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Association between Telomere Length and Neighborhood Characteristics by Race and Region in US Midlife and Older Adults

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Abstract

Disadvantaged neighborhoods are correlated with worse health outcomes, particularly among US Blacks. However, less is known about the link between neighborhood characteristics and biomarkers of cellular age, such as telomere length (TL), which may be implicated in racial health inequities. Moreover, this relationship may vary across US region given patterns of racial segregation across the US. Therefore, this study analyzed 2008 Health and Retirement Study data on 3,869 US-born white and Black adults >50 years old to examine race differences in the relationship between salivary TL and (1) neighborhood safety, cleanliness, and social cohesion and (2) interactions between neighborhood characteristics and US region. Neighborhood characteristics were not associated with TL in whites. However, significant associations were found among Blacks with variation by region. Blacks living in less clean neighborhoods in the Northeast ($b = -0.03$, $SE = 0.01$, $p < 0.05$), Midwest ($b = -0.04$, $SE = 0.01$, $p < 0.01$), and South ($b = -0.05$, $SE = 0.01$, $p < 0.01$) as well as those reporting less neighborhood safety and social cohesion in the Midwest ($b = -0.03$, $SE = 0.02$, $p < 0.05$ and $b = -0.03$, $SE = 0.01$, $p < 0.05$) and South ($b = -0.03$, $SE = 0.01$, $p < 0.05$ for both characteristics) had shorter TL than Blacks in the West. Therefore, exposure to neighborhood level historical discrimination and neglect may be detrimental to TL in Blacks. Future research should further examine how neighborhoods contribute to aging disparities.

Keywords

Neighborhood Characteristics; Race; Health Disparities; Telomere Length; Aging

INTRODUCTION

Socially and economically disadvantaged neighborhoods are associated with poor health outcomes such as depression (Echeverria et al., 2008), cardiovascular disease (Diez-Roux et

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al., 1997), hypertension (Mujahid et al., 2011), and physical disability (Beard et al., 2009) in US adults. However, the pathways linking neighborhoods to health, including biological markers related to disease risk, have not been completely established. For example, neighborhoods characterized by high disorder (i.e., being unsafe or unclean) and low social cohesion may affect health over the life course via exposure to stressful circumstances (Geronimus et al., 2015; Massey, 2004; Williams & Collins, 2001). Long-term exposure to stressors such as adverse neighborhood conditions may promote physiological dysregulation and increase likelihood of disease development and related mortality (McEwen, 1998; McEwen & Seeman, 1999). Consequently, research examining the relationship between neighborhood characteristics and stress-sensitive biomarkers related to morbidity and mortality is needed to advance knowledge of mechanisms driving health inequities.

One biomarker implicated in the chronic stress-disease pathway is telomere length (TL). Telomeres are repetitive DNA-protein complexes serving as protective caps at the ends of chromosomes. Telomeres shorten during replication, with cells having a finite number of times they can replicate. Considered a marker of cellular age, shorter TL is linked to aging-related health conditions, such as cardiovascular disease and some cancers, as well as premature mortality. Moreover, TL may be indicative of biopsychosocial processes (i.e., chronic stress and associated physiological dysregulation) underlying disease development, with research suggesting that exposure to chronic stress is associated with shorter TL and thus increased disease and mortality risk (Cawthon et al., 2003; Epel et al., 2004; Fitzpatrick et al., 2007; Kimura et al., 2008; Révész et al., 2014; Rode et al., 2015; Shalev et al., 2013; Tomiyama et al., 2012).

Few studies have assessed the relationship between TL and neighborhood characteristics, with some using objective measures such as neighborhood-level socioeconomic status (SES) and other research examining respondent perceptions of their neighborhoods. For example, Lynch and colleagues (2017) found greater population density and urban crowding to be associated with shorter TL in adults. In a sample of white and Black mothers in the US, greater neighborhood disadvantage measured as an index including several SES-related factors such as census tract adult education, poverty rate, and unemployment was associated with shorter TL (Massey et al., 2018). Conversely, Needham and colleagues (2014) did not find neighborhood SES to be related to TL in a sample of US midlife and older adults. However, shorter TL was associated with worse ratings on a neighborhood quality scale including measures of neighborhood aesthetics, safety, and social cohesion (Needham et al., 2014). Another study in the Netherlands that examined a perceived neighborhood quality scale capturing overall neighborhood rating as well as perceptions of noise, safety, and vandalism found that adults reporting worse neighborhood perceptions had shorter TL (Park et al., 2015). Similarly, Gebreab and colleagues (2016) found that negative perceptions of neighborhood quality was associated with shorter TL in a sample of US Black women. In general, these findings indicate that low neighborhood quality is related to shorter TL among residents compared to TL of individuals living in more favorable neighborhoods, with residents' perceptions of their neighborhoods rather than measures of neighborhood SES more consistently associated with TL. Because activation of the stress response is driven by negative perceptions, unfavorable beliefs about neighborhoods may be more strongly associated with shorter TL than objective measures of neighborhood characteristics.

