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Purpose in life, Socioeconomic Disadvantage, and Elevated Ambulatory Blood Pressure among Early Middle-aged African American Women in Atlanta, GA

By

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Epidemiology

_____

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# Purpose in life, Socioeconomic Disadvantage, and Elevated Ambulatory Blood Pressure among Early Middle-aged African American Women in Atlanta, GA

By

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2018

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Epidemiology
2020

# Abstract

Purpose in life, Socioeconomic Disadvantage, and Elevated Ambulatory Blood Pressure among Early Middle-aged African American Women in Atlanta, GA

By Crystan A. Hawkins

Hypertension is a leading cause of death and disability in the United States, and there are stark racial disparities in hypertension and hypertension-related outcomes such that African American women suffer disproportionately when compared to their white counterparts. Although some of the risk factors for hypertension, like obesity and physical inactivity, are more common among African American women, these factors do not fully explain the disproportionate rates at which African American women suffer from hypertension[9]. It is possible that differences in psychosocial factors could contribute to the excess risk for hypertension in African American women, but to date, literature on psychosocial contributors to increased risk of hypertension among African Americans focuses on the effects of psychosocial stressors. The purpose of this study is to determine whether purpose in life is associated with blood pressure and hypertension status and to determine whether this association is more pronounced among women with low socioeconomic status.

Participants were 424 African American women between the ages of 30-45 who responded to a 14-item version of Ryff's Psychological Well-Being Scale, which assesses an individual's sense of purpose in life. Self-reported measures of income and educational attainment were collected to assess socioeconomic status. Participants wore an ambulatory blood pressure monitor for 48 hours, where systolic and diastolic blood pressure readings were recorded every 30 minutes during the daytime and every hour at night. Linear regression analyses were used to model purpose in life with continuous blood pressure outcomes, and logistic regression analyses were used to model purpose in life with dichotomous blood pressure outcomes.

Results from logistic regression models testing the association between purpose in life and nighttime hypertension revealed a significant relationship (OR = 0.693; p-value = 0.014) after adjusting for age, income, highest degree, smoking status, and BMI. Purpose in life was not significantly associated with any other nighttime or daytime blood pressure outcomes. No significant associations emerged from the interaction between purpose in life and socioeconomic status.

Findings suggest that while purpose in life may be an important protective factor for nighttime hypertension, depression has a more pronounced effect on all blood pressure outcomes.

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## Chapter I:

### Background:

According to the American Heart Association, "cardiovascular disease in the African American community remains high and is a primary cause of disparities in life expectancy between African Americans and whites" and "hypertension is the most potent risk to the cardiovascular health of African Americans[4] ". Hypertension is a leading cause of death and disability in the United States[1], and there are stark racial disparities in hypertension and hypertension-related outcomes such that African American women suffer disproportionately when compared to their white counterparts[3]. Some of the primary risk factors for high blood pressure include obesity, physical inactivity, tobacco use, heavy alcohol use, high sodium diets, and stress[8]. Although some of these factors, are more common among African American women when compared to white women[8], these factors do not fully explain the disproportionate rates at which African American women suffer from hypertension[9]. Hypertension is considered to be the biggest contributor to excess rates of CVD among African American women[4]; thus, understanding factors that lead to elevated blood pressure in this group of women is important.

With the excess risk of hypertension among African American women being unexplained, exploring non-traditional risk factors for hypertension, like psychosocial health, could be the key to closing this gap. To date, existing literature on psychosocial contributors to increased risk of hypertension among African Americans primarily focuses on the effects of psychosocial stressors[34], but studying positive psychosocial factors and the potential protective effects of psychosocial wellbeing creates an

opportunity to explore innovative interventions. Having a sense of purpose in life refers to the central motivating aims and influences in one's life[40]. This can be extremely influential in a person's decisions, values, behaviors, and overall outlook on life[40]. While it is intuitive that one's sense of purpose in life could impact their mental health, it is important to consider the ways this psychosocial determinant can influence physical health. Associations between purpose in life and various outcomes, including cardiovascular health, cause-specific mortality, and all-cause mortality, have been studied[17-20, 41-45]. There is evidence that having an increased sense of purpose in life increases engagement in health-promoting activities and decreases the risk for adverse health outcomes as well as mortality[17-20, 41-45]. For example, Strecher collaborated with Eric Kim in 2014 to assess the relationship between purpose in life and the use of preventive health care services, where they found that increased sense of purpose in life was associated with increased odds of utilizing preventive health services (OR = 1.31, 95% CI = 1.18-1.45)[47]. A study conducted by Boyle et al found that increased sense of purpose in life was associated with a substantially reduced risk of all-cause mortality[17]. Additionally, Kim et al's 2013 study found that greater purpose in life was associated with lower odds of myocardial infarction (OR = 0.73, 95% CI = 0.57-0.93)[18]. However, there are few studies that look at blood pressure as an outcome, and there is minimal literature studying the association between purpose in life and blood pressure. However, all of these prior studies have been focused on predominantly white cohorts, so we know very little about how purpose in life impacts cardiovascular health among African Americans and African American women in particular. In one of the few studies to include African-Americans, Mezick et al study did find that low purpose in life was

associated with high sleep-wake blood pressure ratios[19]; however, this study used a different assessment of purpose in life and consisted of 50% women, and even fewer African American women[19].

