The Association Between Neighborhood Social Vulnerability and Cardiovascular Health Risk among Black/African American Women in the InterGEN Study

Bridget Basile Ibrahim, PhD, MA, RN, FNP-BC, Rural Health Equity Postdoctoral Fellow, University of Minnesota, Minneapolis, MN, USA
Veronica Barcelona, PhD, MSN, MPH, RN, PHNA-BC, Assistant Professor, Columbia University School of Nursing, New York, NY, USA
Eileen M. Condon, PhD, APRN, FNP-BC, Postdoctoral Associate, Yale School of Nursing, Orange, CT, USA
Cindy A. Crusto, PhD, Associate Professor of Psychiatry, Yale School of Medicine, New Haven, CT, USA, and Associate Professor- Department of Psychology, University of Pretoria, South Africa
Jacquelyn Y. Taylor, PhD, PNP-BC, RN, FAHA, FAAN, Helen F. Petit Professor of Nursing and Executive Director of the Center for Research on People of Color, Columbia University School of Nursing, New York, NY, USA

Conflict of interest: The authors have no conflict of interest to disclose.

Funding:
This study is supported by funding from the National Institute of Nursing Research of the National Institutes of Health (R01NR013520, K01NR017010). Bridget Basile Ibrahim holds a postdoctoral position funded by the National Institutes of Health's National Center for Advancing Translational Sciences, (UL1TR002494). Eileen Condon holds a postdoctoral position funded by the National Institute of Nursing Research (K99NR018876).

Corresponding Author:
Bridget Basile Ibrahim
University of Minnesota Rural Health Research Center
2221 University Ave. SE #350
Minneapolis, MN 55414-3078
Email: basil045@umn.edu

Institutional Review Board Approval:
Yale University (approval #1311012986)
New York University (approval # 1311012986)
Columbia University (approval #AAAS9653)

The Association Between Neighborhood Social Vulnerability and Cardiovascular Health Risk among Black/African American Women in the InterGEN Study

Abstract

Background: Black/African American women in the United States are more likely to live in neighborhoods with higher social vulnerability than other racial/ethnic groups, even when adjusting for personal income. Social vulnerability, defined as the degree to which the social conditions of a community affect its ability to prevent loss and suffering in the event of disaster, **has been used in research as an objective measure of neighborhood social vulnerability.** Black/African American women also have the highest rates of hypertension and obesity in the United States.

Objectives: The purpose of this study was to examine the relationship between neighborhood social vulnerability and cardiovascular risk (hypertension and obesity) among Black/African American women.

Methods: We conducted a secondary analysis of data from the InterGEN Study, that enrolled Black/African American women (N=250) (mean age 31 years) in the Northeast United States. Participants' addresses were geocoded to ascertain neighborhood vulnerability using the **Centers for Disease Control and Prevention's** Social Vulnerability Index at the census tract level. We used multivariable regression models to examine associations between objective measures of neighborhood quality and indicators of structural racism and systolic and diastolic blood pressure

and obesity (body mass index (BMI)> 24.9), and to test psychological stress, coping, and depression as potential moderators of these relationships.

Results: Seventy-four percent of participating Black/African American women lived in neighborhoods in the top quartile for social vulnerability nationally. Women living in the top 10% most socially vulnerable neighborhoods in our sample had more than a threefold greater likelihood of hypertension when compared to those living in less vulnerable neighborhoods. Objective **neighborhood** measures of structural racism **(% poverty, % unemployment, % residents > 25 years old without a high school diploma, and % residents without access to a vehicle)** were significantly associated with elevated diastolic blood pressure and obesity in adjusted models. Psychological stress had a significant moderating effect on the associations between neighborhood vulnerability and cardiovascular risk.

Discussion: We identified important associations between structural racism, the neighborhood environment, and cardiovascular health among Black/African American women. These findings add to a critical body of evidence documenting the role of structural racism in perpetuating health inequities, and highlight the need for a multifaceted approach to policy, research, and interventions to address racial health inequities.

Key Words: Structural racism; health equity; hypertension; stress; social determinants of health; obesity

INTRODUCTION

Hypertension and obesity disproportionately affect Black/African American women in the United States. The prevalence of hypertension among Black/African American women is 56.7% (Ostchega et al., 2020), which is among the highest prevalence rates of hypertension in the world (Beckie, 2017). Black/African American women develop high blood pressure earlier in life and are almost twice as likely to die of hypertension related causes than non-Hispanic White women (Kung & Xu, 2015). Risks of hypertension for Black/African American women include end-stage renal disease, heart disease, stroke, and poor reproductive outcomes (Barcelona de Mendoza et al., 2017; Kung & Xu, 2015). Obesity affects 57% of Black/African American women in the United States, compared to 40% of White women, and is associated with an increased risk of developing diseases such as hypertension, coronary heart disease, end stage renal disease and diabetes (Hales et al., 2020).

A major root cause of health inequities in the United States is structural racism (Bailey et al, 2017). Structural racism describes laws, rules, and practices that are maintained by policies and institutions, embedded in economic systems and cultural norms, and serve to perpetuate both personal biases and broader socioeconomic inequities (Bailey, Feldman & Bassett, 2020). For example, the discriminatory practice of redlining, which barred mortgage lending in Black/African American neighborhoods for much of the 20th century, served to racially segregate and disenfranchise Black/African American communities with impacts that persist today (Bailey et al., 2020). **Structural racism is embedded in policies and inequitable access to resources and opportunities, creating social vulnerability in the form of segregated, socioeconomically disadvantaged and under-resourced neighborhoods.** Black/African American women remain more **likely to live in more socially vulnerable neighborhoods** than

White women, even when controlling for individual socioeconomic status (Cozier et al., 2016), and residence in these neighborhoods is associated with increased cardiovascular risk factors, shorter life expectancies, and higher rates of cardiovascular disease morbidity and mortality (Gary-Webb et al., 2020; Xiao & Graham, 2019). Black/African American women who live in socially vulnerable neighborhoods are also at risk for other predictors of poor health outcomes, including higher allostatic load (Wallace et al., 2013), higher levels of the inflammatory markers (Cozier et al., 2016), disruptions in physiologic stress response (Coulon, Wilson, Van Horn et al., 2016), increased hemoglobin A1C (Cozier et al., 2016), lower HDL (Cozier et al., 2016), expedited aging as evidenced by shorter telomere length (Gebreab et al., 2016), and higher prevalence of depressive symptoms (Schulz et al., 2006). Residing in a socially vulnerable neighborhood also has intergenerational effects, as these women experience higher rates of prenatal depression (Giurgescu et al., 2015), small for gestational age birth (Felker-Kantor et al., 2017), and infant mortality (Wallace et al., 2017).

