertension vs. Normal Blood Pressure

Parameter	Model A	Model B	Model C	Model D	Model E	Model F
	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)
Intercept	-2.2167** (0.800)	-2.4504** (.821)	-2.236** (.817)	-2.3064** (.828)	-2.5878** (0.863)	-2.8012** (.891)
Race ^a	0.1935 (0.116)	.1736 (0.118)	.2320* (.117)	.2100 (.123)	.2090 (.129)	.1501 (.135)
Age	0.0571* (0.028)	.0616* (.0280)	.0570* (.028)	.0604* (.028)	.0658* (.029)	.0656* (.030)
SES						
Income ^b						
0= less than \$20,000	0.3050 (.181)	0.2385 (.188)	.3160 (.185)	.3858* (.189)	.3546 (.199)	.2582 (.206)
1= \$20K-\$39K	.1314 (.150)	0.0842 (.155)	.1253 (.151)	.1419 (.155)	.0935 (.164)	-.0065 (.168)
2= \$40K-\$74K	0.3402** (.129)	0.3324* (.131)	.3415** (.131)	.3397* (.134)	.3373* (.337)	.2501 (.139)
Education ^c						
0= Less than a high school degree	.1761 (.253)	.1252 (.261)	.2862 (.261)	.1073 (.264)	.1706 (.280)	-.0681 (.295)
1= high school diploma or equivalent	.2161 (.158)	.2073 (.163)	.2761 (.162)	.1946 (.166)	.2418 (.174)	.0247 (.182)
2= Bachelor's degree	.0028 (.168)	.0297 (.169)	.0341 (.170)	-.0065 (.177)	.0570 (.180)	-.0206 (.185)
Social Support Factors						
Marital Status ^d		.1294 (.109)			.1217 (.114)	.1294 (.119)
# Close Friends ^e		-.1241 (.333)			-.0390 (.348)	.1451 (.3655)
Volunteering ^f		.0892 (.105)			.0893 (.111)	.1122 (.114)
Employment ^g		.1007 (.126)			.0837 (.130)	.1009 (.135)
Psychosocial Factors						
Depression ^h		-.4145** (.142)			-.3876** (.147)	-.4361** (.153)
Personality Attractiveness ⁱ		-.4811* (.216)			-.4076 (.222)	-.4347 (.228)
Perceptions of Discrimination ^j		.1188 (.121)			.1193 (.126)	.0654 (.131)
Religiosity ^k		.0345 (.123)			.0333 (.133)	.1072 (.139)
Contextual Factors						
Safeness of respondent's home ^l				-.1858 (.226)	-.1752 (.232)	-.2764 (.241)
Proximate Determinants						
BMI ^m						1.0618** (.114)
Tobacco Smoking ⁿ						.0446 (.123)

*p<0.05; **p<0.01

^a White is the reference category

^b At least 75K is the reference category

^c Graduate or professional degree is the reference category

^d Currently married is the reference category

^e At least one friend is the reference category

^f Volunteer activity within past year is the reference category

^g Currently employed is the reference category

^h Not meeting criteria for depression is the reference category

ⁱ Very attractive and attractive is the reference category

^j Never or rarely experiencing discrimination is the reference group

^k Meeting criteria for religiosity is the reference category

^l As rated by the respondent; Safe is the reference category

^l As rated by the interviewer; Very safe or moderately safe is the reference category

^m Not Obese is the reference category

ⁿ No tobacco smoking within the past month is the reference category

factors are all included in the same cross-sectional (Wave IV) multinomial logistic regression model) was not supported.

The final model in the cross-sectional analyses was Model F4, which included all of the factors included in Model E4, plus selected proximate determinants of blood pressure: BMI and tobacco smoking. The likelihood ratio chi-square of the model was 227.4039 ($p < 0.001$), meaning that the model as a whole fit significantly better than a null model. Chi-square difference tests revealed that this model is a better fit for the data than any of the previous models (A4-E4).

As in all of the previous models, age was a significant predictor of prehypertension and hypertension in Model F4 (Tables 3 and 4). Although none of the social support, psychosocial, or contextual factors in the model were significantly predictive of hypertension, depression remained a significant predictor of prehypertension. As shown in Table 3, meeting criteria for depression was significantly and negatively associated with prehypertension (OR = 0.647, 95% CI = 0.479-0.872).

Smoking tobacco was not a significant predictor of either prehypertension or hypertension (Tables 3 and 4). On the other hand, BMI was the strongest and most significant predictor of both prehypertension and hypertension in all of the models. In fact, those with BMIs considered as obese were 2.892 times more likely to have prehypertension, compared to those with lower BMIs (OR = 2.892, 95% CI = 2.314-3.614). And meeting criteria for obesity was

strongly and significantly associated with a nearly fivefold increase in the odds of hypertension (OR = 4.815, 95% CI = 3.455-6.711).

As was the case in Model A4, the OR for race for prehypertension in this model was not significant (OR = 1.162; 95% CI = 0.892-1.514). Interestingly, even after controlling for select social support, psychosocial, and contextual factors, as well as BMI and tobacco smoking, race remained a significant predictor of hypertension in Model F4. Table 4 shows that being black, as compared to being white, was significantly associated with having hypertension. Further, the OR for race in Model F4 was only slightly lower than the OR for race in Model A4 [2.087 (95% CI = 1.450-3.005) and 2.328 (95% CI = 1.707-3.176), respectively]. This indicates that the racial disparities in hypertension remained strong, even after controlling for social support, psychosocial, and contextual factors, and BMI and tobacco smoking. Hypothesis 9 (Racial disparities in hypertension will diminish when Wave IV behavioral factors, namely BMI and tobacco use, are included in the cross-sectional (Wave IV) multinomial logistic regression model) was not supported.

The cross-sectional analyses suggest that the only factor included in the models that explained even a small portion of the racial differences in prehypertension or hypertension was BMI. In fact, after controlling for adulthood social support factors (Model B4), psychosocial factors (Model C4), contextual factors (Model D4), all factors (Model E4), and all factors and BMI and tobacco smoking (Model F4), racial disparities in hypertension and prehypertension remained largely unchanged, relative to the disparities observed in Model A4, which controlled only for SES and age (see Figure 4).

Table 4. Coefficients from Multinomial Logistic Regression Models for Hypertension vs. Normal Blood Pressure

Parameter	Model A	Model B	Model C	Model D	Model E	Model F
	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)
Intercept	-7.4959** (1.217)	-7.7753** (1.248)	-7.5912** (1.237)	-7.1786** (1.260)	-7.6153** 1.312	-7.8400** (1.372)
Race ^a	.8450** (.158)	.8109** (.162)	.8946** (.162)	.8653** (.168)	.8676** (.176)	.7359** (.186)
Age	.1890** (.041)	.1951** (.042)	.1881** (.041)	.1775** (.043)	.1863** (.044)	.1799** (.046)
SES						
Income ^b						
0= less than \$20,000	.3543 (.261)	.2592 (.270)	.3438 (.266)	.4511 (.276)	.3565 (.290)	.2206 (.299)
1= \$20K-\$39K	-.0235 (.233)	-.1149 (.241)	-0.0313 (.235)	.0351 (.243)	-0.0680 (.253)	-0.3169 (.264)
2= \$40K-\$74K	.2143 (.202)	.1979 (.203)	.2277 (.203)	.3167 (.210)	.3089 (.211)	.1535 (.218)
Education ^c						
0= Less than a high school degree	-0.0840 (.423)	-0.0060 (.436)	-0.0793 (.430)	-0.4372 (.471)	-0.3582 (.491)	-0.6657 (.509)
1= high school diploma or equivalent	.5270* (.255)	.5972* (.263)	.5063* (.257)	.4371 (.266)	.5054 (.278)	.1890 (.294)
2= Bachelor's degree	.1826 (.274)	.2772 (.279)	.1601 (.275)	.1473 (.286)	.2272 (.292)	.1262 (.304)
Social Support Factors						
Marital Status ^d		.1556 (.165)			.1709 (.174)	.1910 (.181)
# Close Friends ^e		.1478 (.425)			.1594 (.452)	.4707 (.477)
Volunteering ^f		-0.0765 (.157)			-0.1220 (.165)	-0.0346 (.172)
Employment ^g		.2357 (.180)			.2191 (.188)	.2593 (.196)
Psychosocial Factors						
Depression ^h			-.2052 (.199)		-0.1182 (.207)	-0.1953 (.216)
Personality Attractiveness ⁱ			-0.3871 (.318)		-3508 (.332)	-0.4720 (.351)
Perceptions of Discrimination ^j			.01742 (.173)		.1041 (.184)	.0718 (.189)
Religiosity ^k			.1830 (.184)		.1430 (.198)	.2035 (.209)
Contextual Factors						
Safeness of respondent's home ^l				.0394 (.295)	-0.0299 (.304)	-0.1855 (.317)
Proximate Determinants						
BMI ^m						1.5717** (.169)
Tobacco Smoking ⁿ						.0812 (.182)

* p<0.05; ** p<0.01

^a White is the reference category

^b At least 75K is the reference category

^c Graduate or professional degree is the reference category

^d Currently married is the reference category

^e At least one friend is the reference category

^f Volunteer activity within past year is the reference category

^g Currently employed is the reference category

^h Not meeting criteria for depression is the reference category

ⁱ Very attractive and attractive is the reference category

^j Never or rarely experiencing discrimination is the reference group

^k Meeting criteria for religiosity is the reference category

^l As rated by the interviewer; Very safe or moderately safe is the reference category

^m Not Obese is the reference category

ⁿ No tobacco smoking within the past month is the reference category

Results from Longitudinal Models

Because of the lack of reduction in racial disparities in blood pressure produced by the cross-sectional models examining adulthood factors, I estimated another series of multinomial logistic regression models that examine how adolescent and cumulative factors influence racial disparities in hypertension. These models address my second aim: What adolescent and cumulative factors explain adulthood blood pressure disparities between black and white women?

