Race and Sex Differences in Correlates of Systolic Blood Pressure in Community-Dwelling Older Adults

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Abstract

Objectives: To describe correlates of measured systolic blood pressure (SBP) among community-dwelling older African American and White Medicare beneficiaries.

Methods: Participants completed an in-home assessment and factors significantly correlated with SBP were tested using multivariable models.

Results: Among the 958 participants (mean age= 75.3 [SD = 6.8]; 49% African American; 49% female; 52% rural) African Americans were more often diagnosed with hypertension, more likely on anti-hypertensives, and on more anti-hypertensive medications. SBP was 2.7 mmHg higher in African Americans than Whites (p=.03). SBP was higher in women than men. Multivariable models revealed differences in the factors associated with SBP by race/sex specific groups. Having a history of smoking and reports of being relaxed and free of tension were associated with higher SBP among African American men.

Discussion: Although more likely prescribed anti-hypertensives, mean SBP was higher for older African Americans than Whites. Results support the hypothesis that behavioral and psychosocial factors are more important correlates of SBP levels among older African Americans than among Whites.

Keywords

older adults; blood pressure; African Americans; race/ethnicity

Cover Page Footnote

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ABSTRACT
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Results: Among the 958 participants (mean age= 75.3 [SD = 6.8]; 49% African American; 49% female; 52% rural) African Americans were more often diagnosed with hypertension, more likely on anti-hypertensives, and on more anti-hypertensive medications. SBP was 2.7 mmHg higher in African Americans than Whites (p=.03). SBP was higher in women than men. Multivariable models revealed differences in the factors associated with SBP by race/sex specific groups. Having a history of smoking and reports of being relaxed and free of tension were associated with higher SBP among African American men.
Discussion: Although more likely prescribed anti-hypertensives, mean SBP was higher for older African Americans than Whites. Results support the hypothesis that behavioral and psychosocial factors are more important correlates of SBP levels among older African Americans than among Whites.

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INTRODUCTION

Hypertension, a significant risk factor for the development and complications of cardiovascular disease, coronary heart disease, and kidney disease, affects more than 76 million American adults. African Americans have the highest prevalence of hypertension in the United States; more specifically, hypertension prevalence is highest among African Americans living in the South (Roger et al., 2012). Given the high prevalence of disease, understanding the differences in observed variations in blood pressures among African Americans and Whites

could provide valuable insight into factors that may be helpful in disease management. The purpose of the current study was to describe the correlates of measured systolic blood pressure among older African Americans and Whites.

Control of diagnosed hypertension has increased in past years; however, control among African Americans remains lower than of Whites (Bosworth et al., 2006; Downie et al., 2011; Durant et al., 2010; Hertz et al., 2005; Redmond, Baer, Hicks, 2011; Roger et al., 2012). Therefore, further exploration is needed to determine the potential explanation for racial disparities in blood pressure levels. A number of factors may contribute to differences in blood pressure levels among both those with and without a diagnosis of hypertension, such as access to care (Bosworth & Oddone, 2002; Durant et al., 2010; Fiscella & Holt, 2008; Kramer et al., 2004), decreased resources, difficulty with transportation (Rose, Kim, Dennison, & Hill, 2000), and psychosocial factors including social support, depressive symptoms (Bosworth & Oddone, 2002), and perceived stress (Bosworth, Bartash, Olsen, & Steffens, 2003; Bosworth & Oddone, 2002; Howard et al., 2006).

A negative or positive influence on these psychosocial factors can in turn affect participation in health behaviors and impact blood pressure levels. Positive health behaviors can be formed through social support and health information provided through social networks. Stress responses may be buffered by these networks (York, Cornwell, & Waite, 2012; Thoits, 2011). Alternatively, individuals may participate in health behaviors that are unhealthy such as overeating, drinking, and smoking to manage stress (Jackson, Knight, & Rafferty, 2010).

All of the aforementioned psychosocial factors have been found to be particularly important in exploring factors related to blood pressure levels among African Americans. Researchers have discussed how each of these psychosocial factors impacts hypertension and blood pressure control while highlighting the importance of further exploring these relationships. Findings from previous studies indicate greater observed occurrences of anxiety and depression in individuals who did not have sufficient perceived social support (Cazdow & Servoss, 2009; Raikkonen, Matthews, & Kuller, 2001) while Bosworth and colleagues (2003) only found a significant relationship between depression and hypertension. Carels and colleagues (1998) found that borderline hypertensives indicated a lower level of social support than individuals with normal blood pressure. Additionally, lower levels of satisfaction with social support were found in individuals with higher blood pressures.