A number of researchers have identified relationships between objective measures of neighborhood **social vulnerability** and cardiovascular health, but these multiethnic studies have primarily studied men and women older than 50 years and very few have included Black/African American women of childbearing age (Claudel et al., 2018; Jimenez et al., 2019). Other studies have been limited to older (>50 years) Black/African American adults (Barber et al., 2016; Coulon, Wilson, Alia et al., 2016). Thus, despite persistent health inequities and elevated risk profiles for hypertension, cardiovascular disease, and maternal mortality, very few studies have concentrated specifically on a cohort of solely Black/African American women. In one nationwide study of an all-Black/African American female cohort, Cozier and colleagues found an inverse relationship between residential neighborhood median home value and hypertension

incidence, even after adjusting for individual risk factors. However, this study included primarily middle-class women and used subjective reports of hypertension diagnosis or antihypertensive medication as the outcome (Cozier et al., 2007).

Black/African American women are at disproportionate risk for poor cardiovascular health outcomes, and these inequities cannot be solely accounted for by individual behaviors or risk factors (Cozier et al., 2016). Given the documented health effects of neighborhood social vulnerability, it is essential to explore associations between the neighborhood environment and cardiovascular health in Black/African American women during the childbearing years. The purpose of this study was to examine whether structural racism in the form of neighborhood social vulnerability is associated with increased cardiovascular health risk (i.e. elevated blood pressure and obesity) among Black/African American women. We hypothesized that living in a neighborhood with higher social vulnerability would be associated with elevated blood pressure and obesity, placing those Black/African American female residents with greater risk factors for cardiovascular disease. We also explored correlations among neighborhood social vulnerability and blood pressure/obesity moderating factors such as stress, depressive symptoms, and coping styles.

MATERIALS & METHODS

We conducted a secondary data analysis of women enrolled in InterGEN, a longitudinal cohort study of Black/African American women and their children (Crusto, De Mendoza et al., 2016; Taylor et al., 2016). **The purpose of InterGEN was to examine how environmental (i.e. maternal depression, experiences of racism/discrimination, and parenting stress) and genetic (i.e. DNA methylation) factors influenced blood pressure in mother/child dyads. A community sample of mother-**child dyads (N=250) were recruited in Connecticut from 2014 to

2019. Eligibility criteria included women who: (1) were at least 21 years of age, (2) self-identified as African American or Black, (3) spoke English, (4) did not have a cognitive or psychiatric disorder that could limit accuracy of reporting of study data, and (5) enrolled with a biological child who was 3-5 years old. **Per established study protocols, trained research assistants approached women for recruitment in primary care clinics, early childhood centers, and community health fairs, conducted screening to verify eligibility, and obtained written, informed consent.** The study was approved by the Institutional Review Boards at participating institutions.

Women and children enrolled in InterGEN completed four study visits over the span of 18-24 months, each approximately six months apart. Data used in the present cross-sectional analysis were collected during the baseline (T1) visit. Audio Computer-Assisted Self-Interview software (ACASI, version 16) was used during the visits to collect demographic and psychological data. Full study methods and procedures have been previously described (Crusto, Barcelona de Mendoza et al., 2016; Taylor et al., 2016**). This secondary analysis of InterGEN data adds objective measures of neighborhood vulnerability and structural racism as environmental variables which may influence blood pressure, which were not available in the original dataset.**

Variables and Measures

Exposure Variable

Social Vulnerability Index (SVI) 2018. The Centers for Disease Control and Prevention's (CDC) Social Vulnerability Index (SVI) (Flanagan et al., 2018) is a **relative measurement** of neighborhood vulnerability, **resources, and disadvantage that encompasses** four themes: 1) socioeconomic status, 2) household composition and disability, 3) minority status

and language, and 4) housing and transportation (Flanagan et al., 2018). Scores for each **of the four themes** are reported individually and as an overall score of neighborhood vulnerability **at both the** county and census tract **level**. The SVI was originally intended to identify the most vulnerable areas during public health and natural disaster emergency situations but has also been used for public health/epidemiology research as an objective measure of neighborhood social vulnerability and disadvantage (An & Xiang, 2015; Dasgupta et al., 2020; Diaz et al., 2020).

The total SVI is an overall relative vulnerability score calculated by the CDC for each US census-tract using 15 social factors from US Census tract-level data. Scores range from 0 to 1; scores closer to 1 indicate a census tract's greater social vulnerability relative to other census tracts across the nation. There are 4 themes which are comprised of 1) socioeconomic status (based on % poverty, employment, income, and educational attainment); 2) household composition and disability (based on % pediatric and advanced-age residents, residents aged >5 years with a disability, and single-parent households); 3) racial and ethnic minority (based on % residents who do not identify as White, non-Hispanic and % with limited English proficiency); and 4) housing type and transportation (based on % multiunit structures, mobile homes, crowded dwellings, household vehicle access, and institutionalized group quarters) (CDC & Agency for Toxic Substances and Disease Registry, 2020). **The 2018 SVI uses data from the 2014-2018 American Community Survey (CDC & Agency for Toxic Substances and Disease Registry, 2020). The full list of data used and the CDC's methods for SVI calculation have been published elsewhere (Flanagan et al., 2018).**

We used ArcGIS PRO (ESRI, Redlands, CA) to geocode the T1 home addresses for InterGEN participants (n=236). Fourteen of the study's 250 participants were excluded from analysis due to missing or incomplete addresses. The geocoded points were linked via a spatial

join to determine census tract and obtain objective measures of neighborhood quality including the CDC Social Vulnerability Index (SVI) overall score and theme scores and the 15 individual variables of tract-level census data the CDC uses to calculate the SVI.

Structural Racism. The individual 15 measures of tract-level census data were included in analyses in addition to the SVI scores because they are indicators of structural racism (Wallace et al., 2017).

Outcome Variables

Blood Pressure. Blood pressure was measured according to The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure recommendations (James et al., 2014), three times at each study visit by trained research assistants. Mean systolic and diastolic blood pressures were calculated at each visit for use in regression models. The dichotomous hypertension variable was created based on the 2017 AHA hypertension diagnostic criteria (Whelton et al., 2018). Each participant was categorized as having normal blood pressure (systolic < 120 mmHg and diastolic < 80mmHg) or elevated blood pressure/hypertension (systolic > 120 or diastolic > 80).

Body Mass Index. Body mass index (BMI) was computed from the participant's T1 height(m) and weight(kg) [kg/m^2], which were measured at each study visit by the research assistant. For this analysis, a participant was dichotomously categorized as overweight/obese if their T1 BMI was > 24.9.

Moderating Variables

Stress Overload. Stress was measured using the Stress Overload Scale (SOS), a 24-item instrument measuring subjective stress overload (Amirkhan, 2012) The SOS, which is used to predict increased likelihood of becoming physically ill when faced with psychological stress, has

high reliability in a diverse sample including Black/African American individuals (α =.95) (Amirkhan, 2012). The SOS includes two subscales: event load and vulnerability. Event load refers to the burden of outside demands, responsibilities and pressures and the vulnerability subscale captures feelings of powerlessness, inadequacy, debility, and frailty. Participants report how they felt during the past week using a 5-point Likert Scale ranging from "not at all" to "a lot." The SOS total score, which includes both subscales, and had high reliability in our sample (α=0.95) was used in the current analysis.