The first cumulative model (AC) predicted racial differences in prehypertension and hypertension, adjusted for age and SES in adolescence and adulthood. The likelihood ratio chi-square of the model was 98.267 ($p < 0.001$), indicating that the model as a whole fit significantly better than a null model.

As displayed on Tables 5 and 6, age was a significant predictor of prehypertension (OR = 1.058; 95% CI = 1.002-1.117) and hypertension (OR = 1.223; 95% CI = 1.126-1.328). The effect of respondent's education on blood pressure in Model AC was similar to the effect of respondent's education in Model A4; in each model, the education level of the respondent was a significant positive predictor of hypertension. For instance, relative to having a graduate or professional degree, having only a high school degree was (non-significantly) associated with hypertension (OR= 1.643; 95% CI = 0.970-2.782). Adolescent household income was also (non-significantly) associated with blood pressure, as a household income between \$20,000 and \$39,999 increased

Table 5. Coefficients from Multinomial Logistic Regression Models for Prehypertension vs. Normal Blood Pressure

Parameter	Model A	Model B	Model C	Model D	Model E	Model F
	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)
Intercept	-2.4210** (.825)	-2.8653** (.913)	-2.3171** (.855)	-2.3920** (.827)	-2.8068** (.950)	-2.7754** (1.004)
Race ^a	.1784 (.118)	.1356 (.121)	.2378 (.125)	.1989 (.1212)	.2080 (.132)	0.1656 (.144)
Age	.0561* (.028)	.068* (.030)	.0492 (.029)	.0555* (.028)	.0624* (.031)	.0564 (.033)
SES						
Adolescent Household Income ^b						
0= less than \$20,000	.2222 (.205)	.2199 (.207)	.1908 (.209)	.2307 (.205)	.2193 (.211)	.0955 (.223)
1= \$20K-\$39K	.3639 (.193)	.3866* (.196)	.4238* (.197)	.3598 (.193)	.4484* (.200)	.3818 (.209)
2= \$40K-\$74K	.2796 (.175)	.254 (.117)	.2897 (.178)	.2869 (.175)	.2826 (.180)	.2590 (.188)
Mother's Education ^c						
0= Less than a high school degree	.1306 (.249)	.1367 (.254)	.0917 (.257)	.1002 (.251)	.0752 (.261)	.1665 (.273)
1= high school diploma or equivalent	.0805 (.182)	.1104 (.185)	.0863 (.185)	.0815 (.182)	.1280 (.188)	.1396 (.197)
2= Bachelor's degree	-0.00246 (.205)	.0142 (.207)	-0.0195 (.210)	.0020 (.205)	.0151 (.213)	.0585 (.222)
Adulthood Household Income ^b						
0= less than \$20,000	.3008 (.183)	.1985 (.192)	.2979 (.190)	.3144 (.185)	.2154 (.200)	.1339 (.213)
1= \$20K-\$39K	.1149 (.152)	.0654 (.158)	.1183 (.155)	.1214 (.152)	.0706 (.162)	-0.0432 (.171)
2= \$40K-\$74K	.3240* (.130)	.3276* (.132)	.3377* (.133)	.3173* (.131)	.3405* (.135)	.2517 (.141)
Education ^e						
0= Less than a high school degree	.0542 (.267)	.0349 (.280)	.1681 (.282)	.0796 (.268)	.1614 (.293)	-0.1295 (.318)
1= high school diploma or equivalent	.1230 (.168)	.1558 (.176)	.1341 (.175)	.1250 (.168)	.1638 (.182)	-0.0285 (.194)
2= Bachelor's degree	-0.0282 (.169)	.0236 (.172)	-0.0294 (.174)	-0.0273 (.169)	.0330 (.176)	-0.1061 (.183)
Social Support Factors						
Longitudinal Adolescent Romantic Relationship ^d		.0226 (.108)			.0028 (.111)	-0.0744 (.118)
Adolescent Contact with Friends ^e		.1140 (.173)			.0519 (.181)	.0024 (.190)
Cumulative Volunteer Activity ^f						
0= No volunteering at all		-0.0137 (.144)			-0.0020 (.149)	.0415 (.158)
1= Volunteering at either wave III or IV		-0.0646 (.144)			-0.0812 (.147)	-0.0685 (.155)
Cumulative Employment Status ^g						
0= No working at all		.2030 (.193)			.2962 (.200)	.4093 (.209)
1= Working at either wave III or IV		.0826 (.114)			.0748 (.116)	.1129 (.122)
Adult		.1390			.1595	.1744

Marital Status ^h		(.109)			(.114)	(.120)
# Close Friends ⁱ		-0.1490 (.335)			-0.3483 (.365)	-0.0228 (.384)
Psychosocial Factors						
Longitudinal						
Cumulative Depression ^j						
1= Depression at one wave			-0.1829 (.128)		-0.1819 (.130)	-0.1988 (.137)
2= Depression at two waves			.00752 (.194)		.0231 (.197)	-0.1815 (.211)
3= Depression at three waves			-0.3475 (.323)		-0.4077 (.338)	-0.5411 (.350)
Cumulative Personality Attractiveness ^k						
1= Attractive at one wave			-0.3467 (.531)		-0.3981 (.574)	-0.5845 (.628)
2= Attractive at two of the wave			-0.3532* (.153)		-0.3499* (.156)	-0.3907* (.164)
Cumulative Religiosity ^l						
1= Religious at none of the waves			.1404 (.196)		.1083 (.203)	.2227 (.215)
2= Religious at one waves			.1365 (.209)		.1439 (.215)	.1967 (.225)
3= Religious at two waves			.1097 (.234)		.1178 (.238)	.1080 (.250)
Adult						
Perceptions of Discrimination ^m			.0718 (.124)		.0658 (.126)	.0411 (.132)
Contextual Factors						
Longitudinal						
Safeness of neighborhood ⁿ				-0.0227 (.178)	-0.0297 (.188)	.0377 (.120)
Cumulative Safeness of R's home ⁿ						
1= Unsafe at one wave				-0.2444 (.182)	.1300 (.251)	-0.2865 (.202)
2= Unsafe at two waves				.2828 (.551)	.1004 (.573)	-0.2241 (.630)
3= Unsafe at all three waves				-0.0766 (.186)	-0.0722 (.199)	-0.0522 (.213)
Proximate Determinants						
Longitudinal						
Cumulative BMI ^o (Waves III and IV)						
1= Obese at one wave						.7157** (.144)
2= Obese at both waves						.11225** (.140)
Cumulative Tobacco Smoking ^p (Waves I, II, IV)						
1= Smoking at one wave						-0.1138 (.158)
2= Smoking at two waves						-0.0360 (.156)
3= Smoking at all three waves						-0.0624 (.276)

* p<0.05; **p<0.01^a White is the reference category

^b At least 75K is the reference category

^c Graduate or professional degree is the reference category

^d No romantic relationship within past 18 months is the reference category

^e Hanging out with friends at least once in past week is the reference category

^f Volunteer activity at both waves III and IV is the reference category

^g Currently employed at waves III and IV is the reference category

^h Currently married is the reference category

ⁱ At least one friend is the reference category

^j Below cut-off for depression at all waves is the reference category

^k Very attractive and attractive at all waves is the reference category

^l Above cut-off for religiosity at all waves is the reference category

^m Never or rarely experiencing discrimination is the reference group

ⁿ As rated by respondent; Safe is the reference category

^o As rated by interviewer; Very safe or moderately safe at all waves is the reference category

^p Not obese at either wave III or IV is the reference category

^p No tobacco smoking within the past month at any wave is the reference category

