Neighborhood Stressors and Race/Ethnic Differences in Hypertension Prevalence (The Multi-Ethnic Study of Atherosclerosis)

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BACKGROUND

The reasons for racial/ethnic disparities in hypertension (HTN) prevalence in the United States are poorly understood.

METHODS

Using data from the Multi-Ethnic Study of Atherosclerosis (MESA), we investigated whether individual- and neighborhood-level chronic stressors contribute to these disparities in cross-sectional analyses. The sample consisted of 2,679 MESA participants (45–84 years) residing in Baltimore, New York, and North Carolina. HTN was defined as systolic or diastolic blood pressure ≥140 or 90 mm Hg, or taking antihypertensive medications. Individual-level chronic stress was measured by self-reported chronic burden and perceived major and everyday discrimination. A measure of neighborhood (census tract) chronic stressors (i.e., physical disorder, violence) was developed using data from a telephone survey conducted with other residents of MESA neighborhoods. Binomial regression was used to estimate associations between HTN and race/ethnicity before and after adjustment for individual and neighborhood stressors.

RESULTS

The prevalence of HTN was 59.5% in African Americans (AAs), 43.9% in Hispanics, and 42.0% in whites. Age- and sex-adjusted relative prevalences of HTN (compared to whites) were 1.30 (95% confidence interval (CI): 1.22–1.38) for AA and 1.16 (95% CI: 1.04–1.31) for Hispanics. Adjustment for neighborhood stressors reduced these to 1.17 (95% CI: 1.11–1.22) and 1.09 (95% CI: 1.00–1.18), respectively. Additional adjustment for individual-level stressors, acculturation, income, education, and other neighborhood features only slightly reduced these associations.

CONCLUSION

Neighborhood chronic stressors may contribute to race/ethnic differences in HTN prevalence in the United States.

Keywords: *blood pressure; chronic stress; discrimination; ethnicity; hypertension; neighborhoods; race*

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Despite a large body of literature documenting a greater prevalence of hypertension (HTN) and HTN-related morbidity and mortality among African Americans (AAs) compared to whites, such differences remain poorly understood.[1,2] Research on disparities in HTN has focused on biological differences,[3–5] socioeconomic position (SEP),[6] and health behaviors (diet, physical inactivity)[7–9] as potential explanations. However, many argue that an examination of psychosocial stressors and potentially stress-generating structural/contextual factors is necessary for a full understanding of racial/ethnic disparities in health in general and in HTN in particular.[10–12]

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Psychosocial stressors previously associated with HTN include stressful life events, perceived discrimination, and job strain.[13–16] However, few studies have examined the contribution of psychosocial stressors to race/ethnic differences in HTN or other blood pressure–related outcomes.[16–18] When examined, generally, only one type of stressor is considered and rarely are stressors defined at multiple levels considered. Stress is multidimensional in nature and multiple sources of stress may cluster in individuals.[19] For example, in addition to stressful life events, neighborhoods may also serve as stressors *via* neighborhood problems (e.g. vandalism, violence, overcrowding, noise) or disorder (physical and social).[19–21] Exposure to these stressors may cause individuals to perceive their environment as threatening and cause a direct physiologic stress response that may induce HTN or affect HTN by hindering physical activity. The lack of resources in neighborhoods may also limit resident's ability to cope with other sources of stress in their lives.[20,21]

The few studies that have investigated associations between neighborhood stressors and HTN or HTN-related mortality, use census-derived indicators of SEP as proxies for specific features of neighborhood environments that may be chronic

stressors.[22,23] These measures of neighborhood SEP may be poor proxies for the potentially stress-inducing features of residential environments.[20] To more precisely examine the contribution of neighborhood-level stressors on racial/ethnic differences in HTN prevalence, we used direct measures of neighborhood stressors. Based on prior work,[24] we hypothesized that multiple neighborhood-level stressors including neighborhood safety and social cohesion among others would be associated with HTN. Further, we anticipate that the association between race/ethnicity and HTN would be reduced after adjusting for neighborhood and individual-level chronic stressors.

