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Socioeconomic characteristics of African American women attending community blood pressure screenings

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Abstract

Study objective: To examine the associations of education and income and blood pressure (BP) in a socioeconomically diverse cohort of African-American (AA) women attending community BP screenings.

Design, setting, and participants: This cross-sectional analysis used data from AA women (n = 972) 53 ± 14 years, enrolled between 2015 and 2019 in the 10,000-women hypertension community screening project in the metropolitan Atlanta area. OLS linear regression were used to examine the associations between SES (education and income) and BP after adjusting for age, body mass index (BMI), smoking, and lipids.

Main outcomes and measures: Outcomes were systolic and diastolic BP (SBP, DBP). Measures of SES included education [high school ≤(HS), some college, and ≥college] and income-[<$24,000, $24,000–<$48,000, $48,000–$96,000, and ≥$96,000]. Sociodemographics, health history, anthropometrics and point of care non-fasting lipids were obtained.

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Declaration of competing interest
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Results: Compared to women earning <$24,000, an income of ≥$96,000 (β = −5.7 mmHg, 95% CI: −9.9, −1.5, $p = .01$) was associated with a lower SBP in the minimally adjusted model. Subsequent adjustment for cardiovascular risk factors attenuated the association and was no longer significant. College and above versus ≤HS education was associated with a higher DBP in the minimally (ß = 2.7 mmHg, 95% CI: 0.2, 5.2, $p = .03$) and fully adjusted models (ß = 3.4 mmHg, 95% CI: 0.2, 6.5, $p = .04$).

Conclusion: Income of ≥$96,000 was associated with a lower SBP while a college and above education was associated with a higher DBP. Findings underscore the need for increased cardiovascular risk awareness and education targeting higher SES AA women attending community BP screenings.

Keywords

African American women; Hypertension; Socioeconomic status; Blood pressure screenings

1. Introduction

Hypertension (HTN) is recognized as a major risk factor for cardiovascular disease (CVD) and affects approximately 121 million adults in the United States [1]. Moreover, striking disparities by race and sex exist in the diagnosis and management of HTN, especially among African American women [2,3]. According to NHANES 2015–2018 data, the prevalence of HTN in African American women 20 years and older exceed both non-Hispanic White and Hispanic women, respectively (51%, 40.8%, 57.6%) [1]. African American women also have a higher prevalence of comorbidities such as obesity, diabetes, and chronic kidney disease [1,3–5], are less likely to engage in health behaviors that reduce CVD risk [6], and are less likely to be aware of HTN as a heart disease risk factor [7]. Furthermore, this group is more likely to experience socioeconomic adversity compared to white women [8–10]; even so, higher socioeconomic status (SES) African American women are less likely to experience health gains from their socioeconomic resources compared to white women of similar or equal SES [11–13].

Multilevel strategies such as community health screenings are considered a critical and viable solution to increase awareness, assessment, and detection of various comorbid conditions such as HTN, cancer, and HIV [14–16]. Community health screenings targeting cardiovascular health provide an opportunity to increase the detection of HTN and educate at-risk groups on factors such as blood pressure (BP), cholesterol, diabetes, poor diet, obesity, and physical activity [17,18]. Additionally, they provide access to care for those who may not seek or have established medical care and offer an avenue for strategic partnerships with faith-based, civic, and community organizations fostering health promotion [18–20]. Although studies have documented the impact of various community health interventions targeting cardiovascular health among African American women [14,21,22], less is known regarding the relationship between SES and BP outcomes among its attendees.

Although there is robust evidence supporting a heightened risk for adverse CVD outcomes between low versus high SES groups [23,24], this risk is considered unequal for African

American adults relative to White adults [12,25]. For example, Wendell and colleagues found that among African American women, high versus low SES was associated with greater subclinical CVD in the form of carotid intima media thickness and arterial stiffness, a pattern that was absent among White women [26]. These compelling findings underscore the significance and clinical implications of underestimating CVD risk and its deleterious consequences on cardiovascular health among high SES African American women. Additional investigation of individual SES measures and their association with BP may provide a better understanding of which subgroups are at greatest risk for poor cardiovascular health outcomes.

The purpose of the current analysis was to examine the associations of SES, education and income, and BP in African American women attending community BP screenings. Since prior studies have primarily focused on the efficacy and impact of BP reduction interventions [27–29], we were especially interested in examining whether the association between SES and BP would be different for high (versus low) SES women. While higher SES is generally associated with better health [13,23], extant literature suggests the SES-health gradient among higher SES African Americans is weaker or absent [25,30–32]. Thus, we hypothesized that the magnitude of association between SES and BP outcomes would be different and stronger for low versus high SES African American women.

2. Methods

2.1. Study population

Participants were African American women 18–92 years of age enrolled in the ongoing 10,000 Women HTN project which aims to screen 10,000 African American women for CVD risk factors in the metro Atlanta and surrounding communities. Participants were recruited and enrolled from various screening events held in conjunction with African American churches and community organizations. The current study focused on data from 2015 to 2019. A total of 972 participants were enrolled. Of these, 111 participants were excluded due to missing data on age, income, education, and BP variables leaving an analytic sample of 861 participants. Women were eligible if they self-identified as African American/Black, 18 years of age and older, and were English speaking. All participants provided written informed consent. The study was approved by the Institutional Review Board (IRB) at Emory University.

2.2. Procedures

All study measures were obtained by trained clinical staff and project volunteers and included sociodemographic data, height, weight, body mass index (BMI), systolic and diastolic blood pressure (SBP, DBP), and lipid assays. Sociodemographic variables were collected via self-reported questionnaires, or if required, by an interview by the study staff.