To date, most of the research on purpose in life and health has focused on examining the main effect of purpose in life on outcomes. However, behavioral scientists such as Viktor Frankl suggest that purpose in life is especially important in difficult circumstances[13-16]. In his book "Man's Search for Meaning", Frankl reflects on his experiences as a holocaust survivor and how having a sense of purpose in life influenced himself and those around him[13]. He explains that he noticed a trend in his fellow prisoners in the Auschwitz concentration camps, noting that those who were losing their sense of purpose in life were falling ill and dying more quickly than those who had a higher sense of purpose in life[15]. Victor Strecher also corroborates this idea in his book entitled "Life on Purpose" where he expands on his experience with purpose in life following the death of his daughter[16]. After realizing that his daughter had been his primary purpose in life, he found that in order to recover and maintain his mental and physical health, he needed to repurpose his life[16]. These ideas suggest that while purpose in life is important, it has a greater impact on those in difficult environments or circumstances.

The American Psychological Association defines socioeconomic status as "the social standing or class of an individual, measures as a combination of education, income, and occupation"[21]. However, socioeconomic status goes far beyond a mere classification based on the aforementioned factors; it can be used as an indicator of many different physical and psychological health outcomes while also affecting access to care. There is

evidence that people with low SES, defined using education and income levels, are more likely to suffer from poor health outcomes[22]. Additionally, socioeconomic status influences health insurance status, health education, and other factors that influence a person's health[46]. By studying whether there is evidence an interaction effect between socioeconomic status and purpose in life on blood pressure, we can determine how having a sense of purpose in life could have different effects in different populations.

Psychosocial factors have been found to have an influence on many mental and physical health outcomes, including cardiovascular health[16-20]. African American women are disproportionately burdened by CVD and poor cardiovascular health, and the excess risk among African American women is not fully explained by traditional risk factors[9]. Because of this, the goal of this study is to further examine the relationship between purpose in life and blood pressure and to determine whether socioeconomic disadvantage modifies this relationship. Given the existing evidence of a potential relationship between purpose in life and cardiovascular health, we can use this information to potentially utilize psychosocial factors as prevention or intervention options for hypertension and other chronic illnesses. It is hypothesized that there will be an inverse association between purpose in life and blood pressure. Secondly, it is hypothesized that those with lower levels of socioeconomic disadvantage will demonstrate a stronger relationship between purpose in life and blood pressure compared to those with higher levels of socioeconomic disadvantage.

## Chapter II: Manuscript

### Introduction:

Hypertension is a leading cause of death and disability in the United States, impacting nearly 45% of the adult population[1]. Uncontrolled hypertension has been linked to incident to myocardial infarction[6], heart failure[7], aneurysm[37], stroke[38], and kidney disease[2]. There are stark racial disparities in hypertension and hypertension-related outcomes such that African Americans suffer disproportionately from hypertension when compared to their white counterparts[3]. According to the American Heart Association, "cardiovascular disease in the African American community remains high and is a primary cause of disparities in life expectancy between African Americans and whites" and "hypertension is the most potent risk to the cardiovascular health of African Americans[4] ". In 2017, the prevalence of hypertension among African American women was 46.3% while it was 45% for African American men, 32.3% in white women and 34.5% in white men[5]. Forty-nine percent of African American women over the age of 20 have heart disease. This earlier onset[6] and increased prevalence[5] of hypertension in African American women leads to higher rates of stroke, end-stage renal disease, congestive heart failure, CVD-related mortality, and all-cause mortality[4].

With many of its risk factors being behavioral[8], hypertension is one of the most important modifiable risk factors for a wide range of health outcomes, making it an extremely important predictor for health[7]. Some of the primary risk factors for high blood pressure include obesity, physical inactivity, tobacco use, heavy alcohol use, high sodium diets, and stress[8]. Although some of these factors, like obesity and physical inactivity, are more common among African American women when compared to white women[8], these

factors do not fully explain the disproportionate rates at which African American women suffer from hypertension[9]. It is possible that differences in psychosocial factors could contribute to the excess risk for hypertension in African American women, as many experience the "triple oppression" of being black, female, and working-class in the United States[10]. To date, existing literature on psychosocial contributors to increased risk of hypertension among African Americans primarily focuses on the effects of psychosocial stressors[34], but studying the potential protective effects of psychosocial wellbeing creates an opportunity to explore innovative interventions. Because there are unexplained racial and gender disparities in hypertension[5-6], it is essential that we study alternative preventions and interventions in African American women, as seeing a reduction in these disparities will likely require a multidisciplinary approach.

Psychosocial wellbeing has been found to be associated with positive health outcomes[11, 13-19,]. Specifically, feeling a sense of meaning and purpose in life (i.e. perceived sense of meaning and impact) is an important motivating force for many. Purpose in life is one's perceived sense of meaning and impact in their life[12]. The idea that purpose in life is important to one's physical health was explored by behavioral scientists such as Viktor Frankl and Victor Strecher. In his book "Man's Search for Meaning", Frankl reflects on his experiences as a holocaust survivor and how having a sense of purpose in life influenced himself and those around him[13]. He explains that he noticed a trend in his fellow prisoners in the Auschwitz concentration camps, noting that those who were losing their sense of purpose in life were falling ill and dying more quickly than those who felt a higher sense of purpose in life[15].