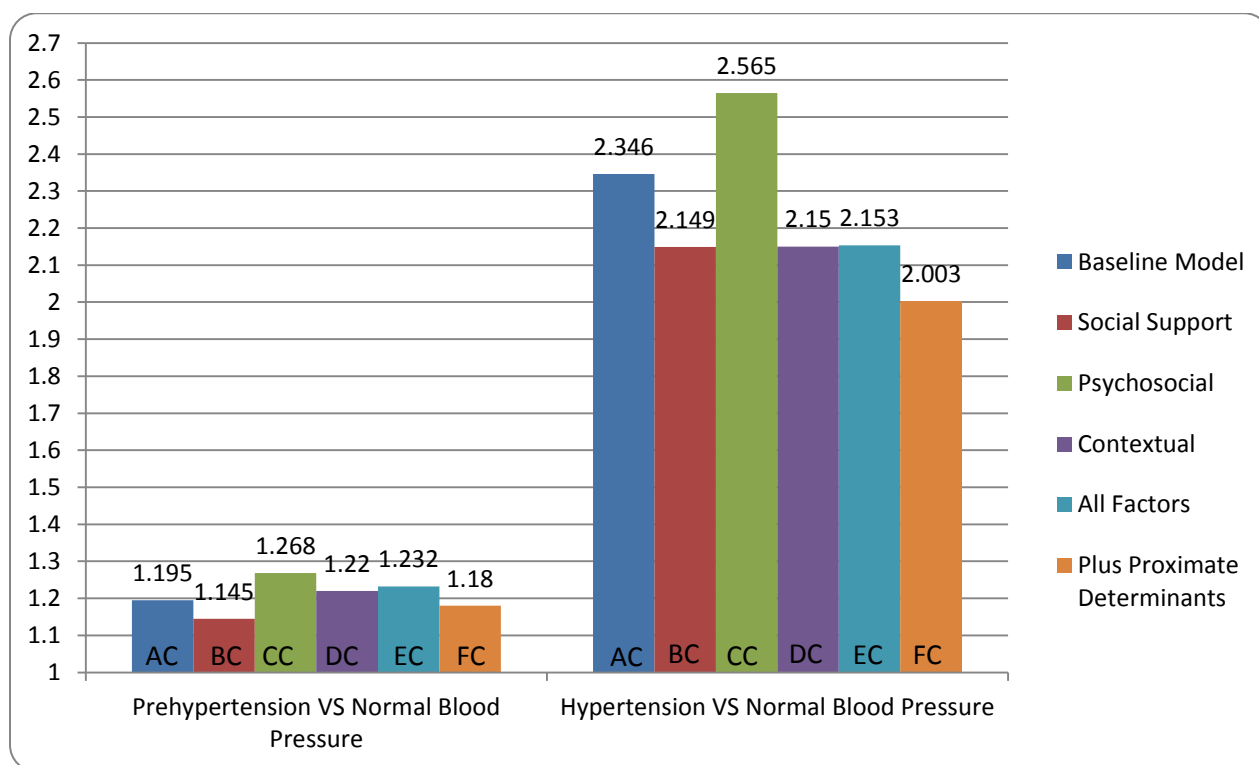
the odds of prehypertension (OR= 1.439; 95% CI = 0.986-2.101), compared to a household income of at least \$75,000. Adulthood household income was also predictive of blood pressure. As shown on Table 5, a household income between \$40,000 and \$74,999, as opposed to having a household income of at least \$75,000, was significantly predictive of prehypertension (OR = 1.383; 95% CI = 1.071-1.785).

Race was also significantly predictive of blood pressure in Model AC (Table 6). Black women were 2.3 times more likely than white women to suffer from hypertension (OR = 2.346; 95% CI = 1.706-3.226). But as indicated on Figure 5, black women did not have significantly higher odds of prehypertension, after controlling for age and SES in adolescence and adulthood (OR = 1.195; 95% CI = 0.949-1.506).

As discussed above, the OR for race in Model A4 (cross-sectional) was 1.213 (95% CI = 0.967-1.522) for prehypertension vs. normal blood pressure, which was slightly higher than the OR for race in the longitudinal Model AC (OR = 1.195; 95% CI = 0.949-1.506). And the OR for race in Model A4 was 2.328 (95% CI = 1.707-3.176) for hypertension vs. normal blood pressure, compared 2.346 (95% CI = 1.706-3.226) in Model AC. This shows that the addition of adolescent household income and mother's education as a child (Model AC) did not help explain racial disparities in blood pressure. So, hypothesis 10 (Racial disparities will diminish but not disappear when adult and adolescent SES factors (education and household income) are used to predict the odds of Wave IV hypertension) was not supported.

In the following models, adolescent and cumulative factors associated with both race and blood pressure were included to determine their role in racial differences in adulthood hypertension. Model BC included the following social support factors: hanging out with friends at least once a week, being in a romantic relationship as an adolescent, having at least one friend in adulthood, being currently married in adulthood, and cumulative volunteer activity and cumulative current employment in Waves III and IV. The model fit was good, as the likelihood ratio chi-square of Model BC was 107.44 ($p < 0.0001$), indicating that the model as a whole fit significantly better than a null model. On the other hand, this model did not fit the data significantly better than model AC, which did not include social support factors.

Figure 5. Odds Ratio for Race in Longitudinal Multinomial Logistic Regression Models AC to FC



White is the reference category

Age remained a significant predictor of both prehypertension and hypertension once social support factors were included in the model (Model BC) (OR = 1.070; 95% CI = 1.008-1.135; OR = 1.246; 95% CI = 1.140-1.361, respectively). Adolescent household income and adult household income also remained significant predictors of prehypertension, as they were in Model AC. For instance, having a household income between \$20,000 and \$39,999 as an adolescent, compared to having an adolescent household income of at least \$75,000, is positively predictive of prehypertension in adulthood (OR = 1.472; 95% CI = 1.003-2.160). And an adult household income between \$40,000 and \$74,999, as opposed to a household income of at least \$75,000, was predictive of prehypertension (OR = 1.388; 95% CI = 1.071-1.798) (Table 5). As indicated in Table 6, having only a high school degree, as compared to having a graduate or professional degree, was also predictive of hypertension (OR = 1.816; 95% CI = 1.045-3.155).

Race remained significantly associated with hypertension, after adolescent and cumulative SES and social support factors were included in the model. Table 6 shows that black women were much more likely to suffer hypertension than white women. Although none of the adolescent, cumulative, or adulthood social support factors in Model AC were significant predictors of prehypertension or hypertension, their addition to the model did reduce racial disparities in prehypertension and hypertension very slightly. For instance, the OR for race predicting prehypertension including only SES and age (Model AC) is 1.195 (95% CI = 0.949-1.506) and the OR for race in the model including adolescent and cumulative social support factors (Model BC) was 1.145 (95% CI = 0.904-1.451) (Figure 5). Further, the OR for race predicting hypertension by only SES and age (Model AC) was 2.346 (95% CI = 1.706-3.226) and the OR for race in the model including adolescent and cumulative social support factors (Model BC) was 2.149 (95% CI = 1.546-2.986) (Figure 5). These differences in odds ratios between the

models indicated a very slight attenuation of racial disparities in prehypertension and hypertension when taking into account adolescent, adulthood, and cumulative social support factors.

So, hypothesis 11 (Racial disparities in hypertension will diminish when adolescent and cumulative measures of social support are added to a cumulative (Waves I, III, and IV) multinomial logistic regression model) was modestly supported.

Model CC includes cumulative and adulthood psychosocial factors. The cumulative factors measured at Waves I, III, and IV are: having an attractive personality (as rated by the interviewer), not meeting criteria for depression, and meeting criteria for religiosity. In addition, measures of perceptions of respect in adulthood are included in Wave IV. The likelihood ratio chi-square of the model is 112.551 ($p < 0.001$), indicating that the model as a whole fits significantly better than a null model. According to chi-square difference tests, model fit does not improve from either model AC or model BC.

As seen in model C4 that included only adulthood factors, a couple of the psychosocial factors included in Model CC were significant but weak predictors of blood pressure. For instance, having an attractive personality in only two of the waves, as compared to across all three waves (I, III, and IV) was negatively associated with prehypertension. And meeting criteria for depression in one wave, as opposed to not meeting criteria in any wave, was negatively (but non-significantly) predictive of hypertension (Table 6).

Race remained a significant predictor of both prehypertension and hypertension, as blacks were more likely than whites to suffer both conditions. Interestingly, prehypertension and hypertension disparities between black and white women did not decrease, but actually increased, with the addition of psychosocial factors in Model CC. As displayed in Figure 5, race

Table 6. Coefficients from Multinomial Logistic Regression Models for Hypertension vs. Normal Blood Pressure

Parameter	Model A	Model B	Model C	Model D	Model E	Model F
	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)
Intercept	-7.9153** (1.265)	-8.5188** (1.389)	-7.8029** (1.304)	-7.9351** (1.273)	-8.8492** (1.451)	-8.8185** (1.558)
Race ^a	.8527** (.163)	.7649** (.168)	.9420** (.171)	.7655** (.170)	.7667** (.185)	.6947** (.203)
Age	.2012** (.042)	.2199** (.045)	.1909** (.043)	.2026** (.042)	.2196** (.047)	.2052** (.050)
SES						
Adolescent						
Household Income ^b						
0= less than \$20,000	.2751 (.304)	.2822 (.307)	.2657 (.307)	.2438 (.305)	.2329 (.312)	.0502 (.330)
1= \$20K-\$39K	.3637 (.289)	.3931 (.293)	.4251 (.292)	.3188 (.291)	.4234 (.296)	.3291 (.312)
2= \$40K-\$74K	.1928 (.270)	.1784 (.272)	.1817 (.273)	.1968 (.270)	.1802 (.275)	.0815 (.293)
Mother's Education ^c						
0= Less than a high school degree	-0.0568 (.368)	-0.0653 (.372)	-0.0851 (.380)	-0.1079 (.371)	-0.1369 (.388)	-0.1262 (.408)
1= high school diploma or equivalent	-0.0058 (.275)	.0210 (.277)	.0275 (.281)	-0.0166 (.275)	.0725 (.283)	.0028 (.301)
2= Bachelor's degree	-0.0863 (.314)	-0.0505 (.315)	.0183 (.320)	-0.1304 (.316)	.0369 (.324)	-0.0199 (.344)
Adulthood						
Household Income ^b						
0= less than \$20,000	.3290 (.265)	.2142 (.278)	.3014 (.275)	.2864 (.268)	.1505 (.290)	-0.0973 (.308)
1= \$20K-\$39K	-0.0521 (.236)	-0.1697 (.246)	-0.0795 (.240)	-0.1022 (.239)	-0.2526 (.254)	-0.5936* (.273)
2= \$40K-\$74K	.2010 (.203)	.1909 (.205)	.2046 (.206)	.1910 (.204)	.1939 (.207)	-0.0397 (.220)
Education ^e						
0= Less than a high school degree	-0.1177 (.441)	-0.1190 (.460)	-0.0384 (.456)	-0.1476 (.445)	-0.0608 (.477)	-0.3792 (.513)
1= high school diploma or equivalent	.4964 (.269)	.5966* (.282)	.4382 (.276)	.4898 (.270)	.5376 (.290)	.2187 (.315)
2= Bachelor's degree	.1953 (.276)	.3062 (.281)	.1556 (.279)	.1840 (.278)	.2524 (.286)	.1223 (.307)
Social Support Factors						
Longitudinal						
Adolescent Romantic Relationship ^d		.0546 (.162)			.1360 (.167)	.0789 (.179)
Adolescent Contact with Friends ^e		.1601 (.250)			.1971 (.254)	.1379 (.273)
Cumulative Volunteer Activity ^f						
0= No volunteering at all		-0.1449 (.211)			-0.1612 (.222)	-0.0374 (.241)
1= Volunteering at either wave III or IV		-0.2002 (.218)			-0.2960 (.225)	-0.1722 (.241)
Cumulative Employment Status ^g		.2271 (.282)			.2365 (.297)	.3478 (.316)
0= No working at all		.1309 (.172)			.0998 (.175)	.1142 (.189)
1= Working at either wave III or IV						
Adult						
Marital Status ^h		.1279 (.166)			.1426 (.173)	.1629 (.183)
		.1529			.2232	.6435