Outcome

2.3. Blood pressure

SBP and DBP were measured with participants in a seated position after resting for 5 min, using automated BP monitors (Omron series 10) by experienced and trained personnel. BP was analyzed as a continuous outcome in the regression models and categorized as follows: 1) normotensive: <120/80 mmHg; 2) elevated: −120–129/<80 mmHg; 3) stage 1: 130–139/<90 mmHg; 4) stage 2: ≥140 or ≥90 mmHg; and 4) Hypertensive crisis defined as SBP > 180 &/or DBP >120 mmHg for descriptive purposes based on the 2017 American College of Cardiology and American Heart Association Blood Pressure Guidelines [33]. Women with a BP ≥160/90 mmHg during the screening event had their BP re-taken after a 5-min rest period and if their BP remained elevated, they were examined by medical volunteers and referred for primary care follow-up.

2.4. Measures

2.4.1. Socioeconomic status—SES was measured using self-reported highest education level and annual household family income. Guided by the 2015 US Census poverty threshold [34], household family income categories were: <$24,000 ($n$ = 189), $24,000–$47,999 (n = 231), $48,000–$96,000 (n = 311), and above $96,000 ($n$ = 130). Education level was defined as the highest grade or year of school completed and divided into three categories: high school or less (n = 123), some college (n = 212), and college & above (n = 526).

2.4.2. Other measures—Demographic measures included age determined by participants date of birth, and health insurance ascertained by self-report and coded (0 = no, 1 = yes). Height was obtained via self-report, body weight was obtained via self-report from women that had reported completing a physical assessment by their provider within the current week or measured by having participants stand on a scale, and BMI was calculated as measured weight in kilograms divided by height in meters squared (kg/m^2). Blood pressure medication use was ascertained by self-report and coded (0 = no, 1 = yes). Reported comorbidities coded (0 = no, 1 = yes) were determined by asking participants if they had ever been told or had a history of CVD (including history of myocardial infarction [MI], stroke), or diabetes. A comorbid categorical variable was computed by summing the ‘yes’ responses.

Lipid profiles were obtained via finger stick and collected via pipette using valid and reliable point of care testing (Cholestech LDX Analyzer/Alere), and included total cholesterol, high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and triglycerides.

2.5. Statistical analysis

Characteristics of the study population were examined by calculating the means for continuous variables and proportions for categorical variables by BP categories. Significance testing was performed using Analysis of Variance (ANOVA) between continuous variables and chi-square tests for categorical variables. Separate multivariable models using Ordinary Least Square (OLS) linear regression were constructed to examine the relationships between SES measures of education level and household income, and continuous BP outcomes (SBP and DBP) separately, while adjusting for possible confounders. Models were sequentially adjusted for: (model 1) age and health insurance; (model 2) model 1 + CV risk factors including BMI, comorbidities, smoking and BP meds; and (model 3) model 2 + clinical factors including lipids (total cholesterol, triglycerides, HDL-C, and LDL-C).

We conducted exploratory analyses to determine whether the estimates between SES and BP differed based on reported BP medication use. Statistical significance was defined a priori as a two-sided *P*-value of <0.05. All statistical analyses were conducted using STATA, version SE 16.0 (StataCorp LP: College Station, TX, USA) software.

3. Results

Descriptive statistics and variable distribution of participants attending the 10,000 women HTN screening project are presented in Table 1. The median age of the sample was 53 ± 14 years with 41% of women classified as having stage 2 HTN. Participants were socioeconomically diverse with 61% of women reporting a college and above education. Across educational level, women with a college and above education had the highest proportion of ‘Elevated’, ‘Stage 1’, and ‘Stage 2’ HTN. Women reporting annual household incomes of $24,000–$47,999 and $48,000–$96,000 had the highest proportion of ‘Elevated’, ‘Stage 1’, and ‘Stage 2’ HTN, and most women had health insurance.

The overall mean SBP and DBP were 133 ± 19.8 mmHg and 83 ± 12.1 mmHg, respectively. The mean BMI was 32 ± 7.2 and was highest among women with stage 2 HTN. Majority of the cohort were non-smokers, and few reported taking antihypertensive medications. Total cholesterol and LDL-C were highest among women with stage 1 and 2 HTN, and severe HTN. There were no significant differences between mean HDL-C and triglycerides across the BP groups. Of the self-reported comorbidities, diabetes was higher particularly among women with stage 1, stage 2 HTN and severe HTN compared to those with normal BP.

3.1. Relationship between education level and household income with systolic blood pressure

We first examined the relationship between two SES variables, education level and income, and SBP measurement at the time of the screening event. Linear regression models for the association between individual measures of SES (education level and income) and SBP are presented in (Table 2). In the minimally adjusted (model 1), including age and health insurance, educational level was not a significant predictor of SBP. Adjustment of additional CV risk factors including smoking, BP medication use, BMI, comorbidities (model 2), and lipids (model 3), demonstrated that education remained nonsignificant.

After adjusting for age and health insurance (model 1), women reporting a household income of >$96,000 compared to those earning <$24,000, had a lower mean SBP (β = −5.7 mmHg (95%CI: −9.9, −1.5). Likewise, household incomes of $24,000–$47,999 and $48,000–<$96,000 were also inversely associated with SBP (ß = −0.92 mmHg [95%CI: −4.5, 2.7]), (ß = −0.83 mmHg [95%CI: −4.3, 2.6]), although the association was not significant. Subsequent adjustment for CV risk factors (model 2) attenuated the association among women earning $>96,000 and was no longer significant. In the fully adjusted model including lipids (model 3), none of the income categories were significant predictors of SBP. However, compared to women earning <$24,000, women earning $24,000-$ < $48,000 and $48,000–$96,000 had a higher mean SBP (ß = 1.2 mmHg [95%CI: −3.2, 5.6]), (ß = 2.5 mmHg [95%CI: −1.7, 6.7]) although the association was not significant. The adjusted mean of SBP across all income categories was also highest among women earning $48,000–$96,000 relative to those in the lower and highest (>$96,000) income categories (Fig. 1).