In a review of studies of race differences and the relationship between reactivity due to stress and blood pressure, Anderson, McNeilly, and Myers (1992) found that among African Americans the association between chronic stress and increased vascular activity was mediated by sodium retention and heightened sympathetic nervous system activity. Autonomic reactivity differed significantly by race. African Americans had a greater reaction to stressors which resulted in elevated blood pressure (Anderson et al., 1992). Anderson and colleagues (1992) indicated African Americans encountered more stressors than their counterparts. They further discussed that race was regarded as a sociocultural designation which indicated different experiences as it related to being exposed to social stressors on a continuous basis. These stressors interacted with a number of risk factors and in turn caused a physiological response. Sodium retention rates increased in instances of acute stress. In addition, resting blood pressure can be affected by physiological responses to chronic stress (Matthews et al., 2002; Matthews, Salomon, Brady, & Allen, 2003).

Tell and colleagues (1994) explored correlates of blood pressure in adults aged 65 to 101 years of age in the Cardiovascular Health Study. Their primary focus was physiologic risk factors for increased systolic and diastolic blood pressure and how blood pressure is affected and distributed. Key findings included systolic blood pressure being lower in individuals with established CVD, and relationships between carotid artery variables, blood chemistry, and anatomy and functions of the cardiac system and blood pressure.

Health disparities in blood pressure and the correlates of blood pressure have been explored, however differences in factors associated with systolic blood pressure (SBP), particularly as it relates to behavioral and psychosocial factors, between racial/sex subgroups needs to be more fully examined. Systolic blood pressure levels are significant indicators of risk for cardiovascular disease in older adults (Chobanian et al., 2003; Dave et al., 2013). The most common type of hypertension in older adults is isolated systolic hypertension (SBP $\geq$ 140mmHg; DBP < 90mmHg). As individuals age, arteries stiffen over time as a result of reduced arterial compliance causing an increase in systolic blood pressure (Basile, 2002; Izzo, Levy, & Blac, 2000; Stokes, 2009). Our study adds to the body of literature on health disparities in blood pressure and correlates of blood pressure by providing additional insight into how these factors affect community-dwelling older African Americans and Whites in urban and rural areas in the southern United States. We explored the correlation of systolic blood pressure with socioeconomic and demographic characteristics, physical health, and psychosocial measures. We hypothesized that (1) behavioral and psychosocial factors (i.e., physical activity, smoking, and perceived social support) would be independent correlates of elevated blood pressure and (2) this association would be stronger in African Americans than in Whites. We further hypothesized that (3) there would be differences by sex within each racial group.

METHODS

Design and Sample

This study was a secondary data analysis of participants in the University of Alabama at Birmingham (UAB) Study of Aging, a random sample of Medicare beneficiaries aged 65 and older living in five counties of central Alabama, selected from a list of Medicare beneficiaries provided by the Centers of Medicare and Medicaid Services (CMS) and stratified by county, race, and sex (Allman, Sawyer, & Roseman, 2006). Recruitment was set to achieve a balanced sample in terms of race, sex, and rural/urban residence. In-home assessments conducted between December 1999 and February 2001 included socio-demographics, measures of physical and mental health, and health care utilization, as well as a single measure of sitting systolic blood pressure (SBP). Interviews were conducted after obtaining informed consent. Data collection for the Study of Aging was approved by the UAB Institutional Review Board; these analyses have been approved by the Institutional Review Boards at the University of Alabama at Birmingham and The University of Alabama.

Recruitment

A letter signed by the CMS administrator was mailed to potential participants explaining the purpose of the study and providing a toll-free number to call if a person did not want to be contacted. Letters were mailed in sets of 50 to 100 letters throughout the course of the study until recruitment goals were met. Ten days after mailing letters, calls were made to ask eligible persons if they would consent to an in-home interview. Up to 10 calls were made at different times and on different days over a six week period. Of 2188 persons contacted to arrange in-

home assessments, 1143 (52.3%) refused and 43 (2.0%) were ineligible because the subject did not live in one of the five study counties, was under the age of 65, or was unable to communicate on the telephone to make arrangements for the in-home assessment. For White females, recruitment was 46% in the urban counties and 44% in rural counties. For White males, 50% of those contacted in urban counties and 52% of those contacted in rural counties were interviewed. Among African Americans, recruitment was 35% for urban males, 36% of urban females, and 55% of both urban and rural males (Allman, Sawyer, & Roseman, 2006). The sample size for the current study was 958 participants.

Interviewers were trained by members of the research team. Eleven percent (N=107) of interviews were completed by African American interviewers, 2% (N=22) by a non-Hispanic White interviewer. No attempt was made to match interviewers to participants; 51% of interviews were not completed by an interviewer of the same race/ethnicity.