METHODS

Study population. The Multi-Ethnic Study of Atherosclerosis (MESA) is a prospective study of 6,814 men and women aged 45–84 years recruited from six study sites within the United States (Baltimore, MD; Chicago, IL; Forsyth County, NC; Los Angeles, CA; northern New York City, NY; and St. Paul, MN). Participants free from clinical cardiovascular disease at baseline were recruited between August 2000 and July 2002. Participation rate among those screened and deemed eligible was 59.8%. Detailed sampling and recruitment procedures have been previously described.[25] The institutional review boards at all participating centers approved the study, and all participants gave informed consent.

In this study, we use a subsample of MESA participants restricted to three of the six study sites for which enriched neighborhood information was available (New York, Maryland, North Carolina, N = 3,265) as part of the MESA ancillary Neighborhood Study. Additionally, we restricted analyses to those with baseline addresses that were successfully geocoded and with complete information on study covariates (N = 2,679, 82% of MESA subsample).

Outcome variable. Resting seated blood pressure was measured three times using an automated oscillometric sphygmomanometer, and the average of the last two measurements was used for analysis (called "clinic blood pressure"). HTN was defined as systolic or diastolic blood pressure ≥140 or 90 mm Hg, respectively, or taking antihypertensive medications.[26]

Individual chronic stressors. Three domains of chronic stressors were assessed at the individual level: chronic burden, perceived major discrimination, and everyday discrimination.

1. Chronic burden was measured using the chronic burden scale.[27] Respondents were asked to indicate whether they had experienced any ongoing problems in five domains (health (self), health (loved one), job, relationship, and financial problems and if any ongoing problems lasted ≥6 months). Respondents rated how stressful each problem was. Respondents were classified as having chronic burden for each of the five domains if they had experienced the circumstance for at least 6 months and it was moderately or very stressful. We summed the number of domains in which chronic burden was experienced (0, 1, 2, or more) to estimate overall chronic burden.
2. A 6-item perceived discrimination scale was adapted from the Detroit Area Study.[28] Respondents were asked to indicate whether they had ever been denied employment or education, unfairly fired, threatened by the police, or prevented from moving into a neighborhood over the lifetime. Respondents were also asked the source of the unfair treatment (race/ethnicity, gender, etc.). We use the number of areas in which a person reported experiencing unfair treatment (0, 1, 2, or more), irrespective of the source, to characterize each person's perceived discrimination.
3. Items for the everyday discrimination scale (9 items) were adapted from The Detroit Area Study.[28] This measure captures the day-to-day minor incidents of unfair treatment. Respondents were asked to indicate the frequency of encounters in which they perceived that they were treated unfairly (i.e. harassed and called names, treated as dishonest, of less value, harmful, or unintelligent) on a day-to-day basis. Responses for the everyday discrimination scale range from 1 to 6 (1 = almost every day to 6 = never) and a summary measure of everyday discrimination was created by summing across the nine items. Higher scores indicate more daily discrimination.

Neighborhood-level stressors. Information on neighborhoods was obtained as part of an ancillary study to MESA, the MESA Neighborhood study, designed to assess neighborhood conditions potentially relevant to cardiovascular disease. A separate sample of 5,988 individuals (recruited between January and August 2004) residing in the same neighborhoods (census tracts) as MESA study participants were asked to rate their neighborhood *via* a telephone survey. Data from this independent sample were used to: (i) reduce the potential for same source bias, (ii) increase the within neighborhood sample size, and (iii) obtain a more valid measure of the features of interest by aggregating perceptions. We recruited a median of 8 individuals per neighborhood (range 1–62). Census tracts were used as proxies for neighborhoods in all analyses based on prior work indicating good agreement across individuals residing within the same tract in relation to neighborhood stressors (intraneighborhood agreement (intra-class correlation coefficient, ICC) = 0.51; neighborhood reliability = 0.82). Additional details on the community survey and measurement properties of the neighborhood scales are provided elsewhere.[29]