3.2. Relationship between education level and income and diastolic blood pressure

The regression coefficients for the association between education level, income, and DBP are presented in (Table 3). In the minimally adjusted model for age and health insurance, education level was not associated with DBP (model 1). After adjusting for CV risk factors (model 2) those with some college (ß = 2.8 mmHg [95% CI: 0.12, 5.5]) and college and higher education levels (ß = 2.7 mmHg [95% CI: 0.23, 5.2]) had a higher DBP compared to those with a HS or less education. This association persisted for those in the college and higher education group (ß = 3.4 mmHg [95% CI: 0.23, 6.5]) but was attenuated and no longer significant among women with some college education (model 3). Conversely, there was no significant association between income and DBP (models 1–3). Although not significant, effect sizes between income and DBP were slightly larger for women earning $48,000–$96,000 compared to women with incomes of $24,000–< $48,000 per year.

Exploratory analyses stratified by women taking BP medications are shown in Tables 4 and 5. In the minimal and subsequently adjusted models, education level was not associated with SBP or DBP with smaller effect sizes compared to the full cohort. Income was also not associated with SBP or DBP; however, estimates for SBP were larger for each income category and most pronounced for women earning $48,000–$96,000 for both SBP and DBP.

4. Discussion

In this cross-sectional study of African American women participating in community BP screenings, we evaluated the associations between measures of SES and BP. Higher income was associated with lower SBP, while higher education was associated with higher DBP. Contrary to our study hypothesis, we found a stronger association between moderately higher income, $48,000–$96,000, and higher SBP and DBP that was smaller among women earning less although not significant. The results of this study suggest that other important factors merit additional study to better elucidate potential mechanisms that may underlie and explain the SES-BP association among African American women higher on the socioeconomic strata.

Due to the paucity of empirical studies focusing on intra-racial socioeconomic disparities and cardiovascular health outcomes in African American populations [32,35], less is known regarding the differential SES-BP patterns among African American women. To our knowledge, this is the first study to characterize and examine SES and BP in a large community cohort of middle-aged African American women attending community BP screenings. Findings from this study contribute to an existing literature that has largely focused on the efficacy of interventions targeting cardiovascular health across various domains including lifestyle changes, BP control, education awareness, and screening evaluations in community settings [14,27,29,36].

Consistent with a prior study that identified an absence of protective effects associated with both higher income and educational attainment on SBP for African American adults [37], our findings did not show a lower SBP among women reporting a moderately higher income range of $48,000–$96,000/year. Although we did not observe a statistically significant association, the magnitude of the estimates between income and SBP as well as DBP was strongest for women earning $48,000–$96,000 in both the primary analysis and stratified analysis of self-reported BP medication use. Further, this group also had the highest SBP after adjusting for potent CV risk factors compared to women reporting household income earnings in the highest group (>$96,000), which had the lowest SBP. Our findings are comparable to results that showed upper middle income, defined as > than 1.5 but < than 3.5 times the poverty level with no absolute income values reported, was associated with a greater risk of HTN while affluent income, 3.5 times the poverty level, was protective against HTN in a cohort of African American adults [35]. Likewise, we found after accounting for CV risk factors and lipids, women with a college and above education had an elevated DBP compared to women with lower education levels. Unlike a prior study that showed a lower odds of HTN among African American adults with a college and above education relative to those with a HS or less education [32], our findings did not reflect this pattern. Given the established SES-CV health gradient, [24,38–40] we expected BP levels to be inversely related to higher SES in this cohort.

One potential explanation for our observed findings may be due to a greater proportion of women with a college and above education and household income range of $48,000–$96,000/year that were classified as having Stage 1 and 2 HTN. Despite possessing greater economic resources which are considered to provide some health protections, upwardly mobile African American women are considered unexempt from the economic and social stressors that are associated with race and gender [35,41]. Stressors such as goal striving stress, discrimination, social isolation, lack of social connections to successfully aid in career elevation, providing economic assistance to family members, and experiencing the “ceiling effect” for professional success are considered pervasive among upwardly mobile African American women [42–44]. Additionally, high SES African Americans are more likely to be employed in less racially diverse occupations, thus increasing their vulnerability to perceived workplace discrimination resulting in undesirable psychological and physical health outcomes including heightened cardiovascular reactivity [45,46]. Future studies are needed to examine the potential mediating role of these stressors in addition to health behaviors which may explain the differential association between SES and BP among higher SES African American women.

Another potential explanation for our observed findings may be due to the Diminished Returns of economic resources. The Diminished Returns’ hypothesis posits that minorities experience reduced health benefits and protections compared to whites despite possessing similar socioeconomic resources [12,31,47,48]. Research in support of this perspective suggests that health differences between African American and White adults are greatest at the highest levels of SES with White populations benefitting more from higher SES indicators of education, income, and occupational status [25,31,49]. Because few studies have examined or reported the association between higher SES and HTN among African Americans [32,35], an income threshold that confers protective health benefits against HTN has yet to be established and warrants additional study. Researchers have argued these differences may also be due to the structural racism that is embedded in American society resulting in maximization of SES benefits for Whites, while minimizing the same benefits for African American populations and other racial/ethnic minority groups [31], [49–51]. Further exploration of contextual factors such as discrimination and chronic stressors in addition to other measures of SES [52], including neighborhood SES (i.e. county, census tract, block group) [53], neighborhood social vulnerability index [54] occupation status, and employment type, between African American and White women of both low and high SES are needed to fully evaluate these associations over time to identify potential patterns.