Measures

Blood pressure was measured according to American Heart Association guidelines and assessed using a sphygmomanometer and stethoscope with the participant's arm at heart level (Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure [JNC], 1997). Initial training to measure blood pressure was directed by a faculty member of the UAB School of Nursing. To mitigate any elevation in blood pressure that might be caused by anxiety about the procedure, the measure was taken towards the end of the interview, after rapport between the interviewer and participant had been established. Participants had been sitting quietly for at least five minutes with their feet on the floor before the measurement began. Interviewers were provided with small, standard, and large adult cuffs.

Socioeconomic and demographic characteristics

For this analysis, rural residence was classified according to census tract designations at the time of the interviews (rural = 1; non-rural=0). Baseline age (continuous), sex (female = 1; male = 0), and race (African American = 1; White = 0) were self-reported. Marital status was categorized as married (1) or not married (0 = widowed, separated, divorced, or never married). Annual family income was reported in nine categories ranging from less than $5000 to $50,000 or greater. Persons with missing responses for reported income (n=166) were assigned an income category derived from an imputed value based on correspondence of income categories to a question about perceived income adequacy. . For persons with responses for both the income category and the income adequacy items, the income variables correlated at r =0.64 ($p<.001$). The four possible responses to the question about income adequacy corresponded to income ranges as follows: "Income is not enough to make ends meet" was equivalent to $5,000 - $7,999; "Income gives you just enough to get by on" was equivalent to $8,000 - $11,999; "Income keeps you comfortable but permits no luxuries" was equivalent to $16,000 - $19,999; "Income allows you to do more or less what you want" was equivalent to $30,000 to $39,000. Education was coded in four categories based on the highest level completed (1 = less than 6^{th} grade; 2 = 7-11^{th} grade; 3 = 12^{th} grade; 4= greater than 12^{th}). Transportation difficulty (1 = difficulty; 0= no difficulty) was determined by a positive response to either of two questions: "Over the past four weeks, have you had any difficulty getting transportation to where you want to go?", and "Do you limit your activities because you don't have transportation?"

Physical health

Comorbid diseases: To determine the presence of co-morbid diseases, participants were asked about medical diagnoses. To verify the presence of a disease or condition, participants had

to report taking a medication for any condition, their primary physician had to report that they had the condition, or the condition had to be documented on a hospital discharge within the three years before entry into the study. Verified co-morbidities other than high blood pressure that are part of the Charlson Comorbidity Index were summed to develop a co-morbidity count and could range from 0 – 11 (Charlson, Sax, & MacKenzie, 1986). Participants were asked to show the interviewer all current medications which were noted on the assessment and later coded as medications prescribed to treat hypertension (American Society of Health Systems Pharmacists, 1999).

Physical function was assessed by difficulty in activities of daily living (ADLs) including difficulty in performing the following tasks: getting out of a bed or chair, bathing or showering, dressing or undressing, eating, walking, walking outside, and getting to or using the toilet (Kovar & Lawton, 1994). The Cronbach's alpha was 0.84. A count of ADLs (range 0-7) was creating by assigning one point to each task for which difficulty was reported so that higher scores reflect greater difficulty.

Measured height in inches and weight in pounds were used to calculate body mass index (BMI). For participants unable to stand, BMI was calculated from measured knee height and mid-arm circumference (Chumlea, Roche, & Mukherjee, 1987). BMI greater than thirty was coded as 1 and 0 if it was 30 or less. To test for a quadratic relationship, the square of BMI was calculated.

Smoking history was assessed in pack-years, the number of packs of cigarettes smoked each day multiplied by the number of years a person smoked. Non-smokers were assigned zero pack-years.

Leisure-time physical activity (LTPA) was calculated using kilocalorie expenditure adjusted for weight (Martin et al., 2006; Siscovick et al., 1997; Taylor et al., 1978). The LTPA included 15 activities and was used to calculate kilocalorie expenditure/week, divided into five quintiles (0=no physical activity; 1 = 1-400 kcal; 2= 401-1000 kcal; 3=1001-1800 kcal; 4=1800+ kcal).

Psychosocial measures

Psychosocial measures included having communication with children or grandchildren at least once a week (1= yes; 0=no), attending church a few times a month or more (1=yes; 0=no), and feeling that family or friends would often or very often be available if assistance was needed (1=yes; 0=no). Unmarried individuals categorized as not having any of the above resources were considered to be at risk for social isolation. Discrimination was measured by asking, "In the last six months, have you experienced any discrimination based on your race or skin color" and "Over your life-time, how often have you experienced discrimination because of your race or skin color?" For six-month and life-time discrimination, any report of discrimination was coded as 1; 0 = no reported discrimination. Depression was assessed using the Geriatric Depression Scale (GDS) (short-form), a 15-item scale (Sheikh & Yesavage, 1986). The Cronbach's alpha was 0.75. Persons with a GDS > 5 were classified as having depressive symptoms based on the standard cut-off suggestive of depression (1=depressive symptomology; 0 = not showing depression symptomology (Burke, Roccaforte, & Wengel, 1991; Herrmann et al., 1996; Sheikh & Yesavage, 1986).