# Close Friends ^l		(.431)			(.438)	(.477)
Psychosocial Factors						
Longitudinal						
Cumulative Depression ^j						
1= Depression at one wave			-0.3546 (.193)		-0.3755 (.197)	-0.3755 (.209)
2= Depression at two waves			-0.2062 (.289)		-0.3323 (.304)	-0.6878* (.334)
3= Depression at three waves			-0.3753 (.461)		-0.4478 (.474)	-0.6995 (.507)
Cumulative Personality Attractiveness ^k						
1= Attractive at one wave			-0.0639 (.686)		-0.0784 (.702)	.0112 (.754)
2= Attractive at two waves			.0088 (.211)		-0.0315 (.216)	-0.0438 (.232)
Cumulative Religiosity ^l						
0= Religious at none of the waves			.2501 (.299)		.4040 (.323)	.5619 (.350)
1= Religious at one waves			.2895 (.316)		.4502 (.337)	.5986 (.361)
2= Religious at two waves			-0.0187 (.360)		.1189 (.378)	.2058 (.404)
Adult						
Perceptions of Discrimination ^m			.2317 (.177)		.1963 (.181)	.1460 (.193)
Contextual Factors						
Longitudinal						
Safeness of neighborhood ⁿ				.3157 (.232)	.3395 (.245)	.4945 (.262)
Cumulative Safeness of R's home ⁿ						
1= Unsafe at one wave				.1470 (.239)	.1300 (.251)	.0521 (.270)
2= Unsafe at two waves				1.0548 (.586)	.6932 (.649)	.5486 (.690)
3= Unsafe at all three waves				.1119 (.262)	.1862 (.275)	.0693 (.307)
Proximate Determinants						
Longitudinal						
Cumulative BMI ^o (Waves III and IV)						
1= Obese at one wave						1.1878** (.221)
2= Obese at both waves						1.8264** (.200)
Cumulative Tobacco Smoking ^p (Waves I, II, IV)						
1= Smoking at one wave						-0.0603 (.245)
2= Smoking at two waves						.2620 (.232)
3= Smoking at all three waves						.0366 (.276)

*p<0.05; **p<0.01

^a White is the reference category^b At least 75K is the reference category^c Graduate or professional degree is the reference category^d No romantic relationship within past 18 months is the reference category^e Hanging out with friends at least once in past week is the reference category^f Volunteer activity at both waves III and IV is the reference category^g Currently employed at waves III and IV is the reference category^h Currently married is the reference categoryⁱ At least one friend is the reference category^j Below cut-off for depression at all waves is the reference category

^kVery attractive and attractive at all waves is the reference category

^lAbove cut-off for religiosity at all waves is the reference category

^mNever or rarely experiencing discrimination is the reference group

ⁿAs rated by respondent; Safe is the reference category

^oAs rated by interviewer; Very safe or moderately safe at all waves is the reference category

^oNot Obese at either wave III or IV is the reference category

^pNo tobacco smoking within the past month at any wave is the reference category

was an insignificant predictor of prehypertension in Model CC is (OR = 1.268; 95% CI = 0.993-1.619). Race was, however, a significant predictor of hypertension in Model CC (OR = 2.565; 95% CI = 1.833-3.589), which was a bit higher than the OR for race in Model AC (OR = 2.346; 95% CI = 1.706-3.226). This indicates that racial disparities in hypertension increased from Model AC to Model CC, suggesting that psychosocial factors may actually exacerbate higher rates of prehypertension and hypertension among black women. Hypothesis 12 (Racial disparities in hypertension will diminish further when adolescent and cumulative psychosocial factors are added to a cumulative (Waves I, III, and IV) multinomial logistic regression model) was not supported.

Model DC included a longitudinal assessment of neighborhood safeness (as rated by the interviewer) and the respondent's concern for safety as an adolescent (Wave I). The likelihood ratio chi-square of Model DC was 107.601 ($p < 0.001$) (Tables 5 and 6), indicating that the model as a whole fit significantly better than a null model. It did not, however, fit the data better than model AC, which included no contextual factors. None of the longitudinal measures of neighborhood safety were associated with prehypertension (Table 5) or hypertension (Table 6).

Race was significantly associated with blood pressure in Model DC. Being black, as compared to being white, was (non-significantly) predictive of prehypertension (Table 5) and significantly associated with hypertension (Table 6). Interestingly, the addition of cumulative safeness of neighborhood and respondents' perceived safeness in adolescence slightly increased

the OR for race. As indicated above, the OR for race in Model AC predicting prehypertension, which included only cumulative SES measures, was 1.195 (95% CI = 0.949-1.506), which was slightly lower than the OR for race in Model DC, which included the cumulative contextual factors (OR = 1.220, 95% CI = 0.962-1.596) (Figure 5). Conversely, the OR for race diminished somewhat with respect to hypertension in Model DC (OR = 2.150, 95% CI = 1.542-2.998), relative to Model AC (2.346; 95% CI = 1.706-3.226) (Figure 5). Therefore, hypothesis 13 (Racial disparities in hypertension will diminish further when adolescent and cumulative measures of environmental conditions are added to a cumulative (Waves I, III, and IV) multinomial logistic regression model) was modestly supported.

Model EC included all of the adolescent, adulthood, and cumulative social support, psychosocial, and contextual factors included in Models BC, CC, and DC. The likelihood ratio chi-square of the model was 131.690 ($p < 0.001$), indicating that the model as a whole fit significantly better than a null model. However, chi-square difference tests showed that this model did not fit the data better than any of the other models (AC-DC).

Few of the adolescent, adulthood, or cumulative social support, psychosocial, or contextual factors in Model EC were significant predictors of prehypertension or hypertension. In fact, the only factor significantly associated with lower odds of prehypertension was having an attractive personality in only two of the three waves, as opposed to all three of the waves (Table 5). And the only factor (non-significantly) negatively associated with hypertension was meeting criteria for depression in one of the three waves (Waves I, III, or IV), relative to not meeting criteria for depression in any of the waves (Table 6).

Race was not a significant predictor of prehypertension in model EC containing adolescent, adult, and cumulative social support, psychosocial, and contextual factors (OR =

1.232, 95% CI = 0.950-1.596). Although race was a significant predictor of hypertension in Model EC, there was a slight decrease in the OR for race in this model (OR = 2.153; 95% CI = 1.498-3.094), compared to the OR for race in Model AC (OR = 2.346; 95% CI = 1.706-3.226). So, while the racial disparities in hypertension diminished slightly in Model EC, relative to Model AC, hypothesis 14 (Racial disparities in hypertension will diminish when the life course effects of social support, psychosocial characteristics, and contextual factors are all included in a cumulative (Waves I, III, and IV) multinomial logistic regression model) was only modestly supported, as adolescent, adulthood, and cumulative social support, psychosocial, and contextual factors only produced a small amount of attenuation in the OR for race.

Model FC, the final model including adolescent, adulthood, and cumulative factors also included two proximate determinants of blood pressure, cumulative BMI and cumulative tobacco smoking. The model fit was great, as the likelihood ratio chi-square of the model was 265.950 ($p < 0.001$), indicating that the model as a whole fit significantly better than a null model. Chi-square difference tests indicated that this model was a significantly better fitting model than model AC, which predicted age-adjusted odds of hypertension by race, controlling for age and SES. In fact, Model FC fit the data better than any of the other cumulative models in these analyses.

Cumulative employment status was (non-significantly) associated with prehypertension in Model FC, as not being currently employed in either Wave III or Wave IV was predictive of prehypertension (OR = 1.506; 95% CI = 1.000-2.268). Interestingly, having an attractive personality in two of the three waves, as opposed to having an attractive personality in all three waves, was negatively and significantly associated with prehypertension (OR = 0.677; 95% CI = 0.491-0.933). BMI was also associated with prehypertension in this model. As shown in Table 5,

relative to non-obesity, obesity in either Wave III or Wave IV and obesity in both waves were associated with increased odds of prehypertension (OR = 2.046; 95% CI = 1.542-2.713 and OR = 3.073; 95% CI = 2.336-4.041, respectively).