Moreover, assessing the relationship between neighborhoods and TL may elucidate determinants of health disparities between Blacks and whites in the US. The greater prevalence of chronic conditions and mortality in US Blacks compared to whites may be explained by racial dissimilarity in neighborhood contexts. Although US Blacks are more likely to be exposed to health-deteriorating neighborhood characteristics than whites, the extent to which Blacks experience neighborhood disadvantage may differ by region of the US given the historical shifts in residential location by race. For example, the greater likelihood of US Blacks than whites to be exposed to concentrated poverty is a result of the interaction of segregation and lack of socioeconomic opportunities in Black neighborhoods particularly in the Northeast and Midwest (Iceland & Hernandez, 2017). Socioeconomically disadvantaged neighborhoods into which Blacks have historically been placed are often characterized by high disorder and lack of social cohesion among residents. Exposure to chronic stressors such as crime can directly affect health via accelerated cellular aging and disease development (Robinette et al., 2016), as well as indirectly through limited engagement in physical activity due to safety concerns (Gallagher et al., 2010; Lorenc et al., 2012). Additionally, low social cohesion in neighborhoods is associated with worse health via lack of social control exemplified by increased crime, fewer role models of healthy behaviors, and hindered cooperation in neighborhood upkeep (Browning & Cagney, 2002). Barriers to developing relationships with neighbors may also inhibit individuals' access to social support as a stress buffer, which can negatively affect health (Thoits, 2011; Umberson & Montez, 2010). For example, low social cohesion is associated with worse cardiometabolic functioning among midlife and older US adults (Robinette et al., 2018).

Altogether, existing evidence provides a framework to understand the biopsychosocial factors that connect neighborhood conditions to health. However, these mechanisms are less explored, including how perceptions of neighborhood characteristics may be related to TL. There is also a dearth of research examining heterogeneity across and within racial groups to better understand how neighborhoods may contribute to health inequities. More specifically, research assessing regional differences in the association between perceived neighborhood characteristics and TL across race in midlife and older adults in the US is lacking. Therefore, this study aims to test the following hypotheses: after accounting for individual-level SES, health, and behavioral factors (1) worse perceptions of neighborhood safety, cleanliness, and social cohesion will be associated with shorter TL among Blacks and whites, (2) the relationship between neighborhood characteristics and TL will be stronger in Blacks compared to whites, and (3) the relationship between neighborhood characteristics and TL will vary by region of the US among Blacks.

METHODS

Data Source

The Health and Retirement Study (HRS) is a longitudinal survey of demographic, psychosocial, health, and biomarker data. The HRS is nationally representative of US adults >50 years old, with oversamples of racial/ethnic minorities. In 2008, a subsample of the larger HRS population provided saliva samples, which were used to assay telomere length. Data for this study were obtained from the 2008 wave of the HRS including the Core

Survey, Leave-Behind Questionnaire, and the Telomere Length Biomarker Data. Additionally, the RAND Corporation produced an imputed data file for economic measures; thus, measures for income and wealth were taken from the RAND data file. The HRS is supported by grant funding from the National Institute on Aging (NIA U01AG009740) and the Social Security Administration. Further details on the administration and content of the HRS can be found in Juster and Suzman (1995) and at <http://hrsonline.isr.umich.edu/>.