Anxiety was measured using the individual items of the anxiety subscale of the Arthritis Impact Measurement (AIMS2) (Meenan, Mason, Anderson, Guccione, & Kazis, 1992). Participants were asked how often they felt a certain way over the past four weeks in regards to

feeling tense or high strung, having been bothered by nervousness or nerves, being able to relax without difficulty, feeling relaxed and free of tension, and feeling calm and peaceful. Responses were scored 1=never; 2= almost never; 3=sometimes; 4=very often and 5= always.

The Mini-Mental State Examination (MMSE) was used to assess cognitive status (Folstein, Folstein, & McHugh, 1975). The Cronbach's alpha was 0.86. Scores ranged from 0-30 with higher scores representing better cognition.

Data Analysis

Analyses were conducted using SPSS (v 21). Characteristics of study participants were described using means and frequency distributions. For continuous measures of interest, the main effects of race and sex and a race x sex interaction were assessed using two-way analysis of variances (ANOVAs). Tests of the homogeneity of odds ratios were used to test for the main effects of race and sex and a potential race x sex interaction on categorical measures of interest. Factors significantly correlated with SBP in bivariate analyses (Pearson (r) and Spearman (ρ)as appropriate) for the total sample or within race/sex specific subgroups were tested in multivariable linear regression models to examine the independence of relevant associations among African American and White participants. Models were constructed entering sets of factors (socio-demographic, general health factors, health care utilization, health behaviors, and psychosocial factors) known to impact systolic blood pressure. To evaluate their added explanatory value, psychosocial factors were added to the model at the last step.

RESULTS

Study participants were included in the analysis if they had a baseline blood pressure measurement. Table 1 shows descriptive characteristics of the study sample by race/sex subgroups. Although some variables were assessed as continuous in the models, for ease of interpretation, Table 1 reports dichotomous values. For example, physical activity is reported in Table 1 as no physical activity vs. any physical activity. The sample size for this secondary data analysis was 958 participants (mean age= 75.3 [SD = 6.8]; 49% African American; 49% female; 52% rural). Overall, the mean SBP was 138 (SD=19.5) with SBP in African Americans 2.7 mmHg higher than Whites and women reporting higher SBP than men (p's = .03). African Americans were more often diagnosed with hypertension, and were prescribed greater numbers of anti-hypertensives (79.7% vs. 62.3%, p = <.001; and 1.3 vs. 0.9, p=<.001, respectively). Among participants with diagnosed hypertension, 56.1% had SBP readings greater than 140 (White males = 54.8%; White females = 52.2%; African American males = 57.0%; and African American females = 59.4%). Participants not included in this analysis (N=42) were significantly more likely to be African American, female, and had lower income, lower education, lower MMSE, and greater symptoms of depression. However, there were no differences in the prevalence of diagnosed hypertension among those included vs. not included in the sample.

There were significant main effects by race and sex in the socio-economic, general health, health behavior, and psychosocial variables and significant interaction effects as noted in Table 1. Only 5.3% of White males reported transportation difficulty whereas White Females and African American males reported similar levels of difficulty (13.8% and 16.9% respectively). However, African American females as a group reported a higher percentage of transportation difficulty (31.1%). The majority of African American males (69.4%) and females (56.1%) reported lifetime racial discrimination.

Bivariate analyses suggested that correlates of SBP differed across race/sex subgroups. Lower income and rural residence were significant correlates of higher SBP only for White women (r=-.199, p<.01 and r=.129, p<.05 respectively). Higher BMI was significant for White men and African American women (r=.175, p<.01 and r=.178, p<.01 respectively). Measures of access, such as medication and recent physician visits, were associated with higher SBP for White females (r=.164, p<.05 and r=.142, p<.05 respectively) and medication was associated with higher SBP for African American men (r=.175, p<.01). Leisure time physical activity was associated with lower SBP only for White females (r=-.190, p<.01) and smoking history was associated with higher SPB only for African American men (r=.183, p<.01). Psychosocial factors were significant only among men. White men who reported being tense, nervous, or calm had higher SBP (r=-.133, p<.01; r=-.200, p<.01; r=-.150, p<.05 respectively). African American men who reported being relaxed and free of tension had higher SBP (r=.204, p<.01) and African American men who did not perceive having social support also had higher SBP (r=-.142, p<.05).

