



Xavier University of Louisiana
XULA Digital Commons

Electronic Thesis and Dissertation

4-2021

Perceived Neighborhood Characteristics and Cognitive Function among Older Adults: Examining the Role of Depression

Allison Sullivan, MPH

Xavier University of Louisiana, asulliva@xula.edu

Follow this and additional works at: <https://digitalcommons.xula.edu/etd>

 Part of the [Public Health Commons](#)

Recommended Citation

Sullivan, MPH, Allison, "Perceived Neighborhood Characteristics and Cognitive Function among Older Adults: Examining the Role of Depression" (2021). *Electronic Thesis and Dissertation*. 49.
<https://digitalcommons.xula.edu/etd/49>

This Thesis is brought to you for free and open access by XULA Digital Commons. It has been accepted for inclusion in Electronic Thesis and Dissertation by an authorized administrator of XULA Digital Commons. For more information, please contact vbarraza@xula.edu, dthimons@xula.edu, kmair1@xula.edu.

Perceived Neighborhood Characteristics and Cognitive Function among Older Adults:

Examining the Role of Depression

Allison Sullivan, BS

A thesis submitted in partial of the requirements for the degree of

MASTER OF PUBLIC HEALTH

XAVIER UNIVERSITY OF UNIVERSITY

Department of Public Health Sciences

APRIL 2021

©Copyright by Allison Sullivan, 2021

All Rights Reserved

Research Advisors: Amy Thierry, PhD, MPH; Kyler Sherman-Wilkins, PhD



Department of Public Health Sciences
XAVIER UNIVERSITY of LOUISIANA

**Perceived Neighborhood Characteristics and Cognitive
Function among Older Adults: Examining the Role of Depression**

By

Allison Sullivan

MPH Health Equity

Xavier University of Louisiana
Department of Public Health Sciences

Spring 2021

A handwritten signature in black ink, reading "Amy D. Thierry".

Amy D. Thierry, PhD, MPH
Committee Chair

A handwritten signature in black ink, reading "Kyler J. Sherman-Wilkins".

Kyler J. Sherman-Wilkins, PhD
Committee Member

A handwritten signature in blue ink, reading "Marcus S. Cox".

Marcus S. Cox, MBA, PhD
Dean

Table of Contents

Abstract	3
Introduction.....	Error! Bookmark not defined.
Theoretical Framework	9
Conceptual Framework	11
Research Question and Hypothesis.....	11
Methods	12
Data Analysis	15
Results.....	16
Discussion	24
References.....	28

Abstract

Purpose: African American older adults have a greater risk of cognitive impairment compared to White older adults. While some research has established that neighborhoods are an important determinant of health, relatively little research has examined the relationship between perceived neighborhood characteristics and cognitive functioning among older adults. Moreover, little is known about how depression is implicated in the relationship between perceived neighborhood characteristics and cognitive functioning, and if racial differences exist. Thus, this thesis aims to determine the mediating and moderating role of depression in the association between perceived neighborhood characteristics and cognitive functioning in older African American and White adults.

Methods: I used data from the Health and Retirement Study and limited the sample to older Black and White adults age ≥ 65 years ($n=7,620$). Cognitive functioning was measured using the Telephone Interview for Cognitive Status (range: 0-35), with higher scores indicating better cognitive functioning. Depression was measured as a dichotomous variable using the Center for Epidemiologic Studies Depression Scale (CES-D). Depression scores ranged from 0 to 8 and the ≥ 3 cutoff was used to categorize adults with depression. Neighborhood perceptions of safety, cleanliness, and social cohesion were measured on a scale ranging from 0 to 7 with higher scores indicating worse perceptions. Linear regression models stratified by race were used to determine if depression played a mediating role in the relationship between perceived neighborhood characteristics (safety, social cohesion, and cleanliness) and cognitive functioning. The moderating role of depression was also examined using interaction terms with each neighborhood characteristic and depression.

Results: The results indicated that there is a negative relationship between perceived neighborhood characteristics and cognitive functioning among White older adults. Depression moderates the relationship between neighborhood characteristics (cleanliness, discohension) and cognitive functioning among White older adults. However, there was no moderating effect of depression among African American older adults. However, after controlling for neighborhood characteristics and other covariates, depression was associated with worse cognitive functioning.