Unexpectedly, having an adulthood household income between \$20,000 and \$39,999, as compared to a household income of \$75,000 and over, decreased the odds of hypertension in Model FC (OR = 0.552; 95% CI = 0.324-0.942). As shown in Table 6, meeting criteria for depression in two waves (Wave I, III, or IV), as opposed to not meeting criteria in any wave, significantly reduced the odds of hypertension (OR = 0.503; 95% CI = 0.261-0.968). This was also true for meeting criteria for depression in one of the three waves, but the effect was not significant (OR = 0.687; 95% CI = 0.456-1.035). Being obese in either Wave III or Wave IV, as opposed to not being obese in either wave, was also predictive of hypertension (OR = 3.280; 95% CI = 2.129-5.053). And being obese in both Waves III and IV, relative to not being obese in either wave, was even more highly predictive of hypertension (OR = 6.211; 95% CI = 4.195-9.198) (Table 6).

As in all other models, race was significantly associated with hypertension in Model FC. As shown in Table 6, blacks were significantly more likely than whites to have hypertension. The addition of proximate determinants (smoking and obesity) in this model does explain some of the racial disparities in hypertension, as the OR for race declined from 2.153 in Model EC to 2.003 (95% CI = 1.345-2.983) in Model FC (Figure 5). Therefore, hypothesis 15 (Racial disparities in hypertension will diminish to the greatest extent when lifetime behavioral factors are included in the model that also includes life course measures of social support, psychosocial characteristics, and contextual factors) was modestly supported by these results. Nevertheless, even after controlling for longitudinal measures of social support, psychosocial, contextual

factors, BMI, and tobacco smoking, black women were still 1.18 times more likely than white women to have prehypertension and over two times more likely to suffer hypertension.

In a separate set of analyses, I re-estimated all six longitudinal models, but instead of including categorical measures of “cumulative risk,” I included the same measures as the simple sum of scores across all three waves (Waves I, III, and IV). Results for these models were similar to those in the first set of cumulative models. The ORs for race in each model were about the same or even slightly higher in some cases, as compared to the models including the categorical cumulative measures. And the addition of the social support factors, psychosocial factors, contextual factors, and proximate determinants to these models did not diminish disparities in blood pressure between black and white women, which was also the case for the first set of cumulative models discussed above.

Models Stratified by Race

In order to determine if social support, psychosocial characteristics, and contextual factors affect blood pressure differently for black and white women, I estimated two sets of racially-stratified models. They were identical to the models described above, except that I removed the “race” variable and then estimated them separately for black and white women. The first set of stratified models examined the effect of adult factors on blood pressure and the second set of models examined the impact of adolescent and cumulative factors on blood pressure.

The first cross-sectional stratified model predicted age-adjusted odds of 3-category hypertension by age and SES (education and income). According to the models, age was a significant predictor of hypertension for both black (OR = 1.279; 95% CI = 1.118-1.465) and

white women (OR = 1.178; 95% CI = 1.063-1.305). The second set of stratified models included social support factors. Although age continued to be a significant predictor of hypertension among both black and white women, none of the social support variables were significant predictors of either prehypertension or hypertension for white or black women.

The third set of stratified models included psychosocial factors. According to the analyses, having an attractive personality (OR = 0.380; 95% CI = 0.170-0.847) and being depressed (OR = 0.533; 95% CI = 0.315-0.900) substantially decreased the odds of prehypertension among black women. Neither of these factors significantly impacted the odds of hypertension among white women.

According to the next set of models, contextual factors did not significantly affect odds of hypertension for black or white women. In the final set of stratified cross-sectional models, all variables from the previous models were included, plus behavioral factors (i.e. obesity and tobacco use). Results show that age remained a significant predictor of hypertension for black women (OR = 1.329; 95% CI = 1.130-1.563) and white women (OR = 1.126; 95% CI = 1.006-1.260). Although none of the social support, psychosocial, or contextual factors significantly impacted odds of prehypertension or hypertension among black women, depression was associated with decreased odds of prehypertension among white women (OR = 0.677; 95% CI = 0.475-0.964). Obesity was very strongly associated with increased odds of prehypertension among both black women (OR = 2.442; 95% CI = 1.553-3.841) and white women (OR = 3.156; 95% CI = 2.425-4.105), as well as hypertension among black women (OR = 4.915; 95% CI = 0.2.672-9.041) and white women (OR = 4.811; 95% CI = 3.182-7.274). These results show that obesity significantly increased the odds of prehypertension and hypertension for both groups of women.

However, the OR for obesity predicting prehypertension for black women was 0.714 lower than the OR for white women (2.442 and 3.156, respectively). This indicates that, although hypertension among both groups was associated with obesity, obesity increased the odds of prehypertension more for white women than it does for black women, suggesting that obesity affects black and white women's health differently, with different effects on blood pressure. These results show that obesity impacted prehypertension among white women more than it does for black women.

The second set of stratified models I estimated predicted blood pressure by adolescent and cumulative social support, psychosocial, and contextual factors separately by race. The first model in this series predicted the age-adjusted odds of 3-category hypertension by adolescent SES (mother's education and adolescent household income) and adulthood SES (education and income). Results indicate that age was a significant predictor of hypertension for both black (OR = 1.317; 95% CI = 1.145-1.515) and white women (OR = 1.194; 95% CI = 1.075-1.325).

The next set of stratified models included social support factors. Interestingly, volunteer activity in either Wave III or Wave IV, as opposed to volunteering in both waves, significantly reduced the risk of hypertension among black women (OR = 0.349; 95% CI = 0.152-0.800). No such association was found among whites. This suggests that short-term volunteering was possibly protective against hypertension among black women, but continuous involvement with volunteering may lead to increased risk of hypertension.

The third set of longitudinal models stratified by race included adolescent and cumulative psychosocial factors. None of the psychosocial factors in the model were significant predictors of blood pressure among white women. However, a couple of variables were significant predictors among black women. Interestingly, having an attractive personality in two,

as opposed to three, of the waves was associated with lower odds of prehypertension (OR = 0.483; 95% CI = 0.268-0.870). And meeting criteria for depression in one wave, as opposed to none of the waves, decreased odds of prehypertension among black women (OR = 0.515; 95% CI = 0.308-0.860). Further, meeting criteria for depression in all three waves, as opposed to none of the waves, significantly decreased the odds of prehypertension among blacks (OR = 0.143; 95% CI = 0.029-0.704). These findings are curious and suggest more research is needed to investigate the association between depression and other health measures, such as blood pressure, among black women.

The next set of stratified models includes adolescent and cumulative contextual factors. According to the results, neither adolescent neighborhood safety, as rated by the participant, nor cumulative neighborhood safety, as rated by the interviewer, was associated with hypertension among blacks or whites. As these models revealed no differences, I subsequently included all of the adolescent and cumulative social support, psychosocial, and contextual factors. None of these factors were associated with hypertension odds for white women. However, volunteering in one wave, as opposed to two of the waves, was again associated with a decreased risk of hypertension for black women. Having an attractive personality in two, as opposed to three, of the waves was also associated with decreased odds of prehypertension among black women. In addition, significant associations between depression and hypertension remained among black women. These findings suggest that, not only is blood pressure affected by these factors differently for black and white women, but they also affect black women in unintuitive ways, suggesting the need for more research on social support factors and psychosocial factors on blood pressure among blacks.

The final stratified models with adolescent and cumulative predictors included all variables in the previous models, with the addition of behavioral factors (i.e. smoking tobacco and obesity). For both black and white women, obesity at one wave and obesity at two waves, as opposed to obesity at none of the waves, were associated with increased odds of prehypertension and hypertension. However, the effect of obesity varied by race and blood pressure level. For instance, being obese in either Wave III or Wave IV was associated with a greater increase in odds of prehypertension among black women (OR = 2.824; 95% CI = 1.500-5.316) than white women (OR = 1.857; 95% CI = 1.339-2.573). The same was true for hypertension (OR = 5.454; 95% CI = 2.338-12.723 for blacks; OR = 2.852; 95% CI = 1.373-4.862 for whites). Conversely, continuous obesity at both Waves III and IV was more strongly associated with both prehypertension and hypertension among white women (OR = 3.493, 95% CI = 2.512-4.859 for prehypertension; OR = 7.120, 95% CI = 4.313-11.754 for hypertension) than black women (OR = 2.300, 95% CI = 1.319-4.010 for prehypertension; OR = 6.168, 95% CI = 2.973-12.793 for hypertension).

These findings suggest that obesity has different impacts on blood pressure according to its frequency and/or duration, for black and white women. As indicated, obesity at only one wave was associated with greater odds of prehypertension and hypertension for both black and white women, but these effects were greater for blacks. Conversely, continuous obesity seems to be more detrimental to hypertension risks among white women than black women. There is no physiological reason to expect such discrepancies, indicating a need for basic replication. Should future research confirm these curious discrepancies, it will be useful to explore possible reasons behind these associations.

Supplemental Analyses

In a separate set of analyses, I estimated the full models with all variables, for both the cross-sectional and the longitudinal data, using continuous measures for certain predictors. For instance, instead of including the social support variable, social ties, as a binary variable (0 = no friends; 1 = at least one close friend), I used a continuous measure of social ties, ranging from 0 to 10 or more friends. I also used a continuous measure of income, rather than the categorical measure I used in the original model. And instead of including the measure of BMI which classified people as either obese (1) or not (0), I used a continuous measure of BMI, with scores ranging from 17 to 70. The results of this model were similar to those of the original model including categorical predictors. BMI remained the most significant predictor of hypertension, and other associations remained insignificant.