Table 1: Descriptive Characteristics of Study Participants (Means and Percentages)

Factor	WM N=246	WF N=240	AAM N=242	AAF N=230	race main effect p-value	gender main effect p-value	race* gender interaction p-value
Socio-demographic Factors							
Age (SD)	74.5 (6.3)	75.0 (6.3)	75.4 (6.6)	76.3 (7.6)	.010	.110	.660
Education (less than 6th grade)	7.3%	3.3%	40.5%	30.9%	<.001	.117	.481
Income (< $8000)	4.5%	13.8%	29.4%	49.1%	<.001	<.001	.157
Rural	56.9%	52.9%	49.2%	48.3%			
Married	80.9%	45.8%	58.3%	19.6%	<.001	<.001	.643
Transportation difficulty	5.3%	13.8%	16.9%	31.3%	<.001	<.001	<.001
General Health Factors							
Verified hypertension diagnosis	59.4%	65.4%	73.9%	85.7%	<.001	.003	.111
Co-morbidity count (not including HTN)	1.8 (1.5)	1.4 (1.3)	1.6 (1.5)	1.4 (1.4)	.334	<.001	.201
BMI (SD)	27.0 (4.9)	26.2 (4.9)	28.2 (5.4)	30.1 (8.3)	.038	.128	<.001
BMI>30	20.7%	22.1%	34.3%	46.1%	<.001	.032	.156
ADLs (SD)	1.1 (1.7)	1.2 (1.8)	1.2 (1.9)	1.6 (1.8)	.038	.028	.176
MMSE (Sd)	26.6 (3.7)	27.6 (2.8)	22.6 (5.3)	23.4 (4.9)	<.001	.001	.791
Health Care Utilization							
Blood pressure medications	1.1 (1.1)	0.82 (.91)	1.28 (1.15)	1.4 (.98)	<.001	.282	.020
Doctor visit (within 1 month)	33.3%	40.4%	44.6%	47.8%	.003	.124	.547
Health Behaviors							
No physical activity	17.9%	19.2%	24.4%	20.4%	<.001	.215	.743
Smoking history (mean pack-years) (SD)	38.1 (44.6)	9.9 (22.3)	24.9 (31.0)	3.5 (10.0)	<.001	<.001	.047
Psychosocial Factors							
Tense/high strung (Very Often and Always)	7.3%	10.9%	9.5%	11.8%	.051	<.001	.975

Factor	WM N=246	WF N=240	AAM N=242	AAF N=230	race main effect p-value	gender main effect p-value	race* gender interaction p-value
Nervous (Very Often and Always)	7.0%	10.3%	10.8%	16.9%	<.001	<.001	.305
Relax without difficulty (Very Often and Always)	78.4%	69.6%	67.0%	56.9%	.051	.002	.261
Relax and free of tension (Very Often and Always)	70.1%	55.4%	64.9%	49.1%	.524	<.001	.768
Calm (All or Most of the time)	78.5%	65.8%	68.6%	60.0%	.115	<.001	.334
Depressive symptoms (Geriatric Depression Scale)	2.11 (2.2)	2.3 (2.3)	2.3 (2.2)	2.5 (2.3)	.170	.186	.958
GDS >5	7.7%	8.8%	10.3%	10.0%	.294	.861	.694
No/little communication with children	15.0%	12.5%	22.7%	20.0%	.002	.275	.881
No perception of support	4.5%	4.6%	14.5%	7.8%	<.001	.061	.177
Minimal church attendance	36.6%	21.7%	32.2%	16.5%	.105	<.001	.642
Racial discrimination (6 mo.)	1.2%	2.1%	9.9%	4.8%	<.001	.112	.096
Racial discrimination (Lifetime)	10.2%	9.6%	69.4%	56.1%	<.001	.020	<.001
Systolic Blood Pressure mmHg (SD)	135.8 (17.1)	138.5 (19.0)	138.5 (21.5)	141.2 (19.9)	.031	.033	.993

WM=white male; WF=white female; AAM= African American male; AAF=African American Female

In the race/sex specific multivariable models (Table 2), variables were entered in sets: Socio-demographic and economic factors (step1), general health (step 2), health care utilization (step 3), health behaviors (step 4), and psychosocial characteristics (step 5). Health behaviors and psychosocial variables were added in the final two steps in the development of the final race/sex specific models for correlates of SBP. The addition of the behavioral and psychosocial variables provided additional model predictability for each of the subgroups although the only significant items were in the model for African American men. These included smoking history and self-reported feeling relaxed and free of tension, both of which were associated with higher SBP.

The final models of associations (Table 2) accounted for a significant amount of variability in SBP for each subgroup except for the model examining African American women. However, it should be noted that within the models for African American women, BMI was significantly and independently associated with SBP and this was evident only among African American women. The test for a potential non-linear relationship of BMI and SBP was not significant. In the final models, education, a verified diagnosis of hypertension, number of blood pressure medications, smoking history, and feeling relaxed or free of tension were significant, independent, correlates for SBP among African American men. Among White men, only a verified diagnosis of hypertension and difficulty in ADLs were significant, independent correlates. Although the overall model for White women accounted for a significant amount of variability in SBP, no factors were significant independent correlates of elevated SBP. The range for model R^2 for the subgroups ranged from a low of 8.8% (African American females) to 18.4% (African American males). The R^2 for White males was 17.3% and for White females: 13.4%.