Measures

Telomere Length—In the 2008 wave of data collection, consenting HRS participants provided saliva samples using an Oragene Collection Kit for the assay of TL. Samples were sent to a laboratory for DNA extraction and storage in 96 well plates, and then stored in their original plates in a -80°C freezer until assayed. Assays were performed by TeloYears (formally Telome Health) using quantitative PCR (Roche LightCycler 480) in which the telomeric repeat (T) is compared to a standard reference (S). This yields a T/S ratio, which is the TL of each participant divided by the length of the standard reference. The value computed is average TL for each participant (Cawthon, 2002). A log transformation of TL was used for analyses due to this variable having a skewed distribution (range = -0.641 – 1.325). Additional information about the TL assay procedure can be found in documentation provided by the HRS (HRS, 2013).

Neighborhood Characteristics—Neighborhood disorder encompassed questions around perceived safety and cleanliness. Participants rated multiple neighborhood characteristics on a scale of 1 to 7, with a score of 7 indicating the worst rating for each characteristic. In regards to safety, participants were asked to rate their perceptions of problems with vandalism or graffiti and feeling unsafe walking alone at night. Cleanliness was determined by participants' rating of perceptions of the local area not kept clean and if there are many vacant houses or storefronts. Lack of social cohesion (i.e., social dis cohesion) was assessed as perceptions of not feeling a part of the area, not being able to trust people, people being unfriendly, and not having anyone to call on for help. To create variables for perceived safety, cleanliness, and social dis cohesion, responses to each of the questions within each category were summed and averaged to maintain the range of possible values to be between 1 and 7, with higher scores representing more negative perceptions of each neighborhood characteristic.

US Region—The four-region designation of the US Census Bureau was used to measure US region. This measure categorizes the US into West, Midwest, South, and Northeast. For analyses, West was set as the reference group.

Control Variables—Age was measured as a continuous variable. Gender (reference: man) and married/partnered status (reference: not married or partnered) were also included. Socioeconomic status was measured by years of education, income, and wealth. Health and behavioral factors that have been associated with TL as well as behaviors that may be used as coping strategies for dealing with stress were included as measures in analyses. Self-reported health was measured as a count of conditions including cardiovascular disease, stroke, high blood pressure, diabetes, respiratory conditions, arthritis, and cancer. Because a

small proportion of participants reported 5 or more conditions, the variable for number of health conditions was constructed as 0, 1, 2, 3, and 4 conditions. Additionally, measures of obesity (reference: not obese) and number of self-reported depressive symptoms using an eight-item shortened form of the Center for Epidemiologic Studies Depression scale (CES-D) were included in analyses (Wallace, 2000). Health-related behaviors included smoking status, alcohol use, and physical activity. Smoking status was categorized as never (reference), former, or current smoker. Alcohol use was categorized as never (reference), moderate (1–2 drinks per day), or heavy (> 3 drinks per day) based on US dietary guidelines for adults (US DHHS & USDA, 2015). Lastly, a combined measure of reported frequency of moderate or vigorous physical activity was created. Based on global recommendations for physical activity among older adults, engagement in either moderate or vigorous physical activity was categorized as frequent (more than once per week: reference), sometimes (once per week or 1–3 times per week), or hardly ever or never (WHO, 2010).

Sample Construction

The initial sample included 5,808 participants with salivary TL data. Examination of the distribution of TL indicated five outliers with high TL values, which were deleted from the sample. Because the HRS is designed to be representative of US adults ages 51 years and older, individuals less than 51 years of age were removed from the sample. The sample was restricted to include only US-born non-Hispanic Blacks and non-Hispanic whites in order to support the theoretical framing that life course exposure to the historical context of racial discrimination via neighborhood disadvantage in the US may negatively impact the health of Blacks. In order to construct the variables for average score of perceptions of neighborhood safety, cleanliness, and social dis cohesion, complete information was required for each set of questions. Therefore, cases who were missing values for any of the individual measures of neighborhood characteristics were removed from the sample. Only participants without missing values for the control variables and non-zero values for the sample weight were retained in the final sample (n=3,869).

Analyses

Sample characteristics were calculated for Blacks and whites separately. Differences in mean values and proportions of each study variable were examined by race using adjusted Wald tests. To test the proposed hypotheses, linear regression models stratified by race were run with each neighborhood characteristic (safety, cleanliness, and social dis cohesion) included independently. First, log TL was regressed on the measured neighborhood characteristic controlling for all other variables. The second model included an interaction term comprised of region and the neighborhood characteristic being examined. HRS survey weights were applied for both descriptive and regression analyses.