Thirteen items (see appendix) were used to characterize neighborhood-level sources of chronic stress in these analyses based on face validity and previous research when possible.[20,30] A summary neighborhood stressors scale constructed by summing responses for these items had good internal consistency (Cronbach's α = 0.88) and test–retest reliabilities (ICC = 0.78). We also considered a measure of neighborhood walkability and availability of healthy foods based on prior associations between these measures and HTN.[24] All neighborhood measures were constructed using Empirical Bayes estimation techniques described elsewhere.[24]

Table 1 | Selected characteristics of MESA participants at baseline (2000–2002) overall and by race/ethnicity

	Overall (n = 2,679), N	White (n = 1,105), %	African Americans (n = 1,159), %	Hispanics (n = 415), %	P value
Study site					
Baltimore	850	37.5	37.6	0.0	<0.001
New York	913	16.8	27.1	99.6	
North Carolina	916	45.7	35.3	0.4	
Age, years	2,679	63.3 (9.8)	61.7 (9.8)	61.3 (10.4)	<0.001
Categorized age, years					
45–55	748	24.2	29.8	32.8	<0.001
55–65	746	27.7	27.9	28.2	
65–75	834	33.9	31.1	23.9	
75+	351	14.2	11.3	15.2	
Gender					
Male	1,236	48.7	43.8	45.8	0.067
Female	1,443	51.3	56.2	54.2	
Education					
<HS diploma	374	5.6	12.2	41.0	<0.001
HS diploma	551	19.7	20.7	22.6	
Some college	785	26.4	34.0	23.9	
College graduate+	969	48.3	33.1	12.5	
Income					
<$24,999	664	14.8	26.7	46.0	<0.001
$25,000–$49,999	805	27.9	30.1	35.7	
$50,000–$74,999	517	21.5	19.5	12.8	
≥$75,000	563	33.5	14.9	4.8	
Unknown	130	2.3	8.8	0.7	
Acculturation[a]	2,551	4.9 (0.3)	4.9 (0.4)	2.4 (1.1)	<0.001
Alcohol use					
Never	469	65.9	45.9	48.4	<0.001
Former	744	19.9	36.1	26.5	
Current	1,453	14.3	18.0	25.1	
Dash diet accordance[a]	2,332	1.5 (1.4)	1.4 (1.3)	1.8 (1.2)	<0.001
Total physical activity, MET min/week[a]	2,678	3.2 (3.6)	4.9 (5.0)	3.4 (3.7)	<0.001
Body mass index	2,679	27.7 (5.0)	30.4 (5.8)	28.9 (5.0)	<0.001
Hypertension					
Yes	1,336	42.0	59.3	43.9	<0.0001
No	1,343	58.0	40.7	56.1	
Time lived in neighborhood					
Yes	1,114	39.9	44.9	58.2	<0.001
No	1,373	60.1	55.1	41.9	
Neighborhood walkability[a]		3.8 (0.3)	3.6 (0.3)	3.7 (0.3)	<0.001
Neighborhood availability of healthy foods[a]		3.3 (0.4)	3.1 (0.3)	3.2 (0.3)	<0.001

P values correspond to χ^2-tests for differences across race/ethnic group.
HS, high school; MESA, multi-ethnic study of atherosclerosis; MET, metabolic equivalent.
[a]Mean (s.d.).

Additional covariates. Additional variables obtained from study questionnaire included study site, age, gender, race/ethnicity, education, income, time lived in neighborhood, acculturation, physical activity, diet, and alcohol consumption. An overall acculturation score (ranging from 0 = least acculturated to 5 = most acculturated) was created by aggregating information on nativity, years lived in the United States, and language spoken at home based on previous methods.[31]

Physical activity was measured as total light, moderate, and vigorous activity in metabolic equivalent-min 1 minutes per week. Diet was measured using a summary score of dash diet accordance (ranging from 0 to 7) based on thresholds defined in Dietary Approaches to Stop Hypertension (DASH) trials for eight nutrients (total fat, saturated fat, protein, cholesterol, fiber, potassium, magnesium, and calcium).[32] Higher scores indicate more physical activity and better dash diet accordance. Weight and height measurements were obtained during the MESA baseline examination and body mass index was calculated as weight (kg)/height $(m)^2$.