Table 2: Correlates of SBP by Race and Gender

	White Men (N=245)			Women (N=239)			African American Men (N=238)			Women (N=229)		
Variable	R2	Change in R2	β	R2	Change in R2	β	R2	Change in R2	B	R2	Change in R2	β
Step 1												
Age			-.068			.082			-.064			-.019
Education			.029			.065			.114			.005
Income			-.088			-.229*			-.049			-.007
Rural residence			-.071			.074			-.065			.069
Married			.002			.032			-.037			.051
Transportation difficulty			-.133**			-.059			-.029			.098
Model (df = 6)	.030	.030		.056	.056		.023	.023		.016	.016	
	F= 1.221; p=.296			F=2.315; p=.034			F=0.926; p=.477			F=0.607; p=.725		
Step 2												
Age			.016			.135			-.032			.018
Education			-.021			.086			.167*			-.008
Income			-.112			-.129			-.063			.018
Rural residence			-.086			.087			-.066			.059
Married			.009			.019			-.027			.027
Transportation difficulty			-.070			-.054			-.026			.102
Diagnosis of Hypertension			.227***			.185**			.203**			.079
Comorbidity			-.053			.046			-.010			-.084
Body Mass Index			.146*			.094			.007			.176*
ADL sum			-.193**			.009			-.143*			.035
MMSE score			.122			-.042			-.127			.011
Model (df=11)	.152	.122		.108	.051		.040	.061		.058	.042*	
	F=3.819; p<.001			F=2.500; p=.006			F=1.898; p=.041			F=1.218; p=.276		

Variable	White Men (N=245) R2	Change in R2	β	Women (N=239) R2	Change in R2	β	African American Men (N=238) R2	Change in R2	B	Women (N=229) R2	Change in R2	
Step 3												
Age			.018			.143			-.032			.016
Education			-.017			.096			.171*			-.013
Income			-.112			-.126			-.069			.028
Rural residence			-.088			.088			-.064			.055
Married			.006			.021			-.031			.023
Transportation difficulty			-.074			-.050			-.016			.100
Diagnosis of Hypertension			.200**			.166*			.159*			.105
Comorbidity			-.068			.041			-.029			-.073
Body Mass Index			.138*			.098			-.020			.185*
ADL sum			-.199**			-.004			-.157*			.041
MMSE score			.118			-.039			-.119			.014
Blood pressure medication			.057			.019			.134			-.024
Doctor visit within 1 mo.			.022			.089			.004			.074
Model (df=13)	.155	.003**		.116	.008**		.098	.014*		.063	.005**	
	F=3.278; p<.001			F=2.275; p=.008			F=1.884; p=.033			F=1.122; p=.341		
Step 4												
Age			.020			.114			-.018			.006
Education			-.021			.080			.174*			-.016
Income			-.126			-.111			-.058			.007
Rural residence			-.097			.079			-.064			.048
Married			.003			.020			-.037			.016
Transportation difficulty			-.077			-.051			-.015			.101
Diagnosis of Hypertension			.200**			.168*			.176*			.089
Comorbidity			.061			.028			-.033			-.064
Body Mass Index			.148*			.096			-.011			.175*
ADL sum			-.199**			-.031			-.146*			.093
MMSE score			.119			-.031			-.119			.026
Blood pressure medication			.058			.014			.138			-.023
Doctor visit within 1 mo.			.024			.099			-.023			-.068
LTPA			.002			-.121			.072			.105
Smoking History			-.073			-.014			.197**			-.111

Variable	White Men (N=245) R2	Change in R2	β	White Women (N=239) R2	Change in R2	β	African American Men (N=238) R2	Change in R2	B	African American Women (N=229) R2	Change in R2	B
Model (df = 15)	.160	.005**		.127	.012*		.137	.039*		.083	.020*	
	F=2.924; p=<.001			F=2.179; p=.008			F=2.370; p=.003			F=1.292; p=.209		
Step 5												
Age			.023			.104			-.030			.008
Education			-.017			.080			.169*			-.017
Income			-.132			-.118			-.067			.015
Rural residence			-.096			.082			-.037			.042
Married			.008			.023			-.036			.016
Transportation difficulty			-.068			-.058			-.022			.094
Diagnosis of Hypertension			.204**			.155			.169*			.095
Comorbidity			-.056			.038			-.044			-.066
Body Mass Index			.128			.092			-.007			.169*
ADL sum			-.170*			-.031			-.126			.083
MMSE score			.102			-.028			-.131			.034
Blood pressure medication			.059			.021			.151*			-.028
Doctor visit within 1 mo.			.042			.095			-.004			-.073
LTPA			.003			-.132			.075			.112
Smoking History			-.064			-.001			.193**			-.116
Tense/high strung			-.026			-.064			-.044			-.050
Nervous			-.123			.053			-.019			.025
Relaxed & free of tension			-.129			-.012			.207*			.047
Calm and peaceful			-.022			-.052			.083			.050
No perceived support			.000			.053			-.118			.018
GDS			.020			.000			.033			.038
Model (df=21)	.173	.013*		.134	.007**		.184	.047*		.088	.005**	
	F=2.238; p=.002			F=1.613; p=.048			F=2.333; p=.001			F=0.960; p=.514		