RESULTS

Descriptive Statistics

Table 1 provides weighted descriptive statistics for each of the study variables compared by race. On average, Blacks in the study sample had longer TL and were 2.66 years younger than whites. In regards to marital status, a smaller proportion of Blacks were married or

partnered compared to whites. Additionally, Blacks reported fewer years of education and less income and wealth than whites. The distribution of race differed by region of the US, with a greater proportion of Blacks living in the South compared to whites (62.25% versus 34.67%). Blacks reported less favorable perceptions of neighborhood cleanliness, safety, and social dis cohesion compared to whites. Furthermore, Blacks differed from whites in regards to health status and health-related behaviors. For example, a greater proportion of Blacks were obese (46.67% versus 31.42%) and Blacks reported an average of 2.16 conditions compared to an average of 1.87 conditions reported by whites. Blacks also reported more depressive symptoms as indicated by CES-D scores compared to whites. A greater percentage of Blacks were current smokers compared to whites (21.63% versus 12.81%) and never engaged in moderate to vigorous physical activity (25.4% versus 15.79%) compared to whites. However, no difference in heavy alcohol use was found by race.

Additional analyses using adjusted Wald tests compared average TL and neighborhood perceptions in Blacks and whites across regions of the US (See Table 2). Variability in TL across US regions was found in Blacks but not whites. Within Blacks, those living in the Midwest had shorter TL on average compared to Blacks in the Northeast and South. Moreover, some within race variability in average neighborhood perceptions was found. Overall, Blacks living in the Midwest reported the highest average scores for their neighborhoods being unclean and unsafe as well as lacking social cohesion (See Figure 1).

Linear Regression Models

Tables 3 and 4 (and Supplemental Tables 1 and 2) show results for the linear regression models of TL and neighborhood safety, cleanliness, and social dis cohesion for whites and Blacks respectively. Results for whites shown in Table 3 indicate that perceived neighborhood characteristics are not associated with TL. However, Table 4 indicates that neighborhood characteristics are associated with TL in Blacks with regional variability in this relationship. Greater social dis cohesion and worse perceptions of neighborhood safety are associated with shorter TL among Midwest and Southern Blacks compared to Blacks living in the West. Among Blacks living in the Northeast, Midwest, and South, worse perceptions of neighborhood cleanliness were associated with shorter TL compared to Blacks living in the West.

To further test for regional variation in the relationship between neighborhood perceptions and TL, additional analyses were run with South set as the reference group for region. Compared to Blacks in the South, Blacks in the West have longer TL with increasingly worse perceptions of neighborhood safety ($b= 0.03$, $p=0.031$), cleanliness ($b= 0.05$, $p=0.001$), and social cohesion ($b= 0.03$, $p=.048$). Blacks in the Northeast have longer TL with worse perceptions of neighborhood cleanliness ($b= 0.02$, $p=0.075$) compared to Blacks in the South. Next, analyses were run using Midwest as the reference group for region. Blacks in the West have longer TL than Midwest Blacks with worse perceptions of neighborhood safety ($b= 0.03$, $p=0.031$), cleanliness ($b= 0.04$, $p=0.002$), and social cohesion ($b= 0.03$, $p=0.048$). Moreover, using an average neighborhood perception variable that combines safety, cleanliness, and social cohesion indicates that among Blacks TL is shorter

with worse overall perceptions of neighborhoods across all US regions compared to the West (Northeast: $b=-0.04$, $p=0.035$; Midwest: $b=-0.05$, $p=0.01$; South: $b=-0.05$, $p=0.007$).

DISCUSSION

In recognizing the links between social inequality, neighborhood quality, and health, this study aimed to examine both racial and regional differences in the relationship between perceived neighborhood characteristics and TL – a biomarker of cellular age – in a nationally representative sample of US midlife and older adults. This study provides evidence that Blacks perceived their neighborhoods less favorably than whites living in the same region of the US. Within race differences in both neighborhood perceptions and TL were also found. In particular, Blacks in the Midwest reported the poorest ratings of neighborhood characteristics and had the shortest TL compared to Blacks in other regions of the country.