There is evidence that having an increased sense of purpose in life increases engagement in health-promoting activities and decreases the risk for adverse health outcomes as well as mortality[16-20]. For example, a study conducted by Boyle et al. in a cohort of 1,238 community-dwelling elderly participants found that increased sense of purpose in life was associated with a substantially reduced risk of all-cause mortality[17]. Additionally, Kim et al.'s 2013 study of 1,546 adults over the age of 50 found that greater purpose in life was associated with lower odds of myocardial infarction[18]. However, there are few studies that look at blood pressure as an outcome, and there is minimal literature studying the association between purpose in life and blood pressure, which may be an important mechanism linking purpose in life to CVD among African Americans. In addition to this, many of the studies that explore purpose in life did not include African Americans, especially African American women. In one of the few studies to include African-Americans, Mezick et al. found that low purpose in life was associated with high sleep-wake blood pressure ratios[19]; this study used a different assessment of purpose in life and had a study population that consisted of 50% women, with only a fraction of those women being African American. A Topel et al. study also looked at purpose in life in African Americans (62% women), finding that those from neighborhoods with lower-than-expected rates of cardiovascular mortality reported having an increased sense of purpose in life; however, the study only included self-reported measures of cardiovascular health, thus did not include objective assessments of blood pressure, or CVD risk factors more broadly[20].

The purpose of this study is to determine whether having a sense of purpose in life is associated with blood pressure and hypertension status and to determine whether

this association is more pronounced among women with low socioeconomic status as a marker of social disadvantage. In his book entitled “Life on Purpose”, Strecher details his experience with purpose in life following the death of his daughter. After realizing that his daughter had been his primary purpose in life, he found that in order to recover and maintain his mental and physical health, he needed to repurpose his life[16]. Consistent with Frankl’s original argument, Strecher’s narrative suggests that while purpose in life is important for all, it may have a particularly pronounced impact among those in difficult environments or circumstances. This creates a unique opportunity to explore the relationship between disadvantage, specifically economic and educational disadvantage among African American women, and the importance of having a sense of purpose in life.

Socioeconomic status is one’s social standing, often measured using educational attainment, income, occupation, and other factors[21]. The relationship between socioeconomic status and hypertension, CVD, and CVD-related outcomes have been studied in different contexts[44], and it is generally found that people with higher socioeconomic status have better health outcomes[22]. Specifically, existing literature suggests that hypertension is negatively associated with socioeconomic status[34,40], with those having low socioeconomic status being at an increased risk for developing hypertension when compared to those with higher socioeconomic status[45-49]. This phenomenon has been explored using different approaches, with the question being raised of whether socioeconomic status is a predictor of health, or if poor health contributes to one’s socioeconomic status[23]. According to a 2019 Schultz, et al. study, women are more likely than men to live in poverty and are disproportionately affected by disparities in

wealth distribution and access to resources[24]. Existing literature also suggests that the relationship between hypertension and socioeconomic status may be based on a person's inability to adequately access healthy foods, as fast food, sugar-sweetened beverages, and diets rich in fatty, high-sodium, and low-quality foods are often times cheaper and are more commonly consumed among those with lower socioeconomic status[25]. Additionally, there is growing evidence that those who have low socioeconomic status are more likely to suffer from psychosocial factors, such as stress and depression, that are associated with adverse health outcomes[23].

Since low socioeconomic status can be a source of disadvantage, creating financial, social, and emotional burdens, we can explore Frankl's idea that having a sense of purpose in life is especially important when faced with disadvantage. By studying the relationship between purpose in life and socioeconomic disadvantage, and their combined impact on blood pressure in African American women—a group that is disproportionately impacted by high blood pressure and social disadvantage, we hope to determine if socioeconomic status acts as a modifier between purpose in life and blood pressure. Among those who have low socioeconomic backgrounds, having a sense of purpose in life can be important to being resilient to the mental and physical challenges one may face.

One noteworthy advance of the current analysis is the focus on ambulatory blood pressure. While resting blood pressure readings are important to determine one's hypertensive status and cardiovascular health, ambulatory assessments are the gold standard in clinical research[36]. Numerous studies have documented that blood pressure follows a circadian pattern, which leads to higher readings during the day and a decrease

in blood pressure at night[29-30]. The absence of this decrease in blood pressure has been found to be associated with increased risk of cardiovascular morbidity and mortality[26]. Abnormal relationships between daytime and nighttime blood pressure readings, which can be measured with ambulatory blood pressure monitoring, can be indicative of uncontrolled blood pressure and increased risk for developing complications from hypertension, making it extremely important to measure nighttime blood pressure[27]. It is hypothesized that: 1) Increased sense of purpose in life will be associated with lower blood pressure, and 2) Purpose in life will have more of an impact on blood pressure in women who have more socioeconomic disadvantage versus women with less socioeconomic disadvantage.