Coping Strategies. Coping was measured using the 33-item Coping Strategy Indicator (CSI) (Amirkhan, 1990). For each item on the instrument, respondents indicated the extent to which they used each coping strategy on a Likert scale ranging from "a little" to "a lot" when thinking about a problem that they have encountered during the last six months. Scores were summed and used to create three coping strategy subscales with high reliability: problem solving (α = .93), seeking social support (α = .91), and avoidance (α = .84). Summed scores for each subscale were used to create categorical variables to indicate the extent to which respondents engage in each coping strategy, ranging from very low to high.

Depressive Symptoms. Symptoms of depression were measured using the Beck Depression Inventory (BDI) (Beck et al., 1988), which has demonstrated validity among low-income African American outpatients (α = .90) (Grothe et al., 2005). This 21-item inventory is scored based on severity of each symptom (0-3). Scores of all items are summed for a total depression score. A score greater than 16 indicates some clinical depression (17-20 = borderline clinical depression, 21-30 = moderate depression, 31-40 = severe depression, score > 40 =extreme depression).

Covariates

Covariates were selected via a priori knowledge and included age and smoking status. BMI was included as an additional covariate in the models where blood pressure was the outcome.

Statistical Analysis

Statistical analyses were completed using Version 9.4 of the SAS System for Windows (Cary, NC). Descriptive analyses were carried out to assess missing data and normality of variables. Because SVI scores for our participants were skewed toward the most vulnerable neighborhoods in the CDC's nationwide ranking, we conducted bivariate analyses by dichotomizing the overall SVI score into two groups: the most vulnerable 10% of neighborhoods among our sample (highest 10% of SVI scores = scores > 0.976) and the remaining women who lived in neighborhoods with less vulnerability (remaining 90% of scores). We treated SVI scores as a categorical variable for bivariate analyses and logistic regression models and SVI scores as continuous in linear regression models. Chi-square tests, t- tests, and ANOVA tests were used to compare demographic characteristics between the dichotomous groups for overall vulnerability.

We used multivariable linear regression to examine associations between overall SVI score, the 4 SVI subthemes, and various objective measures of neighborhood vulnerability and mean systolic and diastolic blood pressure and BMI. The SVI scores and objective neighborhood measures were treated as continuous variables for these analyses and we controlled for age and current smoking status as confounders.

Logistic regression was used to determine the likelihood of hypertension or obesity associated with neighborhood social vulnerability. For the exposure in logistic regression, overall SVI and each of the SVI subthemes were dichotomized into two groups (10% most vulnerable and remaining 90% as a comparator group) as described above.

To test stress, depression, and coping as independent moderators of the relationship between neighborhood vulnerability and cardiovascular health indicators (blood pressure and obesity), we conducted multivariable linear regression as described above, and added stress (SOS), the three scales for coping styles (CSI), and Beck Depression Inventory (BDI) total score as an interaction term between each moderator and overall SVI and subthemes to each model, and included covariates for adjustment.

RESULTS

Study Sample

Women ranged in age from 21 to 46 years, with a mean age of 31.3 years (Table 1). Most participants were overweight or obese (70.3%) and 21.9 % identified as current smokers. At baseline, 34.5% had elevated blood pressure (>120/80 mmHg). Mean BMI was 29.8 (SD 8.3, range 13.7-59.0). More than half of the participants had some college education or more (58.1%), 77.0% received Medicaid or government/Affordable Care Act health insurance, and 46.4% reported an annual household income of less than $15,000. Most women (70.6%) were heads of a single parent household (i.e. not married or cohabiting).

Participants lived in 110 census tracts across CT, with most concentrated in 8 urban areas (Figure 1). Overall SVI score (range 0.009-0.999) had a mean of 0.799 (*SD*=0.212). Almost three quarters (n=171, 73.1%) of our sample lived in the most vulnerable quartile of neighborhoods nationwide, indicated by overall SVI scores > 0.750. Women who lived in the most vulnerable 10% of neighborhoods in our sample tended to be younger, less educated, and have a lower income, however these differences were not statistically significant in bivariate (chi-squared) analyses (Table 1).

Mean census tract per capita income was $20,781.67 (SD $8,656.01). The mean poverty rate for our participants' census tracts was 25.8% (SD 12.4), and the unemployment rate was 15.3% (SD 7.6) (Table 2). The mean percentage of residents of minority race/ethnicity (all persons except white, non-Hispanic (Centers for Disease Control, 2020) was 76.5% (SD 21.8), 21.2% (SD 10.1) of residents older than 25 years did not have a high school diploma or equivalent, and 24.9% (SD 13.1) did not have access to a vehicle. Census tracts had a mean % of single parent households of 19.3% (SD 9.8), residents did not have health insurance were a mean of 12.5% (SD 6.1), and a mean of 7.8% (SD 5.8) had limited ability to communicate in English.

Mean total stress (SOS) score was 60.9 (SD 24.04, range 24-119). Mean depression score (BDI) was 6.4 (SD 7.3, range 0-44). Depression and coping strategies employed by the InterGEN cohort have previously been described in depth (Brown et al., 2019; Millender et al., 2020; Wright et al., 2020).

In unadjusted and adjusted models (Table 2), we found significant associations between selected neighborhood characteristics and cardiovascular risk factors. The percent of residents living in poverty ($\beta = 0.13$, $p= 0.02$) and percent of unemployed residents in a census tract ($\beta = 0.18$, $p=0.04$) were significantly associated with higher diastolic BP. BMI significantly increased as percent poverty ($\beta = 0.12$, $p=0.01$), percent of residents > 25 years without a high school diploma ($\beta = 0.10$, $p=0.05$), and percent of residents without access to a vehicle ($\beta = 0.13$, $p=0.01$) increased in adjusted models.

In adjusted models, women living in the most vulnerable neighborhoods were 3.29 times more likely to have elevated blood pressure relative to the women living in less vulnerable neighborhoods (*a*OR 3.29; 95% CI 1.30, 8.32) (Table 3). We did not find a significant association between neighborhood vulnerability and BMI in our cohort.

Moderating Effect of Stress on the Association between Neighborhood Social Vulnerability and Cardiovascular Risk

In adjusted models, stress significantly moderated the association between overall neighborhood social vulnerability and systolic blood pressure (Table 4). Stress also moderated the relationships between the SVI socioeconomic theme and systolic blood pressure, the SVI household composition and disability theme and diastolic blood pressure, and overall SVI score and BMI (Table 4). Neither coping nor depression moderated the association between neighborhood vulnerability and cardiovascular risk (results not shown).