In order to examine the possible effects of social class mobility on hypertension among black and white women, as well as on racial disparities in hypertension, I created two additional measures of SES, one representing trajectories in income and the other representing trajectories in education. The income trajectory variable I created had three possible trajectory categories: (1) participants whose adulthood income was greater than the income of their adolescent homes, (2) participants whose adulthood income was in the same income bracket as the income of their adolescent homes, and (3) participants whose adulthood income was less than the income of their adolescent homes. The education trajectory variable I included was similar to the income trajectory variable. The possible education trajectories were: (1) participants whose education level at Wave IV was higher than the education level of their mothers at Wave I, (2) participants whose education level at Wave IV was the same as their mother's education level at Wave I, and (3) participants whose education levels at Wave IV were lower than the education

levels of their mothers at Wave I. The income and education trajectory variables represented three trajectories of each measure of SES. Category 1 of both variables represented an improvement in SES, category 2 represented a relatively stable SES, and category 3 represented a declining SES from adolescence to adulthood.

I included these two SES trajectory variables in an additional model predicting the odds of prehypertension and hypertension by race, age, income trajectory, and education trajectory to determine if odds of prehypertension and hypertension, as well as racial disparities in prehypertension and hypertension, were affected by SES trajectories. According to results, neither trajectory variable had a significant effect on the odds of hypertension or prehypertension. And neither had a significant impact on racial disparities.

CONCLUSION

Discussion

In this nationally-representative sample of young adults, I found that the prevalence of prehypertension, hypertension I and hypertension II was higher among black women than white women. Black women were also more likely to have lived in a low SES home as adolescents, and they were more likely to have less education and live in poverty as adults. Despite the substantial differences in SES between the two racial groups, adjustment for both current SES and life course SES did not account for racial differences in blood pressure. And adjustment for other factors associated with blood pressure did not substantially diminish racial disparities in blood pressure either.

Although adulthood, adolescent, and cumulative social support factors helped diminish a small amount of racial disparities in blood pressure, the association between race and blood pressure remained largely unchanged after adjustment for social support (Models B4 and BC). None of the psychosocial factors (Models C4 and CC) reduced blood pressure disparities; in fact, they caused them to widen. Adolescent and cumulative measures of neighborhood context (Models C4 and CC) had only a modest impact on disparities, but in the expected direction. In all, only the cross-sectional and cumulative models including BMI helped explain a non-negligible portion of the disparities in prehypertension or hypertension between black and white women. Indeed, of all the variables considered in my analyses, the only three that clearly and consistently affected the odds of hypertension were race, age and BMI. So, being black, as opposed to being white, increased age, and being obese, rather than having a lower BMI, were all positively and significantly associated with blood pressure.

High BMI is a major cause of hypertension. Many studies, including this one, have shown strong associations between overweight and obesity, and increased risks for prehypertension and hypertension. Interestingly however, even after controlling for BMI, black women remain at greater risk than white women for prehypertension and hypertension. Other research (Bell et al. 2002) has found that blacks have higher prevalence of hypertension than whites at every level of BMI, possibly suggesting the importance of race-specific BMI cutoffs to more accurately assess obesity-related risks of hypertension across groups. The American Heart Association (2012) also reported that, controlling for BMI, blacks had significantly higher blood pressures than whites. These findings indicate complex relationships between race, blood pressure, and obesity that should be examined more thoroughly. The stronger association between obesity and prehypertension among whites in my study suggests that factors other than BMI are affecting blood pressure among black women, putting them at higher risk of prehypertension than their white counterparts at the same BMI level.

Extant research shows that various social support factors, including marriage (Holt-Lunstad et al. 2008) and frequent contact with friends (Gorman and Sivaganesan 2007), are negatively associated with blood pressure. Others have reported that volunteering is significantly associated with lower blood pressure among whites, with no such association among blacks (Tavares et al. 2013). Research also shows that psychosocial factors, including depression and perceived discrimination (Troxel 2003), and contextual factors, such as violent neighborhoods (Clark et al. 2008), are linked with hypertension. The fact that these factors did not diminish racial disparities in prehypertension or hypertension in my study suggests that other social support factors may be important to consider. For instance, these models do not include a measure of relationship or marital quality.

My models also do not account for John Henryism, a style of coping used to deal with psychosocial and environmental stressors such as racism and career problems common among goal-oriented blacks who lack resources such as financial or emotional support needed for success (Duke Medicine News and Communications 2006). Other studies have linked John Henryism to stress and increased blood pressure (Bennet et al. 2004; Holt-Lunstad et al. 2008). It is likely that other measures of social support, as well as other aspects of psychosocial health and environmental context, are behind some of the racial differences in blood pressure.

The lack of substantial reductions in racial disparities in the odds of prehypertension and hypertension, even after accounting for social support, psychosocial characteristics, contextual factors, and proximate determinants (BMI and smoking), could suggest that simply being a black woman in the US is associated with poorer health, including increased blood pressure. It is widely known that black women generally face more pressures, stresses, and obstacles than their white counterparts. They experience more interpersonal, institutional, structural, disciplinary, and ideological racism than most other women (Collins 2009). These forms of racism work together to legitimize and to reinforce inequality and unfairness in all domains in society. And this fosters a stressful living environment for black women, producing psychological and physiological effects related to racism and the minority and subordinate status held by many black women in the US. In other words, racism in each domain, and in society as a whole, may have a cumulative effect on the health and well-being of black women, likely increasing blood pressure and other stress-related symptoms. So, simply being a black woman in US society is arguably unhealthy. The health effects of racism are not easily measured by social science research, which is possibly why racial blood pressure disparities have yet to be explained.

Biological explanations for racial differences in health have generally been dismissed by social scientists, but this study suggests that some of these explanations should be taken more seriously. Over the past few decades, biological research has begun to transform the debate on the origins of health disparities. Recent evidence, including research linking low birth weight to increased risk of cardiovascular disease, has led to new ideas about the effects of the prenatal environment on adult health (Leeson et al. 2001). It is now known that the prenatal environment, along with economic, social, and nutritional factors of pregnant women, affect the adult health of unborn children. Such evidence suggests that some disease etiology may be traced to the intersection of biology and the environment. This newly regarded type of factor is triggered by the environment and manifests as developmental plasticity in the function and structure of tissues, organs, and biological systems (Kuzawa and Sweet 2009).

Because these factors implicate changes in early developmental processes, they can have longer-lasting impacts on adult biology and health than the adulthood environment, which is often transient. Tracking adult disease risk to prenatal and early childhood origins generates new theories about the causes of human biological variation, including that related to race and health (Kuzawa and Sweet 2009). According to the Barker hypothesis, the effects of prenatal and neonatal factors, such as low birthweight and slow fetal growth, as well as postnatal development, are influenced by environmental factors and developmental paths that precede and follow them (Barker 2004).

These processes can help illuminate how early life exposures, such as stress, can produce a phenotypic “memory” that persists through the life-course to influence adult physiological function, health, and risk for disease (Jirtle and Skinner 2007). Such findings are beginning to reframe the study of biology and health as life-course phenomenon, with early life

and life-course environments and experiences of prior generations, affecting adult outcomes (Kuzawa and Sweet 2009).

Moreover, recent research on epigenetics has profound implications for understanding the origin and long-term maintenance of racial health disparities. According to Krieger (2005), during early and critical developmental periods, factors such as disadvantaged social and economic experiences of blacks become embodied, impacting health in adulthood and across generations. There is evidence that social environments, defined along lines of socially constructed racial identities, can drive developmental processes, thus becoming embodied as biological patterns affecting disease and health (Krieger 2005).

Research in epigenetics is demonstrating that environmental factors can modify epigenetic processes, thereby impacting epigenetic marks and downstream patterns of genetic expression in particular cells and cell lineages. This line of research shows that, by linking maternal and intergenerational experience with fetal biology, stressors, such as psychosocial and financial stress or imbalanced nutrition, can alter biological settings in children, with long-term health implications including physiological responses to stress and blood pressure regulation (Kuzawa and Sweet 2009). So, the study of epigenetics indicates that, in addition to the chronic and cumulative health impacts of social environments, there is a strong motivation to consider a developmental influence and intergenerational impacts on patterns of adult health disparities (Kuzawa and Sweet 2009), including those related to blood pressure and hypertension. It is likely that such processes are behind some of the health disparities seen between black and white women.

Limitations

As discussed, this study found that social support, psychosocial, contextual, and behavioral factors did not substantially diminish blood pressure disparities between black and white women. This lack of attenuation of disparities with the addition of these factors is, in itself, an important finding suggesting possible directions for future research. But, despite its merits, this study also has some limitations that require attention.

For instance, this study utilizes the public use Add Health dataset rather than the private use dataset. Use of the public use dataset limits the sample size, which reduces the study's statistical power, increasing standard errors. It also restricts the variables available for analyses. Data in the private use dataset would have allowed access to more measures of contextual factors in adolescence (Wave I), including census tract factors, such as poverty rate and crime rate of respondents' neighborhoods. Private use data would have also given me access to more social support factors in adolescence (Wave I), including detailed information on respondents' friendship networks and family relationships.

Another limitation involves measures available for the social support, psychosocial, and contextual factors of interest in the study. Although I used several variables from Waves I, III, and IV of the public use Add Health dataset, I was not able to capture all potential causes of hypertension. For example, extant research shows that John Henryism (Bennett et al. 2004) is associated with hypertension, especially among blacks in the US. There is no measure of this concept in either the public use or the private use Add Health dataset. I would also have liked to include measures of physical activity, sedentary behavior, and eating behaviors. Even though there are some measures related to these factors in Add Health, the available measures do not capture the exact concepts I wanted to include in the analyses. So, like all studies of secondary

data, my analyses were limited to the measures I had available. Although this study has its limitations, it is an important study that reinforces the notion that racial health disparities are very deeply rooted, provoking thought beyond traditional social science explanations that point to new areas of research, such as epigenetics and the lasting effects of the in utero environment.