## Methods:

### *Recruitment and Study Population:*

Participants were 424 African American women between the ages of 30-45 recruited using consumer residential lists and voter registration records from a wide range of census tracts representative of the greater Atlanta metropolitan area. Potential participants were pre-screened via telephone to determine eligibility. Women were considered to be eligible if they identified as African American, were between the ages 30-45, and were free of CVD, CHD equivalents, and diabetes. Eligible women were also premenopausal, with at least one intact ovary, and could not be pregnant or lactating. Additional ineligibility criteria included: overnight shift working, HIV/AIDS, autoimmune/chronic inflammatory diseases, renal disease, liver disease, current treatment for psychiatric disorders, current illicit drug use, or alcohol abuse.

### *Measures and Data Collection:*

All participants attended a clinic visit at Emory University, where they underwent a series of face-to-face questionnaires and biomedical measurements. Biomedical measures included a fasting blood collection and blood pressure measurements; height and weight measurements were also collected during the clinic visit. The questionnaires were used to gather information about various medical, psychosocial and demographic characteristics of the participant's life. This study received approval from the Emory institutional review board, and all participants provided written, informed consent. Study visits occurred between December 2016 and March 2019. The current analytic sample excluded women without clinic blood pressure readings (n=2), incomplete ambulatory blood pressure

assessments (n=13), or missing purpose in life data (n=26), resulting in a final sample of 385 participants.

*Purpose in Life:*

Purpose in life was assessed using a 14-item version of Ryff's Psychological Well-Being Scale[28]. Example statements include "I have a sense of direction and purpose in life" and "I don't have a good sense of what it is I'm trying to accomplish in life". Participants were asked to rate their agreement with these statements using a 6-point Likert scale with responses ranging from "strongly agree" to "strongly disagree". Scores were averaged with a maximum score of 6. Responses to negatively worded statements were reverse-coded so that high purpose in life scores correspond to greater sense of purpose in life. Purpose in life scores were also coded as categorical variables and split into approximate tertiles of "low", "moderate", and "high" groups based on the distribution of scores in the cohort.

*Socioeconomic Status:*

Socioeconomic status was assessed via self-report using annual household income and highest degree earned by the participant. Annual income from all sources was categorized as: "less than $35,000", "$35,000-49,999", "$50,000-74,999", "$75,000 or higher", or "other". Highest level of education was categorized as: "High School Diploma or Less", "Some College", or "College or Higher".

*Assessments of Blood Pressure:*

Ambulatory blood pressure was assessed over two consecutive days using the Spacelabs OnTrak model 90217 Ambulatory Blood Pressure monitor[33]. Each participant was fit for a blood pressure monitor that was worn for 48 consecutive hours following their clinic visit, only to be removed for showering or bathing. The ambulatory blood pressure monitor was programmed to capture her systolic and diastolic blood pressure every 30 minutes between 6:00am and 10:00pm and every hour between 10:00pm and 6:00am. The participants returned the monitors after 48 hours of wear, and the ambulatory blood pressure measurements were averaged to calculate the participant's ambulatory daytime and nighttime systolic and diastolic blood pressure. Using definitions from the 2017 American College of Cardiology Guideline for High Blood Pressure, participants with a daytime systolic blood pressure greater than 130 mmHg or a daytime diastolic blood pressure greater than 80 mmHg were considered to have daytime hypertension[35]. Those with a nighttime systolic blood pressure greater than 110 mmHg or a nighttime diastolic blood pressure greater than 65 mmHg were considered to have nighttime hypertension[35].

*Covariates:*

Body mass index was calculated using the formula BMI = weight (kg)/height ($m^2$)[31]. Depression was measured using scores from the Beck Depression Inventory (BDI), a questionnaire consisting of 21 statements regarding depressive symptoms experienced within the past two weeks[32]. BDI scores ranged from 0-60, with higher scores corresponding to depression. Current smoking status was measured using yes/no responses to the question "Do you currently smoke regularly?".

***Statistical Analysis:***

Descriptive analyses were utilized to characterize study participants on variables of interest. We examined differences in these characteristics by tertiles of purpose in life score using analysis of variance (ANOVA) for continuous variables and chi-square tests for categorical variables. Unadjusted linear regression analyses were used to test associations between purpose in life, and each of the covariates with continuous blood pressure outcomes, and unadjusted logistic regression analyses were used to test the association between purpose in life, each of the covariates and dichotomous hypertension outcomes. Multivariable linear regression analyses were used to model purpose in life with daytime and nighttime systolic and diastolic blood pressure as continuous outcomes, and multivariable logistic regression analyses were used to model purpose in life with daytime and nighttime hypertension as dichotomous outcomes. Models were adjusted for age, income, highest degree, and smoking status, BMI, and depression. In order to examine intersectional effects, we formally tested for purpose in life × income and purpose in life × education in non-stratified linear models including income, education, and relevant interaction terms. All non-significant interaction terms were dropped from final models. All analyses were conducted in SAS using version 9.4. An alpha level of 0.05 was used to determine significance.