DISCUSSION

This study adds to an important body of evidence regarding the harmful effects of structural racism on cardiovascular disease among Black/African American women. We explored associations between objective indicators of structural racism, including social vulnerability and neighborhood quality, and hypertension and obesity in Black/African American women. We found that living in a more socially vulnerable neighborhood is associated with a greater than threefold increase in likelihood of hypertension, and that various individual measures of neighborhood quality are also associated with higher cardiovascular risk. Specifically, living in a neighborhood with higher rates of poverty and unemployment was associated with higher diastolic blood pressure, and living in a neighborhood with increased poverty and lower educational attainment was associated with higher rates of obesity.

To our knowledge, our study is the first to report associations between objective measures of neighborhood quality and objective measures of cardiovascular health in a cohort of Black/African American women of childbearing age. This study is also one of the first to explore these relationships among women living in the Northeast, rather than in the Southern United

States, and adds to an emerging body of literature documenting a significant relationship between the quality of the residential neighborhood environment and blood pressure for Black/African American women (Barber et al., 2016; Claudel et al., 2018; Sprung et al., 2019).

Similar to findings of past studies, we found that stress had an exacerbating effect on the associations between neighborhood vulnerability and cardiovascular disease risk. In a recent study of Black adults with hypertension in Philadelphia, participants identified the stress of living in an unsafe neighborhood as an explanatory factor for their hypertension (Koehler et al., 2018).

Neither coping nor depression moderated the associations between social vulnerability and cardiovascular risk. In past studies, high-effort, active coping in the form of John Henryism has been associated with increased cardiovascular risk for those living in highly disadvantaged neighborhoods (Booth & Jonassaint, 2016). While we did not find evidence of John Henryism in our sample, we also did not find evidence to suggest that coping protects against the harmful effects of structural racism and a vulnerable residential environment. Therefore, our findings suggest that rather than focusing on individual coping strategies, intervention efforts targeted at dismantling structural racism and its harmful effects, including racial segregation and neighborhood disadvantage, will be a more effective strategy for improving cardiovascular health among marginalized women.

While 80% of the Connecticut population is White, our participants lived in neighborhoods that were comprised of a high percentage (77%) of racial/ethnic minority residents, indicating significant racial segregation (U.S. Census Bureau, 2020). Efforts to quantify structural racism are still early in development (Groos et al., 2018), but the legacy of historically discriminatory policies like redlining suggests that the socioeconomic neighborhood

factors we examined are indeed indicators of structural racism (Bailey et al., 2017; Wallace et al., 2017). The overwhelmingly minority neighborhoods where our participants lived also have significantly higher rates of poverty (25.8% vs 7.86%) and unemployment (15.3% vs 3.8% in November 2019), lower per capita income ($20,781.67 vs $44,496) and lower high school completion rates (21.2% vs 0.8%) than the state of Connecticut (U.S. Census Bureau, 2020; U.S Bureau of Labor Statistics, 2020) further evidence that the systems and policies intended to serve the populace are failing its most vulnerable and marginalized residents and preventing them from improving their lives and the lives of their families.

Strengths and Limitations

This study is strengthened by examination of an exclusive sample of Black/African American women within one US state, which provides a unique opportunity to examine the influences of environment and structural racism at the intersection of race and gender while holding certain state-level health-influencing factors such as Medicaid policies, unemployment benefits, and high-school graduation criteria constant.

This study was conducted as a secondary analysis of previously collected data, and thus we were limited **to subjective measures of stress and** to the residential addresses at the T1 visit. We lacked information about how long the participants had lived at that address and were thus influenced by that specific environment. We also did not measure women's perception of neighborhood quality. Past research with Black/African American women has shown that perceived lower neighborhood quality and safety was associated with higher rates of depressive symptoms in pregnancy (Giurgescu et al., 2015; Sealy-Jefferson et al., 2016) and in general (Schulz et al., 2006). Future research could explore whether perceptions of neighborhood

vulnerability align with objective measures to better tailor interventions to improve both objective and subjective neighborhood vulnerability and associated health outcomes.

While our sample had a higher rate of mother-only households (70.6%) than the national rate of 55% for Black/African American children (National Center for Education Statistics, 2020), the household income of our sample mirrored the fact that nationally, almost half of Black/African American children who live in mother-only households live in poverty (National Center for Education Statistics, 2020). A similar analysis with a sample with greater diversity of family structure and socioeconomic status would remove some of the confounding influences of poverty and single-parent stress that may have been over-represented in our sample.

Because the effects of structural racism and neighborhood environment may be cumulative across the lifespan and likely across generations, other directions for future research may include a longitudinal study of environmental influences of neighborhood vulnerability and structural racism on cardiovascular health. Examination of further sociobiological outcomes of structural racism, such as epigenetic changes associated with neighborhood vulnerability or indicators of structural racism, is also an important direction for future research. Notwithstanding these limitations, our results provide further evidence that the influence on health risk and outcomes of neighborhood environment and one measure of structural racism is significant.

Conclusion

Our results are an important addition to the literature on cardiovascular health in Black/African American women and structural racism. Understanding and documenting the impact of structural racism on the residential environment and associated health inequities can help guide a multifaceted approach to policy, research, and interventions to address health

disparities and improve health equity for Black/African American women.

REFERENCES

Amirkhan, J. H. (1990). A Factor Analytically Derived Measure of Coping: The Coping Strategy Indicator. *Journal of Personality and Social Psychology, 59*(5), 1066–1074. https://doi.org/10.1037/0022-3514.59.5.1066

Amirkhan, J. H. (2012). Stress overload: A new approach to the assessment of stress. *American Journal of Community Psychology*, *49*(1–2), 55–71. https://doi.org/10.1007/s10464-011-9438-x

An, R., & Xiang, X. (2015). Social vulnerability and leisure-time physical inactivity among US adults. *American Journal of Health Behavior, 39*(6), 751–760. https://doi.org/10.5993/AJHB.39.6.2

Bailey, Z. D., Feldman, J. M., & Bassett, M. T. (2020). How structural racism works — Racist policies as a root cause of U.S. racial health inequities. *New England Journal of Medicine*. https://doi.org/10.1056/nejmms2025396

Bailey, Z. D., Krieger, N., Agénor, M., Graves, J., Linos, N., & Bassett, M. T. (2017). Structural racism and health inequities in the USA: evidence and interventions. In *The Lancet*. https://doi.org/10.1016/S0140-6736(17)30569-X

Barber, S., Hickson, D., Wang, X., Sims, M., Nelson, C., & Diez-Roux, A. V. (2016). Neighborhood disadvantage, poor social conditions, and cardiovascular disease incidence among African American adults in the Jackson Heart Study. *American Journal of Public Health, 106*(12), 2219–2227. https://doi.org/10.2105/AJPH.2016.303471