Statistical analysis. We first compared the distribution of sociodemographic characteristics and chronic stressors across racial/ethnic categories using χ^2-tests. We then used logistic regression models to calculate the adjusted probability of HTN across individual- and neighborhood-level chronic stressors, after adjusting for age and gender. We tested for a linear trend across ordered categories by including each stressor as an ordinal measure in regression models.

Binomial regression was used to estimate prevalence ratios of HTN associated with individual- and neighborhood-level stressors before and after adjustment for individual-level covariates. Binomial regression was used because of the limitations of reporting odds ratios in cases of common outcomes.[33] We used a series of sequential models to investigate the contribution of chronic stressors to race/ethnic differences in HTN. We estimated the prevalence ratios of HTN by race/ethnicity controlling for site, age, and gender in Model 1. We then added individual-level chronic stressors (Model 2), neighborhood-level stressors (Model 3), all stressors (Model 4), and all stressors plus individual- and neighborhood-level confounders (individual-level SEP, acculturation, time lived in neighborhood, neighborhood walkability, and availability of health foods; Model 5). In Model 6, we also added traditional risk factors for HTN including BMI, physical activity, diet, and alcohol consumption. These risk factors were added to the final models because they could partly mediate the effects of stressors on HTN.

We tested two-way interactions between race/ethnicity and chronic stressors (neighborhood and individual level) as well as between neighborhood stressors and sociodemographic factors (age, gender, site, individual SEP, acculturation, individual chronic stressors, and time lived in neighborhood). Following prior work, interactions were considered statistically significant if $P < 0.10$.

RESULTS

Table 1 shows the distribution of study site, age, gender, education, income, and HTN overall and by race/ethnicity. The mean age was 62.3 (s.d. = 9.9), 49.9% were hypertensive, and 41.3, 43.3, and 15.5% were white, AA, and Hispanic, respectively. Only 8.4% of Hispanics were born in the United States compared to over 90% of whites and AAs, Among foreign-born Hispanics (63.6%), the Caribbean Islands were the most common place of origin (67.8%, not shown in Table 1).

Table 2 | Individual and neighborhood stressors by race/ethnicity

	N = 2,679, %	White (*n* = 1,105), %	African Americans (*n* = 1,159), %	Hispanics (*n* = 415), %	*P* trend
Chronic burden					
0	46.0	42.2	48.1	50.1	<0.001
1	29.2	33.8	25.5	27.2	
2+	24.8	24.0	26.4	22.7	
Perceived major discrimination					
0	54.4	64.4	41.7	62.9	<0.001
1	24.3	22.4	27.3	20.7	
2+	21.3	13.1	31.0	16.4	
Everyday discrimination					
Low	29.5	33.5	21.1	42.4	<0.001
Medium	33.1	35.9	30.7	32.1	
High	37.4	30.6	48.2	25.5	
Neighborhood stressors					
Low	33.4	52.7	26.9	1.0	<0.001
Medium	33.5	35.3	36.9	19.3	
High	32.9	12.0	36.2	79.8	
One individual/neighborhood-level stressors					
Yes	50.9	35.3	61.1	64.1	<0.001
No	49.1	64.7	38.9	35.9	

P trends correspond to χ^2-test for differences by race/ethnicity.
Yes presents individuals who reported medium or high levels of atleast one individual-level stressor and the neighborhood-level stressor.

All sociodemographic characteristics except gender were associated with race/ethnicity (*P* value for all <0.001; Table 1). Whites were slightly older and had higher levels of education and income than AAs and Hispanics. AAs had the highest prevalence of HTN (59.3%) followed by Hispanics (43.6%) and whites (42.0%; $P < 0.001$). HTN prevalence for Hispanics only slightly differed by country of origin with those born in Central America and the Caribbean Islands having higher prevalence (48.6 and 47.8%, respectively) than those born in the United States and Puerto Rico (42.9 and 39.7%, respectively; not shown in Table 1). These differences were not statistically significant ($P = 0.490$).