LTPA = Leisure time physical activity; GDS = Geriatric Depression Scale

*p ≤ 0.05; **p ≤ 0.01; ***p≤ 0.001

DISCUSSION

In this study, we found that the correlates of SBP differed across race/sex specific subgroups of older adults. We found that a verified diagnosis of hypertension, reported use of a greater number of blood pressure medications, a smoking history and feeling relaxed and free from tension were significant independent correlates of SBP among older, community-dwelling African American men. Although the overall model was not significant, there were indications that BMI was a significant, independent correlate of SBP in older African American women. Paradoxically, the bivariate correlations showed that being tense, nervous, or calm was associated with higher SBP among white men. A verified diagnosis of hypertension and ADL difficulty were the only significant and independent correlates of SBP among White men in multivariable models and none of these factors remained significantly associated with SBP in White women.

The BMI of African Americans was significantly higher than in Whites. This finding was similar to that of other studies (Batson et al., 2010; Bell, Adair, & Popkin, 2002; Brown et al., 2000). Significant risk factors for hypertension include obesity and lack of physical activity, areas that affect BMI yet may be modified (Levine et al., 2011).

With respect to access to health care, the provision of Medicare coverage has played a significant role in decreasing inequalities (Kaplan et al., 2010). It is expected that individuals over 65 have health insurance and, in turn, contact with health care more frequently (Hyman & Pavlik, 2001). Yet, access to care does not insure utilization of care. In a study of veterans with hypertension, Bosworth and colleagues (2006) found that while patients may have adequate access to care, blood pressure control still differed by race. They also found that the probability of blood pressure control in African Americans was lower even after controlling for a number of factors, including psychosocial, clinical, and patient characteristics. Access to medical care as well as utilization of care can be affected by income and educational status (House, 2002; House, Lantz, & Herd, 2005). In our study, African Americans with an elevated blood pressure reported socio-economic difficulty. African Americans also reported greater difficulty with transportation, which may indicate difficulty utilizing healthcare services (Ford, Kim, & Dancy, 2009; Safford, Allison, & Kiefe, 2007).

Despite being aware of the hypertension diagnosis and receiving treatment, African Americans were less likely to be at goal levels of SBP, confirming what has been reported in previous studies (Batson, Belletti, & Wogen, 2010; Delgado et al., 2012; Hertz et al., 2005; Howard et al., 2006; Kramer et al., 2004; Redmond et al., 2011). Although much of the variance in SBP is explained by factors other than the psychosocial variables, the independent associations between smoking and a measure of anxiety, i.e. feeling relaxed and free of tension with systolic blood pressure levels among African American men are notable. These findings were consistent with our hypothesis that behavioral and psychosocial factors would be more important correlates of blood pressure levels among older African Americans than for Whites, although this was true only for men.

Social support may serve as a buffer to stressors and enable participation in health behaviors (Cazdow & Servoss, 2009; Thoits, 2011) that may positively affect blood pressure control (Uchino, 2006; York Cornwell & Waite, 2012). In our study, African Americans reported lower levels of social support than did Whites. This finding is not unlike others regarding social support and African Americans with hypertension (Carels et al., 1998). Scores on the GDS were also higher for African Americans, suggesting higher levels of depressive

symptoms. Spruill and colleagues (2012) found that the effect of being labeled as hypertensive differed by race and had a negative impact on physical and psychological well-being; in particular, more depressive symptoms were noted in African Americans. Depression may affect patients' adherence to other types of preventive measures at the primary and secondary levels, such as medication adherence and participation in other treatment (Bosworth et al., 2003; Schoenthaler, Ogedegbe, Allegrante, 2009; Wang et al., 2002).

Anderson et al. (1992) indicated that in the African American population, representation of certain chronic social stressors is greater because of "historical factors." Increased reactivity and sodium retention are related to these factors (Anderson et al., 1992). Racial discrimination has been a factor in the lives of a number of African Americans, particularly in the southern United States. A number of studies have indicated a relationship between racial discrimination and blood pressure, but other studies have found no relationship between blood pressure and racial discrimination (see also Barksdale, Farrug, & Harkness, 2009; Williams, Neighbors, & Jackson, 2003). However, having felt racial discrimination in the last six months or over the lifetime was not significantly correlated with SBP in our study. This finding was similar to that of Barksdale et al. (2009) and Peters (2006).