Barcelona de Mendoza, V., Wright, M. L., Agaba, C., Prescott, L., Desir, A., Crusto, C. A., Sun,

Y. V, & Taylor, J. Y. (2017). A systematic review of DNA methylation and preterm birth in African American women. *Biological Research for Nursing*, *19*(3), 308–317. https://doi.org/10.1177/1099800416669049

Beck, A. T., Steer, R. A., & Carbin, M. G. (1988). Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical Psychology Review*, *8*(1), 77–100. https://doi.org/10.1016/0272-7358(88)90050-5

Beckie, T. M. (2017). Ethnic and racial disparities in hypertension management among women. *Seminars in Perinatology*, *41*(5), 278–286. https://doi.org/10.1053/j.semperi.2017.04.004

Booth, J. M., & Jonassaint, C. R. (2016). The role of disadvantaged neighborhood environments in the association of John Henryism with hypertension and obesity. *Psychosomatic Medicine*, *78*(5), 552–561. https://doi.org/10.1097/PSY.0000000000000308

Brown, K. M., Hui, Q., Huang, Y., Taylor, J. Y., Prescott, L., Barcelona de Mendoza, V., Crusto, C., & Sun, Y. V. (2019). Association between stress and coping with DNA methylation of blood pressure-related genes among African American women. *Chronic Stress*, *3*, 247054701987908. https://doi.org/10.1177/2470547019879088

Centers for Disease Control and Prevention & Agency for Toxic Substances and Disease Registry. (2020, September 15). *CDC Social Vulnerability Index (SVI)*. https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

Centers for Disease Control & Prevention. (2020). *CDC SVI 2018 Documentation*. Atlanta; Centers for Disease Control.

Claudel, S. E., Adu-Brimpong, J., Banks, A., Ayers, C., Albert, M. A., Das, S. R., de Lemos, J. A., Leonard, T., Neeland, I. J., Rivers, J. P., & Powell-Wiley, T. M. (2018). Association between neighborhood-level socioeconomic deprivation and incident hypertension: A

longitudinal analysis of data from the Dallas heart study. *American Heart Journal*, *204*, 109–118. https://doi.org/10.1016/j.ahj.2018.07.005

Coulon, S. M., Wilson, D. K., Alia, K. A., & Van Horn, M. L. (2016). Multilevel associations of neighborhood poverty, crime, and satisfaction with blood pressure in African-American Adults. *American Journal of Hypertension*, *29*(1), 90–95. https://doi.org/10.1093/ajh/hpv060

Coulon, S. M., Wilson, D. K., Van Horn, M. L., Hand, G. A., & Kresovich, S. (2016). The Association of neighborhood gene-environment susceptibility with cortisol and blood pressure in African-American adults. *Annals of Behavioral Medicine*, *50*(1), 98–107. https://doi.org/10.1007/s12160-015-9737-9

Cozier, Y. C., Albert, M. A., Castro-Webb, N., Coogan, P. F., Ridker, P., Kaufman, H. W., Palmer, J. R., & Rosenberg, L. (2016). Neighborhood socioeconomic status in relation to serum biomarkers in the Black Women's Health Study. *Journal of Urban Health*, *93*(2), 279–291. https://doi.org/10.1007/s11524-016-0034-0

Cozier, Y. C., Palmer, J. R., Horton, N. J., Fredman, L., Wise, L. A., & Rosenberg, L. (2007). Relation between neighborhood median housing value and hypertension risk among Black women in the United States. *American Journal of Public Health*, *97*(4), 718–724. https://doi.org/10.2105/AJPH.2005.074740

Crusto, C. A., Barcelona de Mendoza, V., Connell, C. M., Sun, Y. V, & Taylor, J. Y. (2016). The Intergenerational Impact of Genetic and Psychological Factors on Blood Pressure Study (InterGEN): Design and methods for recruitment and psychological measures. *Nursing Research*, *65*(4), 331–338. https://doi.org/10.1097/NNR.0000000000000163

Dasgupta, S., Bowen, V. B., Leidner, A., Fletcher, K., Musial, T., Rose, C., Cha, A., Kang, G.,

Dirlikov, E., Pevzner, E., Rose, D., Ritchey, M. D., Villanueva, J., Philip, C., Liburd, L., & Oster, A. M. (2020). Association between social vulnerability and a county's risk for becoming a COVID-19 hotspot — United States, June 1–July 25, 2020. *MMWR. Morbidity and Mortality Weekly Report*, *69*(42), 1535–1541. https://doi.org/10.15585/mmwr.mm6942a3

Diaz, A., Chavarin, D., Paredes, A. Z., Tsilimigras, D. I., & Pawlik, T. M. (2020). Association of neighborhood characteristics with utilization of high-volume hospitals among patients undergoing high-risk cancer surgery. *Annals of Surgical Oncology*, 1–15. https://doi.org/10.1245/s10434-020-08860-5

Felker-Kantor, E., Wallace, M., & Theall, K. (2017). Living in violence: Neighborhood domestic violence and small for gestational age births. *Health and Place*, *46*, 130–136. https://doi.org/10.1016/j.healthplace.2017.05.011

Flanagan, B. . E., Hallisey, E., Adams, A., & Lavery. (2018). Measuring community vulnerability to natural and anthropogenic hazards: The Centers for Disease Control and Prevention's Social Vulnerability Index. *Journal of Environmental Health*, *80*(10), 34–36.

Gary-Webb, T. L., Egnot, N. S., Nugroho, A., Dubowitz, T., & Troxel, W. M. (2020). Changes in perceptions of neighborhood environment and cardiometabolic outcomes in two predominantly African American neighborhoods. *BMC Public Health*, *20*(1), 52. https://doi.org/10.1186/s12889-019-8119-9

Gebreab, S. Y., Riestra, P., Gaye, A., Khan, R. J., Xu, R., Davis, A. R., Quarells, R. C., Davis, S. K., & Gibbons, G. H. (2016). Perceived neighborhood problems are associated with shorter telomere length in African American women. *Psychoneuroendocrinology*, *69*, 90–97. https://doi.org/10.1016/j.psyneuen.2016.03.018

Giurgescu, C., Misra, D. P., Sealy-Jefferson, S., Howard-Caldwell, C., Templin, T. N., Slaughter, J. C., & Osypuk, T. L. (2015). The impact of neighborhood quality, perceived stress, and social support on depressive symptoms during pregnancy in African American women HHS Public Access. *Soc Sci Med*, *130*, 172–180. https://doi.org/10.1016/j.socscimed.2015.02.006

Groos, M., Wallace, M., Hardeman, R., & Theall, K. (2018). Measuring inequity: A systematic review of methods used to quantify structural racism. *Journal of Health Disparities Research and Practice*, *11*(2), 13.