Table 2 shows the distribution of individual- and neighborhood-level stressors overall and by race/ethnicity. All stressors were strongly patterned by race/ethnicity ($P < 0.001$). AAs reported higher levels of perceived major and everyday discrimination than Hispanics or whites, and lived in neighborhoods with more chronic stressors than whites. Hispanics lived in neighborhoods with more chronic stressors than AAs or whites, but reported levels of major and everyday discrimination similar to whites. Both AA and Hispanics were more likely to experience medium or high levels of atleast one individual- and neighborhood-level stressor as compared to whites.

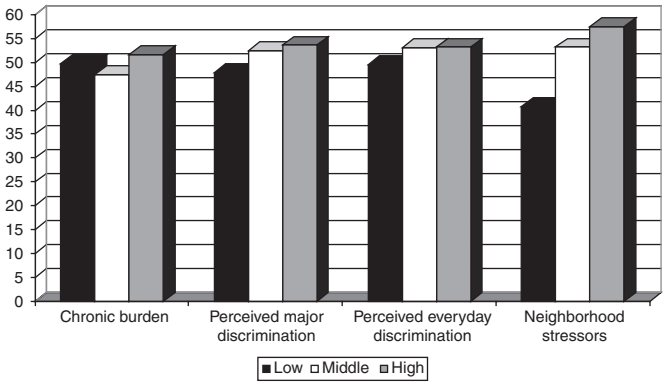

Figure 1 | Age- and gender-adjusted percent hypertension by levels and sources of chronic stressors. Prevalences estimates are adjusted by age and gender. *P* trend across categories: chronic burden: $P = 0.568$; perceived major discrimination: $P = 0.021$; everyday discrimination: $P = 0.655$; neighborhood stressors: $P < 0.001$. Low, middle, and high refer to 0, 1, and 2+ for chronic burden and perceived discrimination, and lowest, middle, and highest tertile for everyday discrimination and neighborhood-level stressors.

Figure 1 shows the adjusted prevalence of HTN by categories of individual- and neighborhood-level stressors. Higher levels of perceived major discrimination and neighborhood-level stressors were positively associated with HTN ($P = 0.021$, <0.001, respectively), after adjusting for age and gender. No clear pattern was present for chronic burden and everyday discrimination.

Table 3 shows prevalence ratios of HTN by categories of race/ethnicity and individual- and neighborhood-level stressors before and after sequential adjustment for individual- and neighborhood-level factors. Age- and sex-adjusted relative prevalences of HTN (compared to whites) were 1.30 (95% confidence interval (CI): 1.22–1.38) for AAs and 1.16 (95% CI: 1.04–1.31) for Hispanics as compared to whites (Model 1). The relative prevalence was only slightly reduced with the inclusion of individual-level stressors (Model 2) but significantly reduced with the inclusion of neighborhood-level stressors (Model 3). Specifically, when neighborhood stressors were included in the models (Model 3), the relative prevalence of HTN

Table 3 | Relative prevalence of hypertension by race/ethnicity and sources of chronic stressors