**Results:**

*Participant Characteristics*

Descriptive characteristics of the cohort are presented in Table 1. The average age of women in the cohort was approximately 37 years old (s.d. 4.21), and about 91% of the cohort were non-smokers. When compared to participants with low purpose in life scores, depression scores were significantly lower ($p<0.0001$) among participants with moderate or high purpose in life scores. Additionally, highest degree earned was significantly higher in those with moderate or high purpose in life scores when compared to those with low scores ($p = 0.0279$). The highest tertile of purpose in life scores had the largest proportion of participants making $75,000 or higher and the lowest proportion of participants making less than $35,000 in comparison to those with moderate and low purpose in life scores.

*Daytime Systolic, Diastolic, and Hypertension Outcomes*

Results from linear regression analyses examining the association between purpose in life and continuous daytime blood pressure outcomes are presented in Tables 2-3. Purpose in life was not found to be significantly associated with daytime systolic blood pressure (estimate = -0.184, p-value = 0.840). Significant covariates in the model for systolic blood pressure were age, BMI, and depression. Purpose in life was not significantly associated with daytime diastolic blood pressure (estimate = -0.238, p-value =0.723), and there were no other significant covariates in the model with diastolic blood pressure. Results from logistic regression models testing the association between purpose in life and daytime hypertension are presented in Table 4. Purpose in life was also not

significantly associated with daytime hypertension (OR = 0.938, p-value = 0.704). Significant covariates in the model were age and BMI.

*Nighttime Systolic, Diastolic, and Hypertension Outcomes*

Results from linear regression analyses examining the association between purpose in life and continuous nighttime blood pressure outcomes are presented in Tables 5-6. Purpose in life was not found to be significantly associated with nighttime systolic blood pressure (estimate = -0.044, p-value = 0.959). Significant covariates in the model for systolic blood pressure were BMI and depression. Purpose in life was not significantly associated with diastolic blood pressure (estimate = -0.244, p-value = 0.719), and BMI was the only significant covariate in the model with diastolic blood pressure.

However, as shown in Table 7 logistic regression models testing the association between purpose in life and nighttime hypertension revealed a significant relationship (OR = 0.693; p-value = 0.014) after adjusting for age, income, highest degree, smoking status, and BMI. Significant covariates in the model were BMI and depression.

*Socioeconomic Status*

Interaction between purpose in life and socioeconomic status was tested in steps 3-4 of modeling, and no significant associations emerged. Neither the purpose in life × income nor the purpose in life × education interactions were significant in any adjusted logistic or linear regression models.

**Discussion:**

In this analysis of 385 African American women, we found that purpose in life was significantly associated with nighttime hypertension after controlling for age, income, highest degree, smoking status, and BMI. We found that every one-point increase in a participant's purpose in life score was associated with 30.7% decreased odds of having nighttime hypertension. Purpose in life was not significantly associated with daytime hypertension, daytime systolic or diastolic blood pressure, or nighttime systolic or diastolic blood pressure. We did not see evidence of interaction between socioeconomic status and purpose in life in any models, suggesting that socioeconomic status does not modify the relationship between purpose in life and blood pressure in this cohort.

Observing a significant relationship between purpose in life and nighttime hypertension is consistent with the existing literature, since it largely suggests a significant relationship between purpose in life and cardiovascular outcomes like hypertension. The Mezick et al. study found that low purpose in life was associated with high sleep-wake blood pressure ratios[19]. A high sleep-wake blood pressure ratio is indicative of a high nighttime blood pressure when compared to daytime blood pressure, so this is consistent with our findings of greater nighttime hypertension in those with lower purpose in life scores. However, the fact that purpose in life was not associated with daytime blood pressure outcomes or nighttime systolic or diastolic blood pressure was not expected, based on existing literature. Prior studies that tested for associations with purpose in life generally found that having an increased sense of purpose in life was a protective factor for many health outcomes. Additionally, since socioeconomic status

did not modify the relationship between purpose in life and blood pressure, our findings were inconsistent with Frankl and Strecher's ideas that purpose in life may have a particularly pronounced impact among those in difficult environments or circumstances[15-16].

It is possible that we observed a significant relationship only between purpose in life and nighttime hypertension due to the fact that nocturnal blood pressure is a stronger and more important indicator of health outcomes[29]. Elevated nighttime blood pressure has been linked to increased cardiovascular morbidity and mortality compared to daytime blood pressure, and nocturnal blood pressure is more heavily influenced by psychosocial factors[29-30]. Therefore, the fact that we found purpose in life to be significantly associated with nighttime hypertension and not daytime hypertension is reasonable. It is also possible that we saw more significant results with nighttime hypertension since a larger proportion of the cohort had nighttime hypertension when compared to daytime hypertension (57.4% vs 33.5%). A noteworthy observation from the results of these analyses is the fact that different relationships are seen between the continuous and dichotomous nighttime blood pressure outcomes. The categorization of the nighttime hypertension variable could have created this difference. In this analysis, nighttime hypertension is defined as having a nighttime systolic blood pressure greater than or equal to 110 mmHg or a diastolic blood pressure greater than or equal to 65 mmHg. Since the continuous blood pressure variable is not able to take into account both the systolic and diastolic readings, it may not be the best indicator of whether or not the participant has hypertension.