Future Research

The only factors that consistently and substantially affect blood pressure in my investigation are age, race, and BMI. None of the social support, psychosocial, and contextual factors significantly diminished the disparities in prehypertension and hypertension between black and white women. Nevertheless, it seems likely that sociological and psychological factors do in fact intertwine with human biology to contribute to racial disparities in blood pressure. Future research should try to capture such effects using Add Health or other datasets, such as NHANES (CDC 2014) and the National Survey of American Adult Life Reinterview (Jackson et al. 2004). Potentially important variables include lifelong relationships and the quality of relationships with family members as well as with romantic partners. And the dataset would have appropriate measures of various important psychosocial measures, such as violent tendencies and John Henryism, among others. The inclusion of a salt intake measure would also be appropriate, as data show that it is strongly tied to hypertension (Eberhard 2010) and that blacks tend to have higher rates of salt sensitivity (Richardson et al. 2013). It is unlikely that any single dataset includes all of these factors, so future research could incorporate more than one dataset into a unified research design (Schenker and Raghunathan 2007).

Future research on racial blood pressure disparities should also incorporate developmental and epigenetic effects on racial disparities in hypertension. For instance, it would be potentially useful to include measures of birth weight, maternal BMI, gestational diabetes, family histories of hypertension, and other biomarkers. Because research in this area has already begun to illuminate important epigenetic processes and links to major chronic conditions, such as metabolic syndrome and CVD, inclusion of mechanisms that lie at the crossroad of biology and sociology could prove insightful, even revolutionary.

Summary

Although this study does not explain racial disparities in hypertension, it is important to understand that this is the norm in health disparities research. It has become apparent that racial health disparities, including disparities in hypertension, are deeply rooted and not easily explained through traditional sociological and psychological explanations. As discussed above, it is possible that being a black woman in the US is inherently stressful and conducive to elevated blood pressure. Although the health effects of racism and other societal pressures characteristic of the daily lives of black women are not easily measured by social science research, it is conceivable that these factors do in fact contribute to racial differences in blood pressure. Further, as indicated above, black women tend to be more disadvantaged from the point of conception than their white counterparts. And this disadvantage tends to compound throughout the life-course and even across generations, producing insidious epigenetic changes that adversely impact adult health. It is difficult to measure these effects in social science research, but current evidence suggests that they are very real.

There are a couple of policy implications related to this theory. In order to decrease racial disparities in hypertension associated with epigenetic effects of racism and other stressors experienced by black women across multiple generations in the US, it would be ideal to eliminate racism and discrimination in society. Any and all measures to reduce racism and discrimination in all social domains, including in education, in the workforce, and in the media, among others, should be taken. According to epigenetic research, the health effects of racial discrimination experienced by prior generations impact the health of subsequent generations of black women. Nevertheless, in a less racist and discriminatory society, black women would experience fewer stressors and unhealthy circumstances in their own lives, reducing blood pressure disparities.

Because racism and discrimination pose difficult long-term obstacles to health equity, a potentially effective way to combat stress and disadvantage among black women could involve making more resources available and easily accessible. For instance, counseling and support services could be helpful for black women experiencing a considerable amount of stress, and for those who are in especially racist or discriminatory circumstances, such as those living or working in highly segregated or racist areas. Also, to help reduce the unhealthy effects of prenatal stress and malnutrition (whether macro- or micronutrient in nature), expecting mothers should be educated about how to experience a healthy pregnancy characterized by low levels of stress and proper nutrition (Utz, Reither, and Waitzman 2012). And for mothers who cannot afford necessary resources conducive to healthy pregnancies, services and resources should be made available.

Because we live in a society still plagued by racism and discrimination (Pager and Western 2012), the health of black women suffers, possibly for generations to come. So,

reducing racial health disparities is the responsibility of the entire society. Arming black women with the knowledge and resources conducive to healthy lives for themselves and for their children is very important, but the most healthy and equal society would be one in which there is no group facing racism, discrimination, or disadvantage. In order to eliminate racial disparities in blood pressure, it is important to reduce societal stress, pressures, and inequalities related to race in the US. Policies and programs aimed at reducing racism and helping black women cope with its effects are important in reducing racial health disparities, including those associated with hypertension.

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- Yoon, S., Y. Ostchega, and T. Louis. 2010. *Recent Trends in the Prevalence of High Blood Pressure and its Treatment and Control, 1999-2008*. NCHS Data Brief, no 48. Hyattsville, MD: National Center for Health Statistics.
- Yoon, Sung Sug, Vicki Burt, T. Louis, and Margaret D. Carroll. 2012. "Hypertension among Adults in the United States, 2009-2010." NCHS Data Brief 107:1-8. Hyattsville, MD: National Center for Health Statistics.
- Yuan, Anastasia Sue. 2002. "Black-White Differences in Social Support and Mental Health among Adolescents: Is Neighborhood Context Important?" *Dissertation Abstracts International, A: The Humanities and Social Sciences* 63(4).
- Zhang, Zhenmei and Mark D. Hayward. 2006. "Gender, the Marital Life Course, and Cardiovascular Disease in Late Midlife." *Journal of Marriage and Family* 68:639-57.

CURRICULUM VITAE

Elizabeth Miranda Reiter
 Sam Houston State University
 Department of Sociology
 Box 2446
 Huntsville, Texas 77341-2446
mirandareiter77@gmail.com

 EDUCATION

- 2014 PhD, Sociology, *Utah State University (USU), Logan, UT*
 Areas of concentration: Demography, Social Epidemiology, Health Inequalities
 Dissertation Research: “*The Impact of Social Support, Psychosocial Characteristics, and Contextual Factors on Racial Disparities in Hypertension*”
 Committee Members: Dr. Eric Reither, Dr. Reed Geertsen, Dr. So-Jung Lim, Dr. Maria Norton, Dr. Julie Gast
- 2007-2009 MA, Public Sociology, *University of North Carolina (UNCW), Wilmington, NC*
 Areas of concentration: Inequality, Social Stratification, and Cultural Studies
 Thesis Research: “*Self Perceived Sex Role Identity and Development of Eating Disorders in Women*”
 Committee Members: Dr. Sangmoon Kim, Dr. Jean-Anne Sutherland, Dr. Susan Bullers
 Honors: *National Scholars Honor Society*
- 2005 - 2006 Post-BA Coursework, University of North Carolina Wilmington, Wilmington, NC
 Honors: *Dean’s List*
- 2002 BA, Psychology, University of Virginia, Charlottesville, VA

 RESEARCH INTERESTS

Social Demography, Health Disparities, Social Epidemiology, Social Stratification, Medical Sociology, Quantitative Research Methods, Statistics

 RESEARCH

- 2014 *SHSU Sociology Department, Huntsville, TX*
Postdoctoral Research Associate
 Social Epidemiology, Health Disparities
- 2013 *USU Sociology Department, Logan, UT*
Graduate Research Assistant
 Principle Investigator: Dr. Erin Hofmann
 Project name: “Gendered Migration Patterns in New Destination States”

- 2010 to Present *USU Sociology Department, Logan, UT*
Graduate Research Assistant
 Principle Investigator: Dr. Eric Reither
 Project name: "Sleep, Obesity, and the Well-Being of U.S. Adolescents." PA-09-131:
 Secondary Analyses in Obesity, Diabetes and Digestive and Kidney Diseases (NIH-R21).
- 2011 to Present *USU Sociology Department, Logan, UT*
Principle Investigator
 Project name: "An Integrated Approach at Explaining Differences in Blood Pressure
 between Black and White Women."
- 2009 *USU Sociology Department, Logan, UT*
Volunteer Research Assistant
 Principal Investigator: Dr. John Allen
 Project name: "Uintah Basin Community Quality of Life Survey. The Uintah
 Mitigation Committee, 2008-2009."
Coded data for inter-rater reliability
- 2007 to 2009 *UNCW Criminal Justice & Public Sociology Department, Wilmington, NC*
Graduate Research Assistant
 Principal Investigator: Dr. Sangmoon Kim
 Research Areas: Embedded Trade, World Systems Theory, Interracial Social
 Relations
Copy-editor for paper: Kim, Sangmoon and John Skvoretz. 2010. "Embedded Trade: A
 Third Party Effect." *Social Science Quarterly*, 91(4): 964-983
- 2008 *UNCW Criminal Justice & Public Sociology Department, Wilmington, NC*
Research Assistant
 Principal Investigator: Dr. Christina Lanier
 Project: Intimate Partner Violence Across the Rural/Urban Divide: A Preliminary
 Investigation
- 2008 *UNCW Criminal Justice & Public Sociology Department, Wilmington, NC*
Phone interviewer
 Principal Investigator: Michael Maume; Cape Fear Crime Survey – 2008.
http://www.wilmingtonnc.gov/Portals/0/crimesurvey_stats.pdf
- 2001 - 2002 *UVA Psychology Department, Charlottesville, VA*
Research Assistant for Dr. Timothy Wilson

Publications:

- 2014 Title: "Ethnic variation in the association between sleep and body mass among US
 adolescents"
 Eric Reither, Patrick M. Krueger, Lauren Hale, **E. Miranda Reiter**, and Paul E. Peppard.
International Journal of Obesity (2014), 1–6.
- 2014 Title: "Gendered personalities and the development of eating disorders in college
 students"
E. Miranda Reiter and Shannon Davis.
International Review of Modern Sociology, 2014