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Race						
White (referent)	—	—	—	—	—	—
Black	1.30 (1.22–1.38)	1.24 (1.17–1.30)	1.17 (1.11–1.22)	1.16 (1.11–1.21)	1.17 (1.11–1.24)	1.15 (1.08–1.23)
Hispanic	1.16 (1.04–1.31)	1.13 (1.02–1.24)	1.09 (1.00–1.18)	1.08 (1.00–1.17)	1.10 (0.95–1.28)	1.09 (0.93–1.28)
χ^2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chronic burden						
0 (referent)		—		—	—	—
1		1.00 (0.95–1.05)		1.00 (0.96–1.05)	1.00 (0.95–1.06)	1.00 (0.94–1.06)
2+		1.02 (0.97–1.08)		1.02 (0.97–1.07)	1.03 (0.97–1.09)	1.01 (0.95–1.08)
χ^2		0.698		0.735	0.555	0.958
Major discrimination						
0 (referent)		—		—	—	—
1		1.00 (0.95–1.06)		1.00 (0.95–1.05)	1.00 (0.95–1.06)	1.02 (0.95–1.09)
2+		1.01 (0.95–1.08)		1.01 (0.96–1.07)	1.01 (0.95–1.08)	1.02 (0.96–1.08)
χ^2		0.923		0.945	0.950	0.823
Everyday discrimination						
Low (referent)		—		—	—	—
Medium		1.02 (0.97–1.08)		1.01 (0.96–1.06)	1.02 (0.97–1.08)	1.03 (0.96–1.10)
High		0.95 (0.89–1.02)		0.96 (0.91–1.02)	0.96 (0.90–1.03)	0.96 (0.90–1.04)
χ^2		0.076		0.167	0.189	0.168
Neighborhood stressors						
Low (referent)			—	—	—	—
Medium			1.05 (1.00–1.10)	1.04 (0.99–1.09)	1.04 (0.98–1.11)	1.04 (0.98–1.12)
High			1.06 (0.99–1.13)	1.05 (0.99–1.12)	1.04 (0.95–1.13)	1.02 (0.93–1.13)
χ^2			0.129	0.179	0.360	0.457

Model 1: study site, age, gender, race/ethnicity; Model 2: Model 1 + individual-level stressors; Model 3: Model 1 + neighborhood-level stressors; Model 4: Model 1 + individual + neighborhood stressors; Model 5: Model 4 + education, income, acculturation, neighborhood walkability, availability of healthy foods, time lived in neighborhood; Model 6: Model 5 + body mass index, alcohol consumption, physical activity, diet. Neighborhood walkability and availability of healthy foods were included as continuous variables.

(compared to whites) were reduced from 1.30 to 1.17 (95% CI: 1.11–1.22) for AAs and from 1.16 to 1.09 (95% CI: 1.00–1.18) for Hispanics. Additional adjustment for income, education, acculturation, neighborhood walkability, availability of health foods, and time lived in neighborhood did not significantly modify these results (Model 5), nor did the inclusion of HTN risk factors (Model 6). There were no statistically significant interactions between race/ethnicity, chronic stressors (individual and neighborhood), and sociodemographic factors ($P > 0.100$ for all 14 interactions tested).

DISCUSSION

The overall goal of our study was to investigate individual- and neighborhood-level chronic stressors as potential mechanisms contributing to race/ethnic differences in blood pressure. Racial/ethnic disparities in HTN prevalence have been previously reported in the MESA cohort with AAs having a higher prevalence of HTN than whites or Hispanics in the full MESA sample.[34] However, in this subsample restricted to three of the MESA sites (including NY where Hispanics were predominately Caribbean-origin), we also found that the prevalence of HTN was higher in Hispanics as compared to whites. This is contrary to nationally representative data sources such as the National Health and Nutrition Examination Survey,[35,36] which include Hispanics of predominately Mexican origin.

We found that AAs reported more perceived major and everyday discrimination than whites and Hispanics. In addition, AAs and Hispanics lived in more stressful neighborhoods than whites and higher levels of neighborhood stressors in turn were associated with a higher prevalence of HTN, independent of site, age, and gender. We also documented a substantial reduction in the association between race/ethnicity and HTN after adjustment for neighborhood-level stressors.