This study has several strengths which includes a large socioeconomically diverse cohort of African American women representing various ages. Unlike prior studies with an overrepresentation of lower SES women, most of the women reported higher education levels and represented a diverse income range in this cohort. There are few studies that have examined and reported the relationships between SES and BP outcomes in an intra-racial cohort of African American women. Examination of education level and household income with BP outcomes provides an opportunity to assess which SES indicators have a greater impact on cardiovascular health by SES among African American women.

5. Study limitations

There are several limitations that must be acknowledged. This was a cross-sectional study so causality cannot be determined, however future studies are needed to examine the longitudinal association between SES measures and BP outcomes. BP was only measured during the screening event and not taken at multiple visits, nor was ambulatory home BP monitoring utilized, increasing the likelihood of inaccurately misclassifying women as hypertensive. To facilitate the efficiency of the community screenings, BP was measured once as opposed to recording the mean of three BP readings. Height and weight were self-reported in some participants and therefore increases the likelihood of an imprecise assessment of BMI. Despite women being asked if they were currently taking BP medications, BP medication adherence or compliance was not assessed in the parent study and may have had an impact on their BP on the day of the screening. Findings may not be generalizable to African American women residing in other geographical regions. Household income data was self-reported which introduces bias in the form of over-or-under-reporting. Unlike education level, income was least likely to be reported by participants which could be the result of fear of judgement or hesitancy to provide such personal information due to concerns of privacy. Additionally, we were unable to examine and compare these associations across other racial/ethnic groups since this was not an objective of the parent study. Psychosocial stressors or additional measures of SES including wealth, neighborhood SES, and occupation were not measured, and therefore their impact on BP was not examined in this cohort. Lastly, although there was a broad representation of ages, most of the participants were middle age (>50 years old), which limits our knowledge regarding the impact of SES on cardiovascular health in younger and early middle age

African American women, a group which is also experiencing increasing rates of CVD [3,55–57].

6. Conclusion

In this sociodemographic diverse cohort of African American women, an income of $96,000 and above was associated with a lower SBP, while moderately higher income range of $48,000–$96,000 was associated with elevated SBP; furthermore, a college and above education was associated with a higher DBP. The findings from this study underscore the importance of increased cardiovascular risk assessment, awareness, and education that also targets higher SES African American women. Future empirical investigations are needed that expand to include environmental stressors and white as well as Hispanic women to more comprehensively evaluate the potential mechanisms that may underlie and explain the differential SES-BP gradient in African American women.

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References

[1]. Tsao CW, Heart disease and stroke statistics-2022 update: a report from the American Heart Association, Circulation (2022), CIR0000000000001052, 10.1161/CIR.0000000000001052.

[2]. Carnethon MR, et al. , Cardiovascular health in african americans: a scientific statement from the American Heart Association, Circulation 136 (21) (2017) e393–e423, 10.1161/CIR.0000000000000534. [PubMed: 29061565]

[3]. Kalinowski J, Taylor J, Spruill TM, Why are young black women at high risk for cardiovascular disease? Circulation 139 (2019) 1003–1004, 10.1161/CIRCULATIONAHA.118.037689. [PubMed: 30779648]

[4]. Choi AI, et al. , White/Black racial differences in risk of end-stage renal disease and death, Am. J. Med 122 (7) (2009) 672–678, 10.1016/j.amjmed.2008.11.021. [PubMed: 19559170]

[5]. Vatsa N, et al. , Cardiovascular risk factors in younger black women: results from the 10,000 women community screening project, Am. Heart J. Plus: Cardiol. Res. Pract 8 (2021) 1–8, 10.1016/j.ahjo.2021.100037.

[6]. Brown AG, et al. , Improving heart health among Black/African american women using civic engagement: a pilot study, BMC Public Health 17 (2017) 1–13, 10.1186/s12889-016-3964-2. [PubMed: 28049454]

[7]. Cushman M, et al. , Ten-year differences in women's awareness related to coronary heart disease: results of the 2019 American Heart Association National Survey: a special report from the American Heart Assocation, Circulation 134 (7) (2021) e239–e248, 10.1161/CIR.0000000000000907.

[8]. Vines AI, et al. , A comparison of the occurrence and perceived stress of major LIfe events in black and white women, Women Health 49 (2009) 5, 10.1080/03630240903238743.

[9]. Yearby R, Racial disparities in health status and access to healthcare: the continuation of inequality in the United States due to structural racism, Am. J. Econ. Sociol 77 (3–4) (2018) 1113–1152, 10.1111/ajes.12230.

[10]. Lindley KJ, et al. , Socioeconomic determinants of health and cardiovascular outcomes in women: JACC review topic of the week, J. Am. Coll. Cardiol 78 (19) (2021) 1919–1929, 10.1016/j.jacc.2021.09.011. [PubMed: 34736568]

[11]. Assari S, High income protects whites but not African Americans against risk of depression, Healthcare (Basel) 6 (2) (2018) 1–12, 10.3390/healthcare602003710.3390/healthcare6020037.

[12]. Bell CN, et al. , Racial non-equivalence of socioeconomic status and self-rated health among African Americans and whites, Soc. Sci. Med. Popul. Health 10 (100561) (2020) 1–9, 10.1016/j.ssmph.2020.100561.

[13]. Brummett BH, et al. , Systolic blood pressure and socioeconomic status in a large multi-study population, SSM-Popul. Health 9 (2019) 1–8, 10.1016/?.ssmph.2019.100498.

[14]. White BM, Rochell JK, Warren JR, Promoting cardiovascular health for African American women: an integrative review of interventions, J. Women's Health 00 (00) (2019) 1–19, 10.1089/jwh.2018.7580.