Papers:

- 2014 Title: "The Effect of Community Attachment and Community Involvement on Health of Rural Texans, by Community Size." Working title
E. Miranda Reiter, Jin Young Choi, and Gene L. Theodori
Planned submission to the *Journal of Rural Sociology*, June 2014
- 2013 Title: "The Impact of Psychosocial Factors throughout the Lifecourse on Disparities in Hypertension between Black and White Women in the US: A Longitudinal Analysis"
E. Miranda Reiter
Planned submission to the *Journal of Health and Social Behavior*, Fall 2014
- 2013 and Title: "The Enduring Relationship between Social Cohesion and Health in Adolescence Adulthood."
E. Miranda Reiter and Abigail B. Reiter
Planned Submission to Sociological journal
- 2013 Title: "How Formal and Informal Emergency Work Policies Perpetuate Inequality and Susceptibility to Further Crises in the Home and at Work Among Vulnerable Populations."
Reiter, Abigail B. and **Elizabeth M. Reiter**
Planned Submission to Sociological journal
- 2007-2008 Title: Self Perceived Gender Role Identity and Development of Eating Disorders in Women
Criminal Justice & Public Sociology Department, Wilmington, NC
Master's Thesis Research Project

PROFESSIONAL PRESENTATIONS

E. Miranda Reiter, Jin Young Choi, Gene Theodori, and Junghyun Choi. 2014. "Needs of Health Care Services among Texas Rural Residents: The 2013 Texas Rural Survey." Paper to be presented at the Annual Meeting of the Rural Sociological Society in New Orleans, LA.

Erin Hoffman and **Reiter, E. Miranda**. 2014. "Gendered Spatial Patterns in Recent U.S. Immigration." Paper presented at the Population Association of America Annual Conference in Boston, MA.

Reiter, E. Miranda. 2013. "The Impact of Cultural and Psychosocial Factors on Racial Health Disparities." Paper presented at the Association for Humanistic Sociology (AHS) in Washington, D.C.

Reiter, E. Miranda, Abigail B. Reiter, and Vicki Hoverman. 2013. "Why Do You Care about Race Anyways, You're White!" An Action Plan for Confronting White Privilege and Racism in Predominantly White Spaces." Paper presented at the Association for Humanistic Sociology (AHS) in Washington, D.C.

Reiter, E. Miranda and Vicki Hoverman. 2013. "Racial Differences in the Impact of Obesity in Terms of QOL and Psychosocial Measures." Paper presented at the Association for Humanistic Sociology (AHS) in Washington, D.C.

Reiter, E. Miranda and Abigail B. Reiter. March 2012. "The Enduring Relationship between Social Cohesion and Health in Adolescence and Adulthood." Paper presentation at the annual conference of the Southern Sociological Society (SSS) in New Orleans, LA.

Abigail B. Reiter and **Reiter, E. Miranda**. March 2012. "Reflections on our Experiences as Budding Sociologists: The Making of Identical Twin Sociologists in Different Environments." Paper presentation at the annual conference of the Southern Sociological Society (SSS) in New Orleans, LA.

Reiter, E. Miranda and Abigail B. Reiter. March 2012. "An Exploration of the Link between Feelings about One's Neighborhood and Tendencies towards Violence among Minority Racial Groups: Using Ethnographic Research to Tell the Story behind the Numbers." Paper presentation at the annual conference of the Southern Sociological Society (SSS) in New Orleans, LA.

Reiter, E. Miranda. February 2011. "Students and Alumni Reflections and Lessons" Panel participant at the annual conference of the NCSA conference in Wilmington, NC.
 Reiter, Abigail B. and **Reiter, E. Miranda**. April 2010. "How Formal and Informal Emergency Work Policies Perpetuate Inequality and Susceptibility to Further Crises in the Home and at Work Among Vulnerable Populations." Paper presentation at the annual conference of the Southern Sociological Society (SSS) in Atlanta, Georgia.

Reiter, E. Miranda, April 2010. The Impact of Body Weight on Self-Esteem. Paper presentation at the annual conference of the Pacific Sociological Association (PSA) in Oakland, CA.

Reiter, E. Miranda. April 2010. Self Perceived Gender Role Identity & Development of Eating Disorders in College-Aged Women. Paper presentation at the annual conference of the Pacific Sociological Association (PSA) in Oakland, CA.

Reiter, E. Miranda. 2009. "Hunger For Acceptance: Cultural Influence On the Development of Eating Disorders." Paper presentation at the annual conference of the Southern Sociological Society (SSS) in New Orleans, LA.

TECHNICAL REPORTS

2014 Choi, Jin Young, **E. Miranda Reiter**, Cheryl Hudec, Gene L. Theodori, and Sarah Beach. 2014. *The 2013 Texas Rural Survey: Medical and Healthcare Report*.

GRANTS AND AWARDS

2014 CPRIT- (Furjen Deng and E. Miranda Reiter, with the Center for Rural Studies at Sam Houston State University) US\$3MIL "Evidence-Based Cancer Prevention Strategies," submitted Summer 2014

CERTIFICATIONS AND TRAININGS

2012 Structural Equation Models and Latent Variables, ICPSR Summer Program, Ann Arbor, MI
 2012 Utah State University Graduate Student Senate Enhancement Award: \$4,000
 2009-2012 Collaborative Institutional Training Initiative (CITI): Training and Certification in Social and Behavioral Research, Expires July 2015.
 2010 Mauer Fellowship: \$3,900
 2009 College Teaching Seminar at Utah State University
 2009 Program Evaluation Training, UNC at Wilmington
 2008 Grant Writing Workshop, QENO - Quality Enhancement for Nonprofit Organizations, Cape Fear Community College, Lynn Smithdeal
 2008 SAS- workshop, University of NC at Wilmington
 2008 National Scholars Honor Society at UNC at Wilmington
 2008 - 2009 Graduate Tuition Scholarship : \$500
 2007 - 2008 Graduate Tuition Scholarship: \$1000

2005 - 2006 Dean's List UNC at Wilmington
 1998 - 1999 Dean's List Richard Bland College

TEACHING EXPERIENCE

Fall 2014	SHSU Sociology Department, Huntsville, TX Lecturer, SOCI 335: Gender and Inequality
Spring and Fall 2014	SHSU Sociology Department, Huntsville, TX Lecturer, SOCI 1301: Principles of Sociology (Online)
Spring 2013	USU Sociology Department, Logan, UT Lecturer, SOC 3120: Social Statistics
Summer 2012	USU Sociology Department, Logan, UT Lecturer, SOC 1010: Introduction to Sociology - interactive broadcasted to distant learning sites
Summer 2010 - Fall 2010	USU Sociology Department, Logan, UT Lecturer, SOC 1020: Social Problems
Summer 2010 - Fall 2010	USU Sociology Department, Logan, UT Lecturer, SOC 1020: Social Problems
Fall 2008 to Spring 2009	<i>UNCW Sociology Department, Wilmington, NC</i> Teaching Assistant for Dr. Sangmoon Kim SOC 105: Introduction to Sociology
Spring 2008	<i>UNCW Sociology Department, Wilmington, NC</i> Teaching Assistant for Dr. John Rice SOC 105: Introduction to Sociology
Fall 2007	<i>UNCW Sociology Department, Wilmington, NC</i> Teaching Assistant for Dr. Adam Watkins SOC (CRM) 105: Introduction to Criminal Justice, SOC (CRM) 315: Victimology, (CRM 301) Sociological Data Analysis and Interpretation
SOC (CRM)	
2003 – 2005	Virginia Institute of Autism, Charlottesville, VA Instructor/Data Programmer for children with autism spectrum disorder

COMMUNITY SERVICE ACTIVITIES

2009 -2013	Sociology Graduate Student Association (SGSA), Utah State University Event Coordinator, 1st-3rd Annual SGSA 5K Run From Poverty Raised over \$1000 for the SGSA and the Sparrow Alliance, Logan, Ut (2009) Raised over \$1000 annually for the SGSA and the Cache Valley Food Pantry, Logan, Ut (2010-2013)
2011-2013	George Mason University Graduate Student Sociology Association Member

2010 -2011	Sociology Graduate Student Association, Utah State University President
2009	<i>Joint UNCW-Hillcrest Community Center Reading Program</i> Volunteer Tutor
2009	United Way Seniors' Aid Program, Wilmington, NC Program Evaluator
Summer 2008-2009	<i>University Learning Center, UNCW</i> Tutor
2006-2009	<i>Cape Fear Literacy Council</i> Volunteer Tutor
2006	<i>UNCW, Wilmington, NC</i> Tutor
2003 – 2005	<i>Virginia Institute of Autism (VIA), Charlottesville, VA</i> Instructor
2000 – 2002	<i>UVA International Student Host Program, Charlottesville, VA</i> Host
2000 – 2001	<i>UVA Migrant Aid Program, Charlottesville, VA</i> Tutor
1995 – 1999	<i>Tri-City Literacy Council, Petersburg, VA</i> Tutor

LANGUAGES

Spanish : Conversational

SKILLS

EndNote- Software tool for publishing and managing bibliographies
WinCATI (computer-assisted telephone interviewing) -interviewer software
SPSS- data analysis software
SAS- data analysis software
MPlus- data analysis software
Program Evaluation Skills
Survey Construction and Evaluation
Grant Writing

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

Society for the Study of Social Problems

Southern Sociological Society

American Sociological Association

Association for Humanist Sociology

Pacific Sociological Association

Population Association of America (PAA)

Rural Sociological Society