This study is novel in extending the study of psychosocial stressors and HTN to the neighborhood level. This is one of the first studies to measure associations between neighborhood stressors and blood pressure by moving beyond census-derived indicators of neighborhood SEP to the direct measurement of neighborhood conditions. We previously examined a range of physical (walkability, availability of healthy foods) and social features (safety, social cohesion) of neighborhood environments in relation to HTN and documented associations between these features and HTN, independent of some individual-level factors (age, gender, education, income). In current analyses, we found that neighborhood stressors were also associated with HTN, although possibly due to the strong patterning of neighborhood characteristics by race/ethnicity, these associations were not statistically significant after adjusting for race/ethnicity. However, our trend of positive associations between neighborhood stressors and the prevalence of HTN is consistent with prior work showing significantly higher systolic and diastolic blood pressure for black men and women living in high-stress areas (as characterized by census measures) compared to black men and women in low-stress areas, after adjustment for a series of individual-level variables (such as age and SEP).[23]

Our study is also one of few that attempt to examine the contribution of stressors to race/ethnic disparities in HTN and related outcomes.[16–18] The fact that race/ethnic differences in HTN were reduced after adjusting for neighborhood stressors is compatible with (although it does not categorically demonstrate) a causal role of neighborhood stressors in creating the observed disparities in HTN prevalence.[37] The proportion of race/ethnic differences in HTN prevalence that is statistically explained by neighborhood stressors may differ from sample to sample depending on the degree of residential segregation and the strength of associations between neighborhood characteristics and HTN; hence, we do not draw inferences regarding the percent of the difference "explained." In addition, because of the potential for many unobserved social and biological differences between race/ethnic groups, which are not accounted for by the variables we included, we make no attempt to interpret the determinants of the race/ethnic difference that persists after adjustment.[38]

Although we provide a more complete assessment of chronic stressors operating at different levels than prior work, we have not considered the full spectrum of stressors that individuals are exposed to throughout the lifecourse. For example, we did not examine job stressors (which have been linked to HTN[13] because of the large representation of retirees (34%) in this sample. Additionally, the stressors we did include are subject to measurement error. Defensiveness or denial may cause an underreporting of discriminatory acts whereas anger and hostility may lead to overreporting.[39,40] Our measure of neighborhood stressors was based on prior work; however, we did not have all items that comprised previously validated scales of neighborhood disorder.[20] Despite this exclusion, we found that our measure had good internal consistency and test–retest reliability. Limitations of our measures of stress (in both type and measurement) may have contributed to our inability to detect an association between stressors and HTN in adjusted models.

As an additional concern, neighborhood chronic stressors may cluster with other features of neighborhood infrastructure. This creates difficulty in teasing out whether it is the stressors or the physical features of neighborhoods associated with them, which contribute to HTN. In our data, the neighborhood stressors scale was moderately correlated with neighborhood measures of walkability ($r = -0.45$) and availability of healthy foods ($r = -0.33$). Additional adjustment for these factors did not further reduce race/ethnic differences although this may be because the neighborhood stressor scale was already capturing these other neighborhood attributes.

Other limitations include limited overlap in the neighborhood stressors by race/ethnicity. For example, 79.8% of Hispanics lived in neighborhoods with the highest tertile of neighborhood stressors as compared to only 12.0% of whites. Regression results are therefore based on extrapolations to areas of sparse data, but we believe these extrapolations are reasonable. Another limitation is the inability to fully capture the accumulation of chronic stressors (at the neighborhood level) to impact a chronic condition like HTN that develops

over the lifecourse. In our sample, 44.1% of respondents have resided in the current neighborhood for ≥20 years. We did not find any statistically significant interactions between time lived in neighborhood and neighborhood stressors in relation to HTN prevalence. The absence of effect modification by time lived in neighborhood could have resulted from individuals being exposed to similar conditions in previous neighborhoods. However, we had limited statistical power to detect significant interactions.

In summary, in this ethnically diverse sample, we found that cross-sectional associations between race/ethnicity and HTN were reduced after accounting for chronic stressors at the neighborhood level. Although these results need to be confirmed in longitudinal and lifecourse designs, they suggest that multilevel sources of stress may contribute to race/ethnic disparities in HTN. Future work also needs to examine the behavioral and biological mechanisms through which stressors may be related to HTN. Our findings suggest that efforts to reduce race/ethnic disparities in high blood pressure may benefit from consideration of possible stress-inducing features of neighborhoods.

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