[15]. Hand T, et al. , The global role, impact, and limitations of community health workers (CHWS) in breast cancer screening: a scoping review and recommendations to promote health equity for all, Glob. Health Action 14 (1) (2021) 1–17, 10.1080/16549716.2021.1883336.

[16]. James AJ, et al. , HIV testing in a large community health center serving a multicultural patient population: a qualitative study of providers, AIDS Care 31 (12) (2019) 1585–1592, 10.1080/09540121.2019.1612016. [PubMed: 31131623]

[17]. Lucky D, Turner B, Hall M, Blood pressure screenings through community nursing health fairs: motivating individuals to seek health care follow-up, J. Community Health Nurs 28 (3) (2011) 119–129, 10.1080/07370016.2011.588589. [PubMed: 21809928]

[18]. Carey RM, et al. , Prevention and control of hypertension: JACC health promotion series, J. Am. Coll. Cardiol 72 (11) (2018) 1278–1293, 10.1016/j.jacc.2018.07.008. [PubMed: 30190007]

[19]. Fleming S, et al. , Self-screening and non-physician screening for hypertension in communities: a systematic review, Am. J. Hypertens 28 (11) (2015) 1316–1324. [PubMed: 25801901]

[20]. Brewer LC, Williams DR, We've come this far by faith: the role of the black church in public health, AJPH Faith Based Org. 109 (2019) 385–386.

[21]. Prendergast HM, et al. , Community targeting of uncontrolled hypertension: results of a hypertension screening and education intervention in community churches serving predominantly racial/ethnic minority populations, Health Promot. Pract 20 (10) (2010) 1–10, 10.1177/1524839920933897.

[22]. Connell P, Wolfe C, McKevitt C, Preventing stroke: a narrative review of community interventions for improving hypertension control in black adults, Health Soc. Care Community 16 (2) (2008) 165–187, 10.1111/j.1365-2524.2007.00737.x. [PubMed: 18290982]

[23]. Schultz W, et al. , Socioeconomic status and cardiovascular outcomes: challenges and interventions, Circulation 137 (20) (2018) 2166–2178, 10.1161/CIRCULATIONAHA.117.029652. [PubMed: 29760227]

[24]. Hamad R, et al. , Association of low socioeconomic status with premature coronary heart disease in US adults, JAMA Cardiol. (2020), 10.1001/jamacardio.2020.1458.

[25]. Assari S, et al. , Diminished returns of educational attainment on heart disease among black Americans, Open Cardiovasc. Med. J 14 (2020) 5–12, 10.2174/1874192402014010005. [PubMed: 32399080]

[26]. Wendell C, et al. , Distributions of subclinical cardiovascular disease in a socioeconomically and racially diverse sample, Stroke 48 (4) (2017) 850–856, 10.1161/STROKEAHA.116.015267. [PubMed: 28235961]

[27]. Brown AGM, et al. , Improving heart health among Black/African american women using civic engagement: a pilot study, BMC Public Health 17 (2017) 1–13, 10.1186/s12889-016-3964-2. [PubMed: 28049454]

[28]. Yanek L, et al. , Project joy: faith based cardiovascular health promotion for African American women, Public Health Rep. 116 (2001) 68–81. [PubMed: 11889276]

[29]. Rodriguez F, et al. , A pilot community-based intervention to improve the cardiovascular health of african american women, Ethn. Dis 22 (4) (2012) 416–421. [PubMed: 23140071]

[30]. Assari S, Health disparities due to diminished return among black americans: public policy solutions, Soc. Issues Policy Rev 12 (1) (2018) 112–145.

[31]. Farmer MM, Ferraro KF, Are racial disparities in health conditional on socioeconomic status? Soc. Sci. Med 60 (1) (2005) 191–204, 10.1016/j.socscimed.2004.04.026. [PubMed: 15482878]

[32]. Bell CN, et al. , Race disparities in cardiovascular disease risk factors within socieconomic status strata, Ann. Epidemiol 28 (3) (2017) 147–152, 10.1016/j.annepidem.2017.12.007. [PubMed: 29317176]

[33]. ACC, AHA, in: Detailed Summary From the 2017 Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults, in A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines, 2017, pp. 1–15.

[34]. Census B, 2015 Poverty Guidelines, HHS, 2015.

[35]. Glover LSM, et al. , Life course socioeconomic status and hypertension in African American adults: the Jackson heart study, Am. J. Hypertens 33 (1) (2020) 84–91, 10.1093/ajh/hpz133. [PubMed: 31420642]

[36]. Schoenthaler A, et al. , Cluster randomized clinical trial of FAITH (Faith-based approaches in the treatment of Hypertension) in blacks, Circ. Cardiovasc. Qual. Outcomes 11 (10) (2018) 1–10, 10.1161/CIRCOUTCOMES.118.004691.

[37]. Assari S, Socioeconomic determinants of systolic blood pressure; minorities' diminished returns, J. Health Econ. Dev 1 (1) (2019) 21–31. [PubMed: 31372601]

[38]. Schultz W, et al. , Socioeconomic status and cardiovascular outcomes: challenges and interventions, Circulation 137 (2018) 2166–2178, 10.1161/CIRCULATIONAHA.117.029652. [PubMed: 29760227]

[39]. Stamler R, et al. , Higher blood pressure in adults with less education some explanations from INTERSALT, Hypertension 19 (3) (1992) 237–241. [PubMed: 1548050]

[40]. Leng B, et al. , Socioeconomic status and hypertension: a meta-analysis, J. Hypertens 33 (2) (2015) 221–229, 10.1097/HJH.0000000000000428. [PubMed: 25479029]

[41]. Keith VM, Brown DR, African American women and mental well-being: the triangulation of race, gender, and socioeconomic status from part II-the social context of mental health and illness, in: Scheid TL, Brown TN (Eds.), A Handbook for the Study of Mental Health Social Contexts, Theories, and Systems, Cambridge University Press, 2012, pp. 291–305.