Another noteworthy finding from these analyses was that the associations were not completely independent of depressive symptoms. Depression was significantly associated with both nighttime hypertension and with purpose in life. However, when both purpose in life and depression were included in a multivariate model, purpose in life was reduced to marginal significance, and depressive symptoms were not significant in the model. However, depressive symptoms were significantly associated with each of the blood pressure outcomes that were modeled, while purpose in life was only significantly associated with nighttime hypertension. These findings suggest that depression and purpose in life may be such opposing forces that, if depressed, a person is unlikely to have a high sense of purpose in life; it also shows us that the presence of depression could reduce one's purpose in life or cancel out the protective effects of having a high sense of purpose in life. The Mezick et al. study did not find a significant relationship between depression and blood pressure ratios[19]. However, Boyle et al. found that purpose in life remained significantly associated with mortality, even after controlling for depression[17]. This introduces the idea that depression may act a mediator between purpose in life and blood pressure in some cases.

There are limitations to consider while interpreting the study findings. First, there are limits to generalizability of the study results, given that the study population is comprised of all African American women. These findings cannot necessarily be applied to African American men or to either men or women from different racial/ethnic groups. Additionally, since socioeconomic status is made up of many different factors, there are limitations to assessing SES with the two indicators, education and income, being analyzed individually. In future studies, it would be beneficial to assess SES in a way that

considers more of the factors that contribute to socioeconomic status together, such as a composite SES score[39]. Further, the cross-sectional design of this study limits our ability to assess how changes in one's purpose in life, or any other covariates, may impact their blood pressure.

This study also has several strengths, one of which being the fact that this is one of the first studies to look at the impact of positive psychosocial factors on blood pressure in African American women, a group at high risk for hypertension and adverse hypertension-related outcomes. In addition to having an all African American women study population, participants were chosen from a wide range of census tracts in Atlanta, making the group diverse in terms of educational attainment, income, and many other factors. Additionally, this study used ambulatory blood pressure monitors to assess blood pressure, which are the gold standard for blood pressure assessment in clinical research.

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**Table 1. Descriptive Characteristics of a Cohort of African American Women by Purpose in Life Score (n=385)**

| Covariates | Total Cohort | Purpose in Life | | | |
|---|---|---|---|---|---|
| | (n = 385) | Low (n = 130) | Moderate (n = 122) | High (n = 133) | p-value |
| **Age** | 37.38 (4.21) | 36.86 (4.29) | 37.38 (4.16) | 37.90 (4.15) | 0.0817 |
| **BMI** | 32.48 (7.95) | 32.81 (8.36) | 33.04 (8.34) | 31.64 (7.14) | 0.5637 |
| **Depression (BDI)** | 5.74 (7.95) | 9.48 (7.75) | 4.70 (5.42) | 3.05 (3.67) | <0.0001* |
| **Income** | | | | | 0.1100 |
| Less than $35,000 | 90 (23.38%) | 39 (30.00%) | 29 (23.77%) | 22 (16.54%) | |
| $35,000-49,999 | 82 (21.30%) | 25 (19.23%) | 28 (22.95%) | 29 (21.80%) | |
| $50,000-74,999 | 86 (22.34%) | 24 (18.46%) | 26 (21.31%) | 36 (27.07%) | |
| $75,000 or more | 121 (31.43%) | 38 (29.23%) | 38 (31.15%) | 45 (33.83%) | |
| Other | 6 (1.56%) | 4 (3.08%) | 1 (0.82%) | 1 (0.75%) | |
| **Highest Degree Earned** | | | | | 0.0279* |
| High School or Less | 118 (30.65%) | 49 (37.69%) | 35 (28.69%) | 34 (25.56%) | |
| Some College | 74 (19.22%) | 28 (21.54%) | 27 (22.13%) | 19 (14.29%) | |
| College+ | 193 (50.13%) | 53 (40.77%) | 60 (49.18%) | 80 (60.15%) | |
| **Smoking Status** | | | | | 0.0888 |
| No | 351 (91.17%) | 123 (94.62%) | 106 (86.89%) | 122 (91.73%) | |
| Yes | 34 (8.83%) | 7 (5.38%) | 16 (13.11%) | 11 (8.27%) | |
| **Daytime SBP** | 120.72 (12.05) | 121.16 (11.78) | 122.18 (12.04) | 118.94 (12.19) | 0.6109 |
| **Daytime DBP** | 77.20 (8.64) | 77.23 (8.22) | 78.39 (8.78) | 76.09 (8.82) | 0.9663 |
| **Daytime Hypertension** | | | | | 0.7421 |
| No | 256 (66.49%) | 85 (65.38%) | 74 (60.66%) | 97 (72.93%) | |
| Yes | 129 (33.51%) | 45 (34.62%) | 48 (39.32%) | 36 (27.07%) | |
| **Nighttime SBP** | 109.95 (11.73) | 109.84 (11.75) | 111.73 (11.75) | 108.43 (11.56) | 0.8932 |
| **Nighttime DBP** | 66.82 (8.83) | 66.65 (8.59) | 68.23 (9.21) | 65.69 (8.58) | 0.7895 |
| **Nighttime Hypertension** | | | | | 0.4618 |
| No | 164 (42.60%) | 52 (40.00%) | 46 (37.70%) | 66 (49.62%) | |
| Yes | 221 (57.40%) | 78 (60.00%) | 76 (62.30%) | 67 (50.38%) | |

dichotomous covariates reported as n (%)
continuous covariates reported as mean (standard deviation)