Linear regression analyses indicated that perceived neighborhood characteristics across regions of the US were associated with TL in Black adults but not for whites even after accounting for individual SES, health indicators, and behaviors. Thus, the hypothesis that TL would be negatively associated with neighborhood perceptions in both Blacks and whites was partially supported. As hypothesized, the relationship between TL and neighborhood perceptions was more pronounced in Blacks compared to whites. Moreover, the association between neighborhood perceptions and TL was not explained by individual-level differences in SES, health status, depressive symptoms, or behavioral risk factors. These findings are similar to results of previous research. For example, Geronimus and colleagues (2015) found that less neighborhood satisfaction was associated with shorter TL in a diverse sample of Detroit adults even after accounting for individual-level SES, psychosocial stress, smoking, and BMI. Other research suggests that physical and social characteristics of neighborhoods may condition the relationship between SES and health (Browning & Cagney, 2002).

Additionally, study results coincide with recent evidence that neighborhood disadvantage is associated with other biomarkers of biological aging (e.g., DNA methylation) (Lei et al., 2018; Smith et al., 2017). Existing research suggests that changes to the epigenome – that is, modifications that determine gene expression – via life course exposure to social and environmental risk factors may be a mechanism underlying health disparities. In particular, social disadvantage measured at the neighborhood level was associated with epigenetic alterations linked to increases in cortisol, inflammation, and oxidative stress each of which may be implicated in TL erosion (Olden et al., 2015). Thus, there is evidence to suggest that adverse neighborhood conditions may promote cellular-level changes related to chronic disease morbidity and overall mortality.

Furthermore, variability in the relationship between neighborhood characteristics and TL was found within Blacks across US region. For example, shorter TL was associated with worse perceptions of neighborhood cleanliness among Blacks in the Northeast, Midwest, and South compared to the West. Additionally, lack of safety and social cohesion were marginally significantly associated with TL for Blacks living in the Northeast. While average perceptions of these two characteristics were on par with perceptions reported by

Blacks in the West and South, they may be qualitatively different across region and thus do not impart the same level of environmental or psychological stress associated with TL. Previous research shows that independent assessment of domains of neighborhood characteristics may reveal unique associations with each domain and TL. For example, perceptions of neighborhood safety but not noise were independently associated with TL (Park et al., 2015). Thus, examining domains of neighborhood characteristics separately may be a useful analytic approach considering that each domain may tap into different biopsychosocial stress processes (Park et al., 2015).

Converse to this study's findings, other research testing an interaction between race and neighborhood disadvantage did not find differences between Blacks and whites in the relationship with TL (Massey et al., 2018). One explanation is that the present study included an older sample of adults; thus, these individuals may have been exposed to neighborhood stressors for a longer period of time. Therefore, this study may be better able to capture the impact of accumulated stress on TL.

Also, neighborhoods may play a different role in health and wellbeing for older adults compared to younger individuals. Older adults, especially those with physical or cognitive limitations, may more carefully consider how to carry out daily activities on their own within their neighborhoods. Because Blacks in the US disproportionately experience worse health than whites, they may have an increased sense of vulnerability to disorder and low social cohesion due to their health impairments and so may be more likely to perceive neighborhood conditions negatively. As a result, older Black adults may have a heightened awareness of neighborhood disorder such as vandalism, graffiti, or neglected structures. Self-efficacy to navigate their neighborhoods may then decline if surroundings are considered hazardous. For example, older Blacks' who perceive their neighborhoods as unsafe or unclean may choose to limit time spent outside of their homes thus decreasing physical activity and social engagement (Gallagher et al., 2010). Negative health effects associated with perceived lack of safety may be compounded by limited availability of social support (Choi et al., 2017). The negative health consequences of social isolation may be particularly detrimental to older adults who may have a more difficult time sustaining social relationships due to the death of peers or spouses, family members living far away, and limited availability of opportunities to be socially engaged (Cornwell & Waite, 2009). For Black older adults who experience disparities in chronic conditions and physical disability, neighborhood-based structural or social barriers to maintain good health may exacerbate existing health inequities.