We found that African Americans had a higher prevalence of hypertension, yet African American men were more likely to report being "relaxed and free of tension." Although the men may be reporting low levels of stress, the elevation in blood pressure indicates there may be an underlying response to stressors. They may in fact be participating in coping behaviors to decrease their perceived stress levels. Of note, it has been shown that the frequency of smoking may increase among African American men beginning at middle age (Jackson et al., 2010). This behavior may be utilized as a coping mechanism that continues as the men age.

There is a psychosocial component to differences in blood pressure control; however, given this finding there are clearly other issues affecting control as well such as diet and physical activity. African Americans may be participating in other health behaviors to compensate for stress such as eating unhealthy foods. It is noted that increased levels of obesity in African American women may be due to behaviors such as overeating and are related to responses to stressors. This behavior may continue to grow stronger as the individual ages (Jackson et al., 2010).

Limitations

There were limitations to this secondary data analysis. Hence, the contextual factors influencing blood pressure were not explored. This may be accomplished through future research utilizing qualitative or mixed methods research. One limitation is that systolic blood pressure was measured only one time during the baseline in-home assessment. Although a single measure of systolic blood pressure does not define high blood pressure, this was the only measure available. However, the diagnosis of hypertension was verified by use of a medication, physician report, or hospital discharge summaries. In addition, there are a number of other factors that may affect blood pressure control such as medication adherence, relationship between the patient and health care provider (Bosworth & Oddone, 2002; Bosworth et al., 2006; Fiscella & Holt, 2008), quality of care (Downie et al., 2011), and health beliefs (Bosworth et al., 2006). Also, environmental factors that may affect outcomes such as access to fresh fruits and vegetables, clean water of safety. However, these areas were not the focus of the current analysis. An additional limitation was anxiety was measured as single items; this was done to examine the individual items to explore potentially differing aspects of affect.

CONCLUSION

A key strength of this study is that it utilizes a sample of community-based, rural and urban older African American and White adults. As the population continues to age, emphasis on management of chronic disease and prevention of comorbidities is of extreme importance. Based on findings from an analysis of the National Health and Nutrition Examination Survey for 1999-2002, African Americans have 8000 more heart disease and stroke deaths annually due to disparities in control of systolic blood pressure (Fiscella & Holt, 2008). Outcomes related to cardiovascular disease are affected by slight variations in systolic and diastolic blood pressure (Kaplan, Huguet, Feeny, & McFarland, 2010; Staessen, Kuznetsova, & Stolarz, 2003). Although African Americans were aware of their diagnosis and receiving treatment, the fact that their SBPs remained elevated indicates a need for continued attention to addressing this disparity. This issue in turn should be one of importance not only in relation to health disparities, but as an objective for overall public health (Howard et al., 2006).

These findings also have implications for clinical and health promotion practice. Carson and colleagues (2011), note both the American Heart Association and Health People 2020 have as goals the reduction of cardiovascular disease through prevention. The importance of preventing hypertension and cardiovascular disease should be emphasized at earlier ages in order to work toward prevention of these conditions in older adulthood. Education regarding prevention should be discussed with patients in the clinical setting as well as in the community setting. Clinicians should discuss the impact of diet, exercise, smoking cessation, stress reduction, and family health history. Education should include both the patient and their families.

To address disparities related to blood pressure control, culturally appropriate and sensitive interventions should be implemented to address issues that affect blood pressure control among African Americans (Scisney-Matlock et al., 2009; Stuart-Shor et al, 2012). Behavioral strategies have been found to be effective in addressing efforts to increase physical activity (Conn, Hafdahl, & Mehr, 2011) and in smoking cessation. We found that BMI was a factor significantly associated with elevated SBP in African American women. Programs should emphasis the importance of incorporating daily physical activity and healthy eating into lifestyle changes (Scisney-Matlock et al., 2009; Stuart-Shor et al., 2012) with consideration for adaptation for health status (such as physical limitations and co-morbid conditions). We also found that African American males reported being relaxed and free of tension, yet their SBP was elevated. In addition, smoking was associated with elevated SBP. To address this issue, culturally sensitive and appropriate smoking cessation programs need to be implemented (Stuart-Shor et al., 2012) while also accounting for the need to replace this behavior with one that would be comforting and healthy.

As individuals continue to live longer, the effective treatment and management of chronic disease is of increasing importance. Effectively managing diseases such as hypertension can have a tremendous impact on health outcomes and trajectories (York Cornell & Waite, 2012).
Findings from our study add to the body of literature related to disparities and blood pressure control; however, additional research is needed to examine and explain the associations between psychosocial factors and hypertension control among older African Americans.

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