**Table 2. Adjusted Multivariate Analyses of Covariates with Daytime Systolic Blood Pressure (SBP)**

| | Model 0 | | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Covariates** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** |
| **Purpose in Life** | -0.946 | 0.232 | -1.149 | 0.147 | -0.860 | 0.284 | -1.266 | 0.325 | -0.592 | 0.633 | -0.184 | 0.840 |
| **Age** | -- | -- | 0.294 | 0.042* | 0.374 | 0.012* | 0.340 | 0.021* | 0.355 | 0.016* | 0.334 | 0.024* |
| **Income** | -- | -- | -- | -- | -0.502 | 0.362 | -1.416 | 0.641 | -- | -- | -0.287 | 0.732 |
| **Highest Degree** | -- | -- | -- | -- | -1.052 | 0.175 | -- | -- | 0.027 | 0.995 | -0.405 | 0.608 |
| **PIL * Income** | -- | -- | -- | -- | -- | -- | 0.137 | 0.828 | -- | -- | -- | -- |
| **PIL * Highest Degree** | -- | -- | -- | -- | -- | -- | -- | -- | -0.275 | 0.764 | -- | -- |
| **Smoking Status** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.946 | 0.388 |
| **BMI** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.292 | <0.001* |
| **Depression (BDI)** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.249 | 0.022* |

*p-value < 0.05

**Table 3. Adjusted Multivariate Analyses of Covariates with Daytime Diastolic Blood Pressure (DBP)**

| | Model 0 | | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Covariates** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** |
| **Purpose in Life** | -0.549 | 0.334 | -0.667 | 0.242 | -0.515 | 0.373 | -0.887 | 0.338 | -0.440 | 0.622 | -0.238 | 0.723 |
| **Age** | -- | -- | 0.162 | 0.121 | 0.198 | 0.066 | 0.176 | 0.099 | 0.195 | 0.068 | 0.188 | 0.087 |
| **Income** | -- | -- | -- | -- | -0.087 | 0.826 | -1.00 | 0.646 | -- | -- | 0.063 | 0.876 |
| **Highest Degree** | -- | -- | -- | -- | -0.665 | 0.234 | -- | -- | -0.343 | 0.915 | -0.303 | 0.604 |
| **PIL * Income** | -- | -- | -- | -- | -- | -- | 0.159 | 0.727 | -- | -- | -- | -- |
| **PIL * Highest Degree** | -- | -- | -- | -- | -- | -- | -- | -- | -0.075 | 0.909 | -- | -- |
| **Smoking Status** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.551 | 0.126 |
| **BMI** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.074 | 0.192 |
| **Depression (BDI)** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.111 | 0.166 |

*p-value < 0.05

**Table 4. Adjusted Multivariate Analyses of Covariates with Daytime Hypertension**

| | Model 0 | | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Covariates** | **OR** | **p-value** | **OR** | **p-value** | **OR** | **p-value** | **OR** | **p-value** | **OR** | **p-value** | **OR** | **p-value** |
| **Purpose in Life** | 0.863 | 0.284 | 0.834 | 0.194 | 0.865 | 0.318 | 0.833 | 0.423 | 1.082 | 0.718 | 0.938 | 0.704 |
| **Age** | -- | -- | 1.046 | 0.085 | 1.056 | 0.044* | 1.051 | 0.062 | 1.054 | 0.049* | 1.059 | 0.039* |
| **Income** | -- | -- | -- | -- | 0.955 | 0.642 | 0.889 | 0.828 | -- | -- | 0.993 | 0.944 |
| **Highest Degree** | -- | -- | -- | -- | 0.864 | 0.297 | -- | -- | 2.476 | 0.258 | | 0.541 |
| **PIL * Income** | -- | -- | -- | -- | -- | -- | 1.007 | 0.949 | -- | -- | -- | -- |
| **PIL * Highest Degree** | -- | -- | -- | -- | -- | -- | -- | -- | 0.799 | 0.174 | -- | -- |
| **Smoking Status** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.107 | 0.805 |
| **BMI** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.029 | 0.042* |
| **Depression (BDI)** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.030 | 0.138 |

*p-value < 0.05

**Table 5. Adjusted Multivariate Analyses of Covariates with Nighttime Systolic Blood Pressure (SBP)**

| | Model 0 | | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Covariates** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** |
| **Purpose in Life** | -0.798 | 0.301 | -0.938 | 0.225 | -0.741 | 0.346 | -1.24 | 0.321 | -1.037 | 0.393 | -0.044 | 0.959 |
| **Age** | -- | -- | 0.188 | 0.185 | 0.246 | 0.093 | 0.224 | 0.121 | 0.220 | 0.115 | 0.172 | 0.223 |
| **Income** | -- | -- | -- | -- | -0.464 | 0.388 | -1.79 | 0.546 | -- | -- | -0.167 | 0.749 |
| **Highest Degree** | -- | -- | -- | -- | -0.640 | 0.399 | -- | -- | -2.195 | 0.618 | 0.220 | 0.770 |
| **PIL * Income** | -- | -- | -- | -- | -- | -- | 0.247 | 0.690 | -- | -- | -- | -- |
| **PIL * Highest Degree** | -- | -- | -- | -- | -- | -- | -- | -- | 0.274 | 0.760 | -- | -- |
| **Smoking Status** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.225 | 0.559 |
| **BMI** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.423 | <0.001* |
| **Depression (BDI)** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.217 | 0.036* |