The findings of the present study must be considered within the historical context of systemic residential segregation of Blacks in the US via policies and practices that barred Blacks from experiencing the same housing and economic mobility opportunities as their white counterparts. Thus, Blacks currently are over-represented in neighborhoods scarred by high levels of poverty and inadequate access to resources. Regional differences in perceptions of neighborhoods and association with TL in Blacks point to the history of Black migration from the South to other areas of the US driven by the prospect of job opportunities – especially during the Second Great Migration when study participants 65 and older would have entered adulthood – and the consequences of declines in regional

economies. For example, Midwest communities were particularly hard hit by the collapse of steel industries and the lack of efforts to reinvest in these communities following the economic downturn. Moreover, Williams and Collins (2001) discuss the lower purchasing power of Blacks in disadvantaged neighborhoods as a source of health inequity. The “poverty tax” is related to a lack of access to and higher costs of goods and services in poor Black communities. The interaction of socioeconomic hardship with race-based residential segregation may have increased Midwestern Blacks’ exposure to chronic stressors, leading to accumulated physiological effects which may be captured in TL. Likewise, the legacy of slavery perpetuated in the economic, social, and environmental conditions in the South can have lasting health effects on Blacks who reside in this region.

Another possible mechanism by which neighborhoods may be associated with TL is via experiences of everyday discrimination. Living in disadvantaged communities may increase exposure to not only systemic racism for Blacks but also discrimination across various aspects of individuals’ lives. For example, everyday discrimination was associated with shorter TL in Blacks in the HRS (Liu & Kawachi, 2017). Moreover, regional patterns by race in health-related behaviors have been previously documented and these differences may point to a behavioral pathway by which exposure to stress may contribute to the findings of this study. For example, King et al., (1999) found that Blacks in the Midwest had the highest rates of smoking while Blacks in the West had the lowest rates.

Strengths and Limitations

One strength of this study is the use of a large, nationally representative panel of diverse middle-aged and older adults. This study was able to examine multiple categories of perceived neighborhood characteristics and test their association with a biomarker of cellular age across race and US region. One limitation of the HRS data is that TL was measured only in the 2008 wave. Therefore, a faster rate of decline in TL over time due to worse neighborhood perceptions could not be assessed. This is important to consider as rate of change in TL may be a more indicative mechanism of the cumulative effects of chronic stress. However, TL taken at a single point in time is a valuable measure of the accumulated biopsychosocial processes at the population level. Additionally, this study did not include a measure of the length of residence in current neighborhood or changes in neighborhood characteristics over time. However, what may be captured by TL in this study is the long-term processes that created the lower quality neighborhoods in which respondents currently reside.

Future Directions

Future research should aim to disentangle the effect of perceived and contextual/structural conditions of neighborhoods on health. This includes exploring interactions between measures of individual-level social disadvantage and perceptions of neighborhood characteristics. Additionally, future research may consider including both individual perceptions of neighborhood conditions and measures of objective neighborhood characteristics, such as neighborhood-level SES, racial residential segregation, and availability of economic and health related resources. Studies may also aim to capture life course exposure to disadvantaged neighborhood contexts in order to better understand the

long term, accumulated effects on health and aging. This may include measuring duration of residence in current neighborhood as well as assessing neighborhood characteristics and residents' perceptions at different points of the life course. Examining longitudinal measures of TL will provide additional information about the impact of neighborhood quality on cellular aging-related mechanisms.

Differences between rural and urban settings may play a role in the regional variability in the relationship between neighborhood characteristics and TL found within Blacks in this study. For instance, Blacks in the South are concentrated in rural areas, while Blacks in the Midwest and Northeast primarily reside in more urban areas. Rural versus urban living may be linked to health in different ways. For example, exposure to air pollution, noise, and crowding may be unique risk factors for individuals living in urban areas. Limited access to healthcare or economic resources can pose limitations on individuals in rural communities. Thus, future research examining the relationship between neighborhood characteristics and TL should also explicitly analyze rural versus urban residence as an added dimension to better understand the role of region in health disparities among Blacks. Including a measure of urbanicity in an interaction term with US region and neighborhood characteristics or stratifying regression models by rural-urban residence will contribute new knowledge of whether the regional differences found in the present study are capturing unique histories of Black communities in these regions or instead rural versus urban context as a driver of these patterns.

Another variable to consider in future research is the migration patterns of Blacks to certain regions of the country. For example, the migration history of Blacks from the South to the Midwest for work opportunities intersected with racial discrimination practices and policies which culminated in shifts in the housing, economic, and social landscapes for Blacks in the Midwest. The stress of making economic gains, losing economic opportunities, and not having resources replaced via systematic disinvestment in Black communities should be examined as a contextualizing factor of how neighborhoods may affect TL in US Blacks.