[42]. Hudson D, et al. , The price of the ticket: health costs of upward mobility among African Americans, Int. J. Environ. Res. Public Health 17 (4) (2020) 1179–1197, 10.3390%2Fijerph17041179.

[43]. Cole ER, Omari SR, Race, class and the dilemmas of upward mobility for african americans, J. Soc. Issues 59 (4) (2003) 785–802.

[44]. Higginbotham E, Weber L, Moving up with kin and community: upward social mobility for black and white women, Gend. Soc 6 (3) (1992) 416–440.

[45]. Moody D, et al. , Lifetime racial/ethnic discrimination and ambulatory blood pressure: the moderating effect of age, Health Psychol. 35 (4) (2017) 333–342, 10.1037%2Fhea0000270.

[46]. Troxel WM, et al. , Chronic stress burden, discrimination, and subclinical carotid artery disease in African American and Caucasian women, Health Psychol. 22 (3) (2003) 300–309. [PubMed: 12790258]

[47]. Assari S, Unequal gain of equal resources across racial groups, Int. J. Health Policy Manag 7 (1) (2017) 1–9, 10.15171/ijhpm.2017.90.

[48]. Williams DR, Collins C, US socioeconomic and racial differences in health: patterns and explanations, Annu. Rev. Sociol 21 (1995) 349–386.

[49]. Assari S, The benefits of higher income in protecting against chronic medical conditions are smaller for African Americans than whites, Healthcare (Basel) 6 (1) (2018) 1–11, 10.3390%2Fhealthcare6010002.

[50]. Liu SY, et al. , The association between blood pressure and years of schooling versus educational credentials: test of the sheepskin effect, Ann. Epidemiol 21 (2) (2011) 128–138, 10.1016%2Fj.annepidem.2010.11.004. [PubMed: 21184953]

[51]. Hudson D, et al. , The price of the ticket: health costs of upward mobility among African Americans, Int. J. Environ. Res. Public Health 17 (1779) (2020) 1–18, 10.3390/ijerph17041179.

[52]. Nuru-Jeter AM, et al. , Relative roles of race versus socioeconomic position in studies of health inequalities: a matter of interpretation, Annu. Rev. Public Health 39 (2018) 169–188, 10.1146/annurev-publhealth-040617-014230. [PubMed: 29328880]

[53]. Lian M, Struthers J, Liu Y, Statistical assessment of neighborhood socioeconomic deprivation environment in spatial epidemiologic studies, Open J. Stat 6 (3) (2016) 436–442, 10.4236/ojs.2016.63039. [PubMed: 27413589]

[54]. G.R.A. (GRASP), in: A.f.T.S.a.D. Registry (Ed.), CDC Social Vulnerability Index A Tool to Identify Socially Vulnerable Communities, CDC, Atlanta, GA, 2021.

[55]. Bateman BT, et al. , Hypertension in women of reproductive age in the United States: NHANES 1999–2008, PLoS One 7 (4) (2012), e36171, 10.1371/journal.pone.0036171. [PubMed: 22558371]

[56]. Jolly S, et al. , Higher cardiovascular disease prevalence and mortality among younger blacks compared to whites, Am. J. Med 123 (5) (2010) 811–818, 10.1016/j.amjmed.2010.04.020. [PubMed: 20800150]

[57]. Smilowitz NR, Adverse trends in ischemic heart disease mortality among young New Yorkers, particularly young black women, PLoS One 11 (2) (2016) 1–13, 10.1371/journal.pone.0149015.