*p-value < 0.05

**Table 6. Adjusted Multivariate Analyses of Covariates with Nighttime Diastolic Blood Pressure (DBP)**

| | Model 0 | | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Covariates** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** | **Estimate** | **p-value** |
| **Purpose in Life** | -0.689 | 0.235 | -0.776 | 0.183 | -0.702 | 0.236 | -1.306 | 0.168 | -1.151 | 0.208 | -0.244 | 0.719 |
| **Age** | -- | -- | 0.110 | 0.302 | 0.141 | 0.202 | 0.136 | 0.209 | 0.124 | 0.258 | 0.097 | 0.379 |
| **Income** | -- | -- | -- | -- | -0.463 | 0.253 | -2.233 | 0.318 | -- | -- | -0.278 | 0.495 |
| **Highest Degree** | -- | -- | -- | -- | 0.054 | 0.924 | -- | -- | -2.328 | 0.482 | 0.541 | 0.358 |
| **PIL * Income** | -- | -- | -- | -- | -- | -- | 0.372 | 0.425 | -- | -- | -- | -- |
| **PIL * Highest Degree** | -- | -- | -- | -- | -- | -- | -- | -- | 0.423 | 0.532 | -- | -- |
| **Smoking Status** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.199 | 0.191 |
| **BMI** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.170 | 0.002* |
| **Depression (BDI)** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.137 | 0.090 |

*p-value < 0.05

**Table 7. Adjusted Multivariate Analyses of Covariates with Nighttime Hypertension**

| | Model 0 | | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | | Model 6 | | Model 7 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Covariates** | **OR** | **p-value** | **OR** | **p-value** | **OR** | **p-value** | **OR** | **p-value** | **OR** | **p-value** | **OR** | **p-value** | **OR** | **p-value** | **OR** | **p-value** |
| **Purpose in Life** | 0.710 | 0.015* | 0.704 | 0.013 | 0.702 | 0.014* | 0.727 | 0.165 | 0.604 | 0.027* | 0.693 | 0.011* | 0.693 | 0.014* | 1.001 | 0.066 |
| **Age** | -- | -- | 1.008 | 0.734 | 1.009 | 0.714 | 1.011 | 0.663 | 1.008 | 0.7691 | 1.007 | 0.778 | 1.001 | 0.974 | 0.736 | 0.978 |
| **Income** | -- | -- | -- | -- | 0.947 | 0.563 | 1.035 | 0.948 | -- | -- | 0.960 | 0.670 | 0.985 | 0.875 | 0.985 | 0.881 |
| **Highest Degree** | -- | -- | -- | -- | 1.051 | 0.710 | -- | -- | 0.514 | 0.413 | 1.085 | 0.551 | 1.213 | 0.175 | 1.220 | 0.163 |
| **PIL * Income** | -- | -- | -- | -- | -- | -- | 0.983 | 0.885 | -- | -- | -- | -- | -- | -- | -- | -- |
| **PIL * Highest Degree** | -- | -- | -- | -- | -- | -- | -- | -- | 1.151 | 0.392 | -- | -- | -- | -- | -- | -- |
| **Smoking Status** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.498 | 0.308 | 1.816 | 0.146 | 1.751 | 0.176 |
| **BMI** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.051 | <0.001* | 1.051 | <0.001* |
| **Depression (BDI)** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.016 | 0.425 |

*p-value < 0.05

## Chapter III:

### Public Health Implications and Future Directions:

The excess risk for cardiovascular disease in African American women is not fully explained by traditional risk factors, making it difficult to propose interventions that will close this gap. By contributing evidence that there is a relationship between psychosocial wellbeing and nocturnal blood pressure, which is the strongest indicator of cardiovascular outcomes, we can begin to explore ways that purpose in life and other positive psychosocial factors can be used to aid in reducing hypertension and cardiovascular risk in African American women. Future studies should be done assess purpose in life as a potential prevention method for hypertension in African American women who are free of hypertension. Additionally, studies can look at the effectiveness of improving purpose in life as an intervention for African American women with hypertension.

### Conclusions:

This is one of few studies to examine the relationship between positive psychosocial factors and blood pressure in African American women. In this cohort of African American women, feeling a high sense of purpose in life was associated with decreased odds of having nighttime hypertension. Having a sense of purpose in life may be an important psychosocial factor that could decrease risk for hypertension in African American women and help even out the disproportionately high rates at which African American women are burdened by hypertension. However, findings from this study also suggest that depression may be a stronger indicator of elevated blood pressure in African

American women and that negative psychosocial factors could potentially overpower the benefits of psychosocial wellbeing in this group. This further supports the need for future studies to consider the way both positive and negative psychosocial factors play a role in racial and gender disparities in hypertension and other CVD related outcomes.