In conclusion, this study provides new evidence of how neighborhood characteristics may be associated with TL, a biomarker related to disease morbidity and mortality. Moreover, the present study adds to the literature on how disadvantaged neighborhoods may have unique effects on health and aging for US Blacks. As shown in this study, Black midlife and older adults overall and particularly those living in the Midwest and South may be at greater risk for exposure to poor neighborhood conditions associated with shorter TL. Therefore, more research on how neighborhoods affect health across as well as within racial groups is needed. In particular, studies using biomarkers such as TL should aim to understand the underlying mechanisms driving variability in these pre-clinical measures in order to better address health inequities across the life course.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

Black US midlife and older adults perceive their neighborhoods less positively than Whites.

Blacks in the Midwest perceive their neighborhoods less favorably than Blacks in other regions.

Blacks in the Midwest have shorter telomere length than those in the Northeast and South.

Neighborhood perceptions are positively associated with telomere length among Black US adults.

The association between neighborhood perceptions and telomere length in Blacks differs by region.

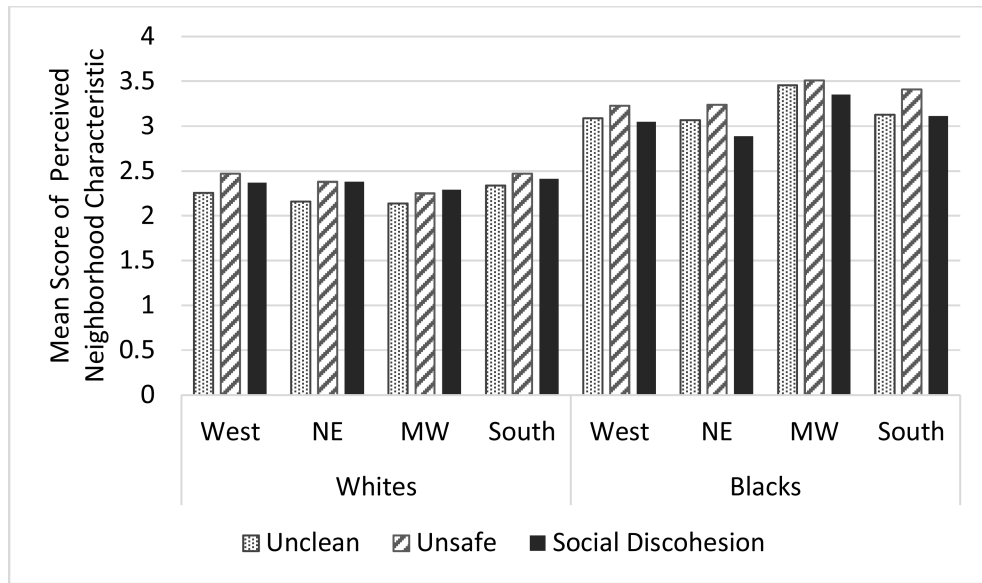


Figure 1:
 Mean scores of perceived neighborhood characteristics by race and region, HRS 2008
 (n=3,869)

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Table 1

Weighted sample characteristics reported as means (standard errors) and percentages, HRS 2008 (n=3,869)

	Whites (n=3,352)	Blacks (n=517)
Telomere Length (logged)	0.11 (0.01)	0.15 [*] (0.01)
Age (51–100)	67.21 (0.24)	64.55 [*] (0.61)
Woman	53.25%	55.40%
Married/Partnered	63.98%	36.27% [*]
Education (years)	13.36 (0.07)	12.16 [*] (0.21)
Income	\$75,267.88 (\$2,989)	\$40,971 [*] (\$2,533)
Wealth	\$596,304 (\$30,085)	\$138,046 [*] (\$22,726)
Region		
West	19.38%	8.95% [*]
Northeast	15.12%	10.11%
Midwest	30.83%	18.69% [*]
South	34.67%	62.25% [*]
Average Neighborhood Unclean (0–7)	2.24 (0.03)	3.16 [*] (0.11)
Average Neighborhood Unsafe (0–7)	2.39 (0.03)	3.39 [*] (0.12)
Average Social Dis cohesion (0–7)	2.36 (0.03)	3.14 [*] (0.09)
Obese	31.42%	46.67% [*]
Number of Conditions (0– 4)	1.87 (0.03)	2.16 [*] (0.07)
CES-D (0–8)	1.22 (0.05)	1.88 [*] (0.12)
Smoking Status		
Never	42.75%	39.35%
Former	44.44%	39.03%
Current	12.81%	21.63% [*]
Alcohol Use		
Never	60.18%	69.84% [*]
Moderate	30.57%	17.45% [*]
Heavy	9.25%	12.71%
Moderate/Vigorous Physical Activity		
Never	15.79%	25.40% [*]
Sometimes	22.69%	28.30% [*]
Frequent	61.52%	46.30% [*]