Grothe, K. B., Dutton, G. R., Bodenlos, J., Ancona, M., Jones, G. N., & Brantley, P. J. (2005). Validation of the Beck Depression Inventory - II in a low-income African American sample of medical outpatients. *Psychological Assessment*, *17*(1), 110–114. https://doi.org/10.1037/1040-3590.17.1.110

Hales, C. M., Carroll, M. D., Fryar, C. D., & Ogden, C. L. (2020). Prevalence of obesity and severe obesity among adults: United States, 2017-2018 Key findings Data from the National Health and Nutrition Examination Survey. In *NCHS Data Brief* (Vol. 360).

James, P. A., Oparil, S., Carter, B. L., Cushman, W. C., Dennison-Himmelfarb, C., Handler, J., Lackland, D. T., LeFevre, M. L., MacKenzie, T. D., Ogedegbe, O., Smith, S. C., Svetkey, L. P., Taler, S. J., Townsend, R. R., Wright, J. T., Narva, A. S., & Ortiz, E. (2014). 2014 Evidence-based guideline for the management of high blood pressure in adults: Report from the panel members appointed to the Eighth Joint National Committee (JNC 8). In *JAMA - Journal of the American Medical Association* (Vol. 311, Issue 5, pp. 507–520). American Medical Association. https://doi.org/10.1001/jama.2013.284427

Jimenez, M. P., Wellenius, G. A., Subramanian, S. V., Buka, S., Eaton, C., Gilman, S. E., &

Loucks, E. B. (2019). Longitudinal associations of neighborhood socioeconomic status with cardiovascular risk factors: A 46-year follow-up study. *Social Science and Medicine, 241*, 112574. https://doi.org/10.1016/j.socscimed.2019.112574

Koehler, K., Lewis, L., Peter, ;, & Cronholm, F. (2018). Neighborhood and social influences on blood pressure: An exploration of causation in the explanatory models of hypertension among African Americans. *Journal of Community Medicine, 1*(1002).

Kung, H.-C., & Xu, J. (2015). Hypertension-related mortality in the United States, 2000-2013. *NCHS Data Brief, No. 193*.

Millender, E., Barile, J. P., R. Bagneris, J., Harris, R. M., De Faria, L., Wong, F. Y., Crusto, C. A., & Taylor, J. Y. (2021). Associations between social determinants of health, perceived discrimination, and body mass index on symptoms of depression among young African American mothers. *Archives of Psychiatric Nursing*, *35*(1), 94-101. https://doi.org/10.1016/j.apnu.2020.09.014

National Center for Education Statistics. (2020) Characteristics of Children's Families. Institute for Educational Statistics. Washington, DC. https://nces.ed.gov/programs/coe/indicator_cce.asp

Ostchega, Y., Fryar, C. D., Nwankwo, T., & Nguyen, D. T. (2020). Hypertension prevalence among adults aged 18 and over: United States, 2017-2018 Key findings Data from the National Health and Nutrition Examination Survey. *NCHS Data Brief*, *364*, 1–8.

Schulz, A. J., Israel, B. A., Zenk, S. N., Parker, E. A., Lichtenstein, R., Shellman-Weir, S., & Klem, A. B. L. (2006). Psychosocial stress and social support as mediators of relationships between income, length of residence and depressive symptoms among African American women on Detroit's eastside. *Social Science and Medicine*, *62*(2), 510–522.

https://doi.org/10.1016/j.socscimed.2005.06.028

Sealy-Jefferson, S., Giurgescu, C., Slaughter-Acey, J., Caldwell, C., & Misra, D. (2016). Neighborhood context and preterm delivery among African American women: the mediating role of psychosocial factors. *Journal of Urban Health*, *93*(6), 984–996. https://doi.org/10.1007/s11524-016-0083-4

Taylor, J. Y., Wright, M. L., Crusto, C. A., & Sun, Y. V. (2016). The Intergenerational Impact of Genetic and Psychological Factors on Blood Pressure (InterGEN) Study: Design and methods for complex DNA analysis. *Biological Research for Nursing*, *18*(5), 521–530. https://doi.org/10.1177/1099800416645399

U.S. Census Bureau. (2020). *U.S. Census Bureau QuickFacts: Connecticut; United States*. QuickFacts: Connecticut. https://www.census.gov/quickfacts/fact/table/CT,US/PST045219

U.S Bureau of Labor Statistics. (2020). Local Area Unemployment Statistics: Over-the-Year Change in Unemployment Rates for States. https://www.bls.gov/web/laus/laumstch.htm

Wallace, M., Crear-Perry, J., Richardson, L., Tarver, M., & Theall, K. (2017). Separate and unequal: Structural racism and infant mortality in the US. *Health and Place*, *45*, 140–144. https://doi.org/10.1016/j.healthplace.2017.03.012

Wallace, M., Harville, E., Theall, K., Webber, L., Chen, W., & Berenson, G. (2013). Neighborhood poverty, allostatic load, and birth outcomes in African American and white women: Findings from the Bogalusa Heart Study. *Health and Place*, *24*, 260–266. https://doi.org/10.1016/j.healthplace.2013.10.002

Whelton, P. K., Carey, R. M., Aronow, W. S., Casey, D. E., Collins, K. J., Himmelfarb, C. D., DePalma, S. M., Gidding, S., Jamerson, K. A., Jones, D. W., MacLaughlin, E. J., Muntner, P., Ovbiagele, B., Smith, S. C., Spencer, C. C., Stafford, R. S., Taler, S. J., Thomas, R. J.,

Williams, K. A., … Hundley, J. (2018). 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults a report of the American College of Cardiology/American Heart Association Task Force on Clinical pr. In *Hypertension* (Vol. 71, Issue 6). https://doi.org/10.1161/HYP.0000000000000065

Wright, M. L., Lim, S., Sales, A., Rajagopal, S., Nzegwu, D., Crusto, C. A., & Taylor, J. Y. (2020). The influence of discrimination and coping style on blood pressure among Black/African American women in the InterGEN study. *Health Equity*, *4*(1), 272–279. https://doi.org/10.1089/heq.2019.0122

Xiao, Y., & Graham, G. (2019). Where we live: The impact of neighborhoods and community factors on cardiovascular health in the United States. *Clinical Cardiology*, *42*(1), 184–189. https://doi.org/10.1002/clc.23107