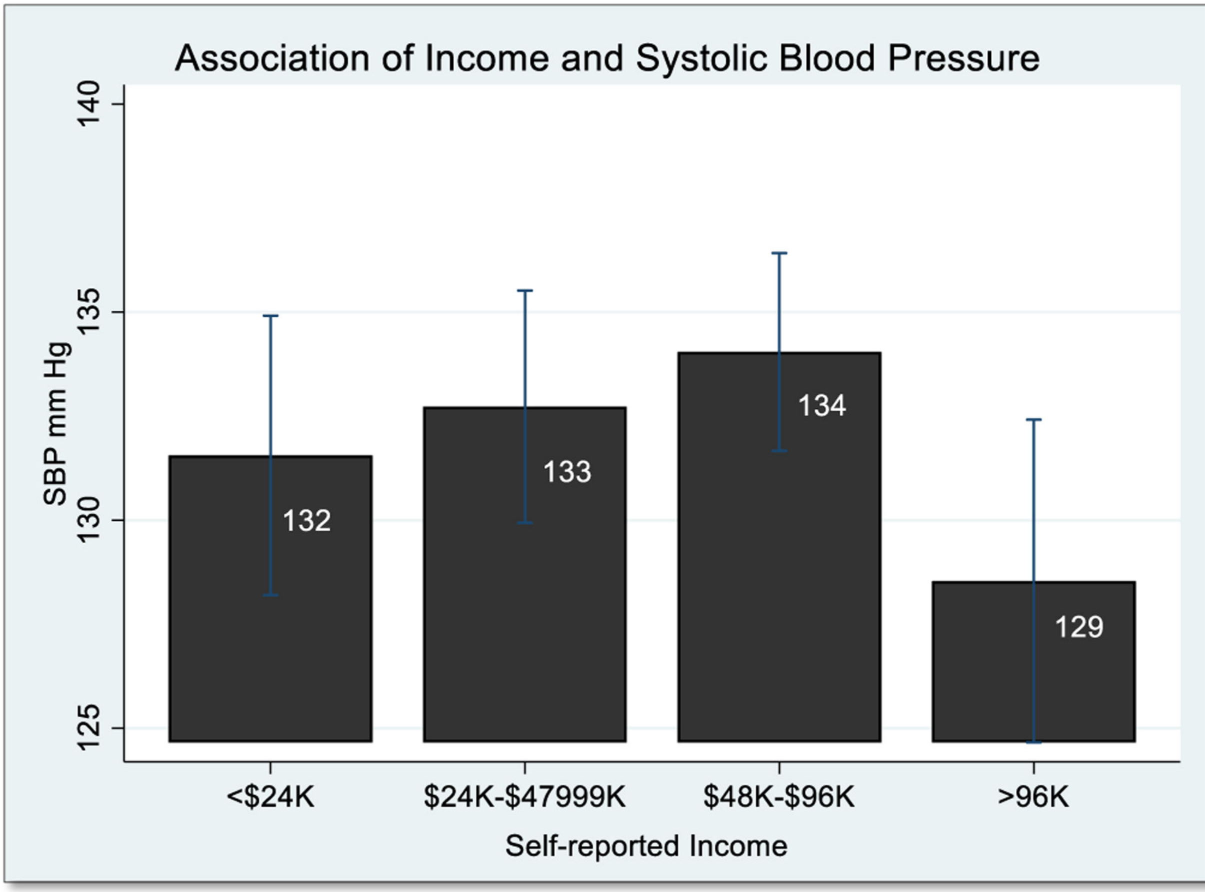

Fig. 1.
Values are means and error bars represent confidence intervals.

Table 1

Participant characteristics by blood pressure categories.

		Normal	Elevated	Stage 1	Stage 2	HTN CRISIS	
	Overall N[%]	**167 [19]**	**66 [8]**	**264 [30]**	**358 [41]**	**14 [2]**	**p-value**
Age, years, M(SD)	53 (13.8)	46 (12.8)	54 (12.7)	51 (13.5)	57 (13.2)	60 (13.9)	<0.001
Education N[%]							0.11
HS or less	123 (14)	27 (16)	5 (8)	33 (13)	54 (15)	4 (29)	
Some college	212 (25)	33 (20)	21 (33)	65 (25)	87 (24)	6 (43)	
College & above	526 (61)	106 (64)	38 (59)	163 (62)	215 (60)	4 (29)	
Income N[%]							0.15
$<24,000	189 (22)	41 (25)	8 (13)	59 (23)	76 (21)	5 (36)	
$24 K–$47,999	231 (27)	35 (21)	24 (38)	67 (26)	102 (29)	3 (21)	
$48 K–$96,000	311 (36)	58 (35)	20 (31)	92 (35)	136 (38)	5 (36)	
>$96,000	130 (15)	32 (19)	12 (19)	43 (16)	42 (12)	1 (7)	
Insured states, N[%]	784 [91]	145 [87]	61 [95]	237 [91]	329 [93]	12 [86]	0.15
CVD risk factors							
SBP mm Hg M(SD)	133 (19.8)	109 (7.1)	125 (2.7)	126 (8.6)	148 (13.2)	191 (25)	<0.001
DBP mm Hg M(SD)	83 (12.1)	71 (6.2)	74 (4.7)	82 (5.1)	89 (11.4)	110 (29)	<0.001
Body mass index, kg/m^2, M(SD)	32 (7.2)	28 (6.9)	32 (6.3)	32 (6.5)	34 (7.3)	31 (6.5)	<0.001
Health behaviors							
BP meds, N[%]	185 [21]	19 [11]	9 [14]	49 [19]	105 [29]	3 [21]	<0.001
Current smoker, N[%]	39 [5]	6 [4]	3 [5]	9 [4]	18 [5]	3 [21]	0.09
Clinical factors							
Lipids							
Total cholesterol, M(SD)	189 (37.8)	181 (39.4)	184 (28.1)	193 (36)	191 (39)	223 (39.4)	0.02
HDL-C, M(SD)	60 (17.0)	59 (17.1)	60 (18.9)	61 (16.5)	59 (17)	61 (11.3)	0.63
LDL-C, M(SD)	105 (37.1)	98 (35.1)	98 (23)	108 (41.1)	105 (36)	136 (43)	<0.01
Triglycerides	130 (81.3)	120 (77.7)	127 (87.6)	123 (75.5)	140 (85)	136 (93.7)	0.34
Comorbidities N[%]							
Diabetes	103 [12]	9 [5]	5 [8]	23 [9]	62 [17]	4 [29]	<0.001
MI	12 [1]	0	0	2 [1]	8 [2]	2 [14]	<0.001

		Normal	Elevated	Stage 1	Stage 2	HTN CRISIS	
	Overall N[%]	**167 [19]**	**66 [8]**	**264 [30]**	**358 [41]**	**14 [2]**	**p-value**
Stroke	22 [3]	2 [1]	0	4 [2]	11 [3]	5 [36]	<0.001

Abbreviations: HS-High School; SBP-Systolic blood pressure; DBP-Diastolic blood pressure; CVD-Cardiovascular disease; MI-Myocardial Infarction. BP definitions: Normal-<120 (SBP) and <80 (DBP)mm Hg; Elevated-120–129 (SBP) and <80 (DBP)mm Hg; Stage 1–130–139 or >80 mmHg; Stage 2-≥140or ≥90 mmHg; HTN Crisis-≥180/≥120 mmHg.

Table 2

Association of SES and systolic blood pressure.