* Racial difference at p<0.05

Table 2

Regional and racial differences in mean TL and mean perceptions of neighborhood characteristics, HRS 2008 (n=3,869)

	Whites				Blacks			
	West	Northeast	Midwest	South	West	Northeast	Midwest	South
Mean Log TL ^{a, d}	0.11	0.10 [*]	0.11	0.10 [*]	0.13	0.16	0.13	0.16
Mean Score								
Unclean ^{b, d}	2.26	2.16	2.14	2.34	3.09 ⁺	3.07 [*]	3.46 [*]	3.13 [*]
Mean Score								
Unsafe ^{b, c}	2.47	2.38	2.25	2.47	3.23	3.24 [*]	3.51 [*]	3.41 [*]
Mean Score								
Social Discohesion ^e	2.37	2.38	2.29	2.41	3.05 [*]	2.89 [*]	3.35 [*]	3.11 [*]

^{*} within region differences between whites and Blacks at p<0.05

⁺ within region differences between whites and Blacks at p<0.01

^a within Blacks difference between Midwest and Northeast at p<0.05

^b within whites difference between Midwest and South at p<0.05

^c within whites difference between Midwest and West at p<0.05

^d within Blacks difference between Midwest and South at p<0.1

^e within whites difference between Midwest and South at p<0.1

Table 3

Linear regression models of association between log TL and perceived neighborhood characteristics by US region among whites, HRS 2008 (n=3,352)^a

	Unclean b (SE)	Unsafe b (SE)	Social Dis cohesion b (SE)
Neighborhood Characteristic	0.001 (0.004)	0.002 (0.003)	-0.002 (0.004)
Region			
Northeast	-0.01 (0.01)	-0.01 (0.01)	-0.02 (0.0)
Midwest	0.004 (0.01)	0.004 (0.01)	0.002 (0.01)
South	-0.002 (0.01)	-0.002 (0.01)	-0.01 (0.01)
Region * Neighborhood Characteristic			
Northeast	0.004 (0.006)	0.01 (0.01)	0.01 (0.01)
Midwest	0.0003 (0.004)	0.001 (0.003)	0.001 (0.01)
South	-0.0004 (0.004)	-0.0003 (0.004)	0.003 (0.01)
Constant	0.10 (0.04) *	0.09 (0.04) *	0.103 (0.04) *
R squared	0.0286	0.0301	0.0286

⁺
p<0.1

^{*}
p<0.05

^aModels control for age, gender, marital status, years of education, log income, log wealth, obesity, number of chronic conditions, CES-D score, smoking status, alcohol use, physical activity

Table 4

Linear regression models of association between log TL and perceived neighborhood characteristics by US region among Blacks, HRS 2008 (n=517)^a

	Unclean	Unsafe	Social Dis cohesion
	b (SE)	b (SE)	b (SE)
Neighborhood Characteristic	0.04 (0.01)**	0.03 (0.01) ⁺	0.02 (0.01)
Region			
Northeast	0.12 (0.06)*	0.13 (0.06)*	0.12 (0.06)*
Midwest	0.12 (0.06)*	0.10 (0.06)	0.07 (0.05)
South	0.15 (0.05)**	0.12 (0.06)*	0.12 (0.05)*
Region * Neighborhood Characteristic			
Northeast	-0.03 (0.01)*	-0.03 (0.02) ⁺	-0.03 (0.02) ⁺
Midwest	-0.04 (0.01)**	-0.03 (0.02)*	-0.03 (0.01)*
South	-0.05 (0.01)**	-0.03 (0.01)*	-0.03 (0.01)*
Constant	0.24 (0.09)**	0.30 (0.09)**	0.34 (0.09)**
R squared	0.0750	0.0660	0.0657

⁺
p<0.1

*
p<0.05

**
p<0.01

^aModels control for age, gender, marital status, years of education, log income, log wealth, obesity, number of chronic conditions, CES-D score, smoking status, alcohol use, physical activity