Table 1 *Characteristics of Women Enrolled in InterGEN Study (n=250)*

		Total Sample	Less Vulnerable Neighborhoods (n=225)	Most Vulnerable Neighborhoods [a] (n=25)	
		N (%)	n (%)	n (%)	p-value[b]
Age					
	20-29 years	105 (42.0)	92 (40.9)	13 (52.0)	.55
	30-39 years	124 (49.6)	114 (50.7)	10(40.0)	
	40-49 years	21 (8.4)	19 (8.4)	2 (8.0)	
Education					
	Less than high school	13 (5.2)	12 (5.3)	1 (4.0)	.84
	High school graduate	91 (36.7)	80 (35.6)	11 (44.0)	
	Some college	82 (33.1)	73 (32.4)	9 (36.0)	
	Associate's degree or higher	62 (25.0)	49 (21.8)	4 (16.0)	
Annual household income					.37
	< US$15,000	111 (46.4)	96(45.1)	15 (60.0)	
	US $15,000-50,000	102 (42.9)	94(44.1)	8 (32.0)	
	> US$50,000	25 (10.5)	23(10.8)	2 (8.0)	
Health insurance type					
	Private	35 (14.1)	33 (14.7)	2 (8.0)	.07
	Medicaid	154 (62.1)	142 (63.1)	12 (48.0)	
	Government provided/ACA	37 (14.9)	28 (12.4)	9 (36.0)	
	Other	7 (2.8)	6 (2.7)	1 (4.0)	
	None	14 (5.7)	13 (5.8)	1 (4.0)	
Current smoker					
	Yes	54 (21.9)	48 (21.6)	6(24.0)	.79
	No	193 (78.1)	174 (78.4)	19(76.0)	
Marital status					
	Single/ Divorced/ Separated	175 (70.6)	161 (71.6)	14 (73.7)	.29
	Married/ cohabiting	73 (29.4)	62 (27.6)	11 (26.3)	
Latina ethnicity		22 (8.8)	19 (2.8)	3 (6.0)	.80

Note: SVI: Social Vulnerability Index. [a]Most vulnerable neighborhoods are those that scored in the top 10% of our sample for overall Social Vulnerability Index (SVI) score (>0.976). Less vulnerable neighborhoods are the remaining 90% of neighborhoods. [b]Chi-square tests used to compare participants living in less vulnerable versus most vulnerable neighborhoods.

Table 2 *Unadjusted and Adjusted Associations between Neighborhood Vulnerability and Blood Pressure and Body Mass Index (N=234)*

		Systolic Blood Pressure				Diastolic Blood Pressure				Body Mass Index			
		Unadjusted		Adjusted[1]		Unadjusted		Adjusted[1]		Unadjusted		Adjusted[2]	
		β (SE)	p-value	β (SE)	p-value	β (SE)	p-value	β (SE)	p-value	β (SE)	p-value	β (SE)	p-value
Social Vulnerability Index (SVI)		0.72 (4.31)	.87	1.34 (3.8)	.73	2.84 (3.40)	.41	4.00 (3.1)	.20	3.19 (2.56)	.21	4.37 (2.6)	.09
SVI Theme 1-Socioeconomic status		4.03 (4.11)	.33	4.50 (3.7)	.22	4.61 (3.24)	.16	5.61 (30)	.06	3.62 (2.44)	.14	4.71 (2.5)	.06
SVI Theme 2- Household composition		-1.26 (3.29)	.70	0.48 (2.9)	.87	-0.27 (2.60)	.92	1.46 (2.4)	.55	1.48 (1.96)	.45	2.52 (2.0)	.21
SVI Theme 3- Minority & language		1.79 (6.76)	.78	0.67 (5.7)	.90	4.54 (5.02)	.37	4.30 (4.6)	.35	4.68 (3.78)	.22	5.35 (3.8)	.16
SVI Theme 4-Housing &transport		-0.91 (3.96)	.82	-1.81 (3.4)	.60	2.38 (3.13)	.45	1.96 (2.8)	.49	1.77 (2.36)	.45	2.01 (2.4)	.39
Selected Neighborhood Characteristics [cohort mean % (SD)]													
Poverty	25.8(12.4)	0.13 (0.07)	.08	0.13(0.07)	.06	0.11 (0.06)	.05*	0.13 (0.05)	.02*	0.10 (0.04)	.02*	0.12 (0.04)	.01*
Unemployment	15.3(7.6)	0.15 (0.12)	.24	0.18 (0.11)	.10	0.15 (0.10)	.13	0.18 (0.09)	.04*	0.06 (0.07)	.43	0.07 (0.07)	.31
No high school diploma	21.2 10.1)	0.16 (0.09)	.07	0.15 (0.08)	.07	0.12 (0.07)	.09	0.12 (0.06)	.07	0.09 (0.05)	.09	0.10 (0.05)	.05*
Single parent household	19.3(9.8)	0.13 (0.09)	.17	0.13 (0.08)	.12	0.06 (0.07)	.41	0.07 (0.07)	.29	0.08 (0.06)	.15	0.10 (0.06)	.08
Minority race residents	76.5(21.8)	0.002 (0.04)	.95	0.01 (0.04)	.77	0.02 (0.03)	.64	0.03 (0.03)	.38	0.02 (0.02)	.39	0.03 (0.03)	.28
Limited English ability	7.8(5.8)	0.12 (0.16)	.27	0.17 (0.14)	.22	0.17 (0.12)	.18	0.16 (0.11)	.15	0.01 (0.09)	.88	0.01 (0.09)	.88
Crowded dwellings	4.1(3.0)	0.25 (0.31)	.42	0.33 (0.27)	.21	0.31 (0.24)	.20	0.38 (0.22)	.09	-0.08 (0.18)	.68	-0.05 (0.18)	.77
No access to vehicle	24.9(13.1)	0.10 (0.07)	.16	0.07 (0.06)	.28	0.08 (0.06)	.15	0.07 (0.05)	.17	0.11 (0.04)	.01*	0.13 (0.04)	.01*
No health insurance	12.5(6.1)	0.13 (0.15)	.38	0.20 (0.13)	.13	0.10 (0.12)	.39	0.15 (0.11)	.16	-0.08 (0.09)	.41	-0.07 (0.09)	.42

Note: SVI, Social Vulnerability Index; BMI, Body Mass Index; SE, Standard Error; CI, Confidence Interval; SD, Standard Deviation; [1]Models adjusted for age, BMI, and smoking status. [2]Model adjusted for age and smoking status.*$p \leq 0.05$

Table 3. *Associations between Neighborhood Vulnerability and Blood Pressure and Obesity (N=234)*

	Hypertension[1]				Overweight/ Obese[2]			
	OR	95% CI	*a*OR [a]	95% CI	OR	95% CI	*a*OR [b]	95% CI
Residence in 10% Most Vulnerable Neighborhoods								
Social Vulnerability Index (SVI)	2.58*	1.10, 6.05	3.29*	1.30, 8.32	1.67	.64, 4.32	2.14	.76, 5.99
SVI Theme 1-Socioeconomic status	1.96	.85, 4.52	2.16	.87, 5.36	1.41	.57, 3.48	1.63	.62, 4.27
SVI Theme 2- Household composition	0.87	.36, 2.08	0.97	.38, 2.49	1.15	.48, 2.75	1.35	.53, 3.43
SVI Theme 3- Minority & language	1.24	.56, 2.76	1.33	.56, 3.16	0.89	.40, 2.02	0.83	.55, 2.05
SVI Theme 4-Housing & transportation	0.63	.24, 1.66	0.53	.19, 1.51	1.57	.60, 4.10	1.51	.57, 3.96