	Model 1 *n* = 858			Model 2 *n* = 846			Model 3 *n* = 571		
SES Indicators	**ß**	**95% CI**	***P*- value**	**ß**	**95% CI**	**P-value**	**ß**	**95% CI**	***P*-value**
Education[a]									
Some college	1.2	−2.9, 5.3	0.56	2.6	−1.4, 6.6	0.20	3.6	−1.5, 8.7	0.17
College & above	−0.48	−4.2, 3.2	0.80	1.4	−2.3, 5.1	0.45	2.7	−2.0, 7.3	0.26
Income[b]									
$24,000–$47,999	−0.92	−4.5, 2.7	0.62	−0.68	−4.2, 2.8	0.70	1.2	−3.2, 5.6	0.60
$48,000–$96,000	−0.83	−4.3, 2.6	0.63	0.4	−3.0, 3.8	0.82	2.5	−1.7, 6.7	0.24
$ > 96,000	−5.7	−9.9, −1.5	0.01	−4.0	−8.1, 0.19	0.06	−3.0	−8.2, 2.2	0.25

Model 1 (adjusting for age + health insurance-yes), **Model 2** (model 1 + CV risk factors: BMI, comorbidities, BP meds, smoking), **Model 3** (Model 2+ Clinical risk factors: HDL (high-density lipoprotein), LDL (Low-density lipoprotein); Education[a]-HS or less referent group, Income[b]-$<24 K referent group.

Table 3

Association of SES, education and income, and diastolic blood pressure.

	Model 1 *n* = 858			Model 2 *n* = 846			Model 3 *n* = 571		
SES Indicators	**ß**	**95% CI**	***P*-value**	**ß**	**95% CI**	***P*-value**	**ß**	**95% CI**	***P*-value**
Education[a]									
Some college	2.3	−0.35, 5.0	0.09	2.8	0.12, 5.5	0.04	3.4	−0.04, 6.8	0.05
College & above	1.9	−0.57, 4.3	0.13	2.7	0.23, 5.2	0.03	3.4	0.23, 6.5	0.04
Income[b]									
$24,000–$47,999	1.2	−1.2, 3.6	0.34	1.4	−1.0, 3.8	0.26	1.4	−1.5, 4.4	0.21
$48,000–$96,000	1.1	−1.1, 3.4	0.33	1.6	−0.70, 3.9	0.17	2.2	−0.69, 5.0	0.08
$>96,000	−0.88	−3.7, 1.9	0.54	−0.3	−3.1, 2.5	0.82	−0.64	−4.2, 2.9	0.72

Model 1 (adjusting for age + health insurance-yes), **Model 2** (model 1 + CV risk factors: BMI, comorbidities, BP meds, smoking), **Model 3** (Model 2 + clinical factors: HDL (high-density lipoprotein), LDL (Low-density lipoprotein), triglycerides; Education[a]-HS or less referent group, Income[b]-$<24 K referent group.

Table 4

Association of SES and systolic blood pressure among women taking BP meds.

	Model 1 *n* = 185			Model 2 *n* = 181			Model 3 *n* = 167		
SES Indicators	**ß**	**95% CI**	***P*-value**	**ß**	**95% CI**	***P*-value**	**ß**	**95% CI**	***P*-value**
Education[a]									
Some college	−1.1	−9.7, 7.5	0.80	1.7	−7.0, 10.4	0.70	0.35	−9.0, 9.7	0.94
College & above	−1.9	−9.6, 5.8	0.63	−0.7	−8.5, 7.1	0.86	−2.3	−10.8, 6.2	0.59
Income[b]									
$24,000–$47,000	3.3	−4.3, 10.9	0.39	4.2	−3.5, 11.8	0.28	5.0	−3.1, 13.1	0.22
$48,000–$96,000	4.7	−2.5, 11.8	0.20	4.9	−2.5, 12.2	0.19	5.5	−2.2, 13.2	0.16
$>96,000	−3.9	−12.3, 4.6	0.37	−1.7	−10.3, 6.9	0.70	−1.6	−10.7, 7.5	0.72

Model 1 (adjusting for age + health insurance-yes), **Model 2** (model 1 + CV risk factors: BMI, comorbidities, BP meds, smoking), **Model 3** (Model 2+ Clinical risk factors: HDL (high-density lipoprotein), LDL (Low-density lipoprotein); Education[a]-HS or less referent group, Income[b]-$<24 K referent group.

Table 5

Association of SES and diastolic blood pressure among women taking BP meds.

	Model 1 *n* = 185			Model 2 *n* = 181			Model 3 *n* = 167		
SES Indicators	**ß**	**95% CI**	***P*-value**	**ß**	**95% CI**	***P*-value**	**ß**	**95% CI**	***P*-value**
Education[a]									
Some college	−2.4	−8.0, 3.3	0.41	−1.8	−7.6, 4.0	0.54	−3.0	−9.0, 3.0	0.33
College & above	0.9	−4.1, 6.0	0.72	2.1	−3.1, 7.2	0.44	0.52	−4.9, 6.0	0.85
Income[b]									
$24,000–$47,999	−1.6	−6.6, 3.4	0.52	−0.82	−5.9, 4.3	0.75	−1.6	−6.8, 3.6	0.54
$48,000–$96,000	2.7	−2.0, 7.5	0.26	3.9	−1.0, 8.8	0.12	3.4	−1.5, 8.4	0.18
$ > 96,000	−1.1	−6.7, 4.5	0.69	−0.28	−6.0, 5.5	0.92	−0.7	−6.6, 5.1	0.80

Model 1 (adjusting for age + health insurance-yes), **Model 2** (model 1 + CV risk factors: BMI, comorbidities, BP meds, smoking), **Model 3** (Model 2+ Clinical risk factors: HDL (high-density lipoprotein), LDL (Low-density lipoprotein); Education[a]-HS or less referent group, Income[b]-$<24 K referent group).