Note: CI, Confidence Interval; OR, Odds Ratio; BP, Blood Pressure; BMI, Body Mass Index; [1]Hypertension (HTN): based on 2017 AHA HTN categories, (systolic BP > 120 or diastolic BP >80) . [2]Overweight /Obese = BMI > 24.9. [a]Adjusted for age, body mass index, smoking status. [b]Adjusted for age and smoking status.
*$p \leq 0.05$

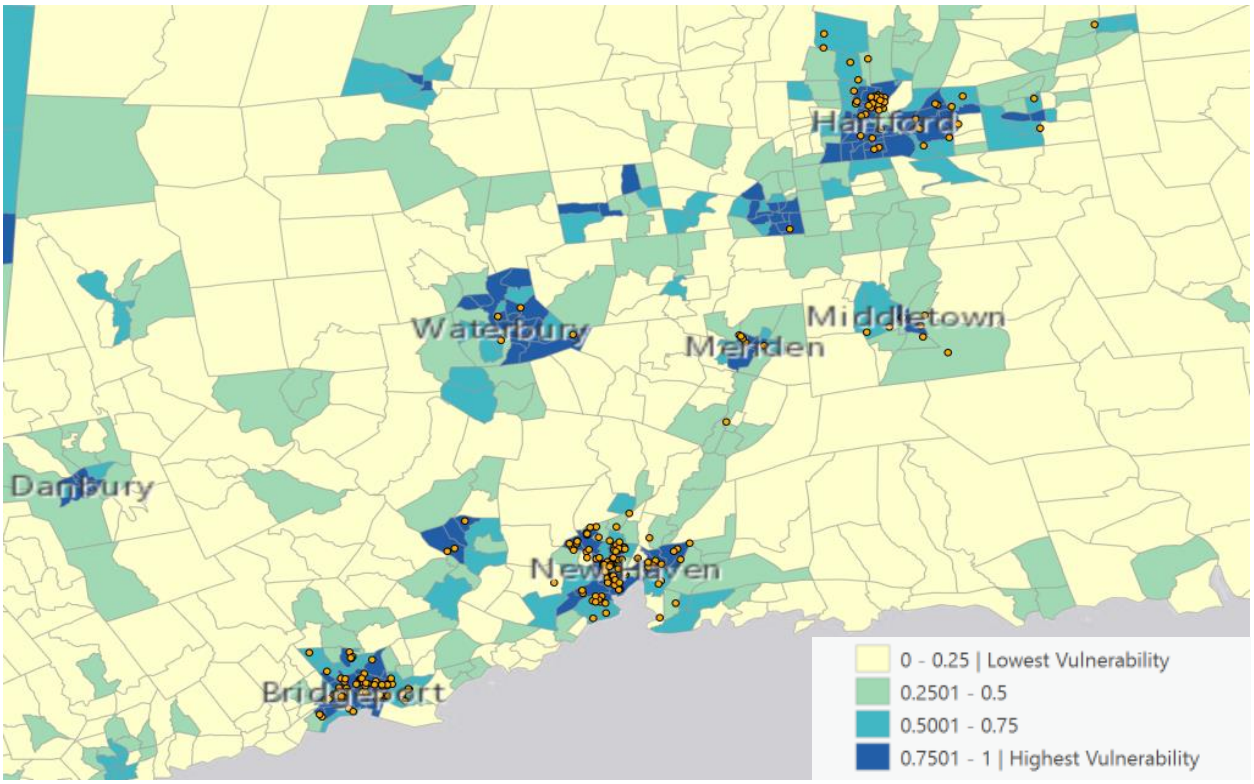
Table 4 *Moderating Effect of Stress Interaction on the Association between Residential Neighborhood Vulnerability on Blood Pressure and Body Mass Index (N=222)*

	Systolic Blood Pressure[1]		Diastolic Blood Pressure[1]		Body Mass index[2]	
	β (SE)	p-value	β (SE)	p-value	β (SE)	p-value
Social Vulnerability Index (SVI)						
SVI	25.12 (12.9)	.05*	17.05(10.8)	.12	17.38 (8.8)	.04*
Stress Overload Score	0.30 (0.2)	.07	0.17 (0.1)	.22	0.17 (0.1)	.12
SVI*Stress Overload	-0.39 (0.2)	.04*	-0.22 (0.2)	.19	-0.21(0.1)	.13
SVI Theme 1- Socioeconomic Status						
SVI Theme 1	30.78 (11.3)	.01*	17.78 (9.4)	.06	11.98 (7.8)	.12
Stress Overload Score	0.33 (0.1)	.02*	0.16 (0.1)	.19	0.10 (0.1)	.31
SVI Theme 1*Stress Overload	-0.44(0.2)	.01*	-0.21 (0.2)	.15	-0.12 (0.1)	.32
SVI Theme 2- Household Composition						
SVI Theme 2	12.37(8.6)	.15	14.14 (7.1)	.04*	8.94(5.8)	.13
Stress Overload Score	0.10 (0.1)	.27	0.12 (0.1)	.31	0.07 (0.1)	.24
SVI Theme 2*Stress Overload	-0.19 (0.1)	.15	-0.21(0.1)	.05*	-0.11 (0.1)	.24
SVI Theme 3- Minority Status and Language						
SVI Theme 3	30.26 (20.1)	.13	19.63 (16.7)	.24	21.68 (13.7)	.11
Stress Overload Score	0.40 (0.3)	.13	0.22 (0.2)	.32	0.23 (0.2)	.21
SVI Theme 3*Stress Overload	-0.50 (0.3)	.10	-0.27(0.3)	.29	-0.26 (0.2)	.21
SVI Theme 4- Housing and Transportation						
SVI Theme 4	-2.89 (10.9)	.79	-0.52 (9.0)	.95	12.12 (7.4)	.10
Stress Overload Score	-00.03 (0.1)	.83	-0.04 (0.1)	.70	0.11 (0.1)	.16
SVI Theme 4*Stress Overload	0.01 (0.2)	.98	0.04(0.1)	.78	-0.15 (0.1)	.16

Note: BP, Blood Pressure; BMI, Body Mass Index; SVI, Social Vulnerability Index [1]Adjusted for age, BMI, smoking status. [2]Adjusted for age and smoking status. *$p \leq 0.05$

Figure 1. Residential Distribution and Neighborhood Social Vulnerability of InterGEN Participants

Figure 1


Hartford
Waterbury
Middletown
Meriden
Danbury
New Haven
Bridgeport
0 - 0.25 | Lowest Vulnerability
0.2501 - 0.5
0.5001 - 0.75
0.7501 - 1 | Highest Vulnerability