Discussion/Conclusion: Depression is associated with worse cognitive functioning for both African American and White adults. Among White older adults with depression, there was a more pronounced negative association between neighborhood perceptions and cognitive functioning compared to those without depression. However, depression in African Americans was associated with worse cognitive functioning after controlling for neighborhood characteristics and other covariates. Therefore, depression is directly related to worse cognitive functioning in older adults.

Introduction

Neighborhoods and Health

Due to residential segregation, many African Americans live in neighborhoods that are resource-deprived (Elo et al., 2009; Elwert & Sharkley, 2012; Krieger, 2002). These neighborhoods tend to be overcrowded, polluted, and unsafe. Fast food and corner stores can be prevalent, with the provision of unhealthy foods contributing to chronic conditions such as hypertension, diabetes, and obesity (Assari, 2019; Bonaccorsi, 2020; Brown, 2007). Low socioeconomic status (SES) individuals who reside in disordered neighborhood tend to depend on public transportation or walking to get to destinations such as healthcare and fresh grocery. However, when a neighborhood is in disorder it is complicated to maneuver safely for exercise and daily use due to litter and crime. Residing in an unsafe neighborhood can cause an overactive stress response due to living in constant fear (Everson, 2012; Fitzpatrick, 2020). An overactive stress response can cause a weakened immune system which allows individuals to be more susceptible to health conditions. Polluted neighborhoods allow the greatest risk of infections, disease, and hazards because of high concentrations of virus and bacteria. Neighborhood safety and pollution could potentially work together to increase the risk of chronic conditions such as cancer (Jefferson et al., 2012). Moreover, unfavorable neighborhood perceptions could negatively affect the health of an individual residing there over time.

Neighborhood disparities have been around for decades (Darden et al., 2010; Landrine & Corral, 2009; William & Collins, 2001). Although White people can move into a better neighborhood due to job transitions when a neighborhood becomes deserted, many African Americans are not given the same opportunities to allow them to move out of under-resourced communities (Darden et al., 2010). Low SES African Americans are disproportionately impacted

by limited upward socioeconomic mobility than White adults (Williams, 2010). Moreover, African Americans can become stuck living within these under-resourced neighborhoods with high numbers of pawn shops, fast food restaurants, and pollution (Frank et al., 2019; Spring, 2018). Neighborhoods that have high concentrations of pawn shops, fast food restaurants, and loitering are perceived as unsafe (Spring, 2018). Perceptions of unsafe environments are important because it could possibly cause stress or lack of physical activity from fear (Barnett et al., 2018; Whitfield et al., 2018). Resources normally dictate the quality of the neighborhood causing African Americans to experience different life stressors that contribute to their overall health later in life (Glister, 2016; Latkin, 2003). These stressors can include lack of socioeconomic mobility, poverty, and discrimination, with long-term exposure to life stressors being detrimental to the health of the individual (Glister, 2016).

Neighborhood Characteristics and Cognition

At least 10% of older adults in the US have some form of cognitive impairment such as Alzheimer's disease and related dementia (ADRD) (Besser, 2017). Garcia et al. (2019) show that African Americans are expected to spend three years more with dementia than Whites at the age of 50. Also, African Americans have a higher prevalence of ADRD than Whites, although African Americans have a slower cognitive decline than their White counterparts (Garcia et al., 2019, Weuve et al., 2019).

The literature suggests that there is an association between perceived neighborhood characteristics and cognitive functioning, yet the direct pathway is unknown (Clarke et al., 2016, Clarke et al., 2012). Negative neighborhood characteristics can be social stressors which have been linked to poor cognitive functioning (Ailshire, 2017). Furthermore, negative neighborhood perceptions can diminish cognitive functioning of older adults, which is more detrimental for

adults ages 55 and older more than young and middle age adult groups (Deeg, 2005). Ailshire (2017) found that individuals who reside in stressful neighborhood conditions have a higher risk of lower cognitive functioning compared to individuals who did not reside in stressful neighborhoods. Low SES, particularly African American, individuals disproportionately live within disordered neighborhoods that expose them to higher amounts of stress (Thierry, 2019). Chronic stress due to long term exposure to disordered neighborhoods may lead to worse mental and physical health outcomes, which in turn may be associated with lower cognitive functioning (Forrester et al., 2019; Stetz et al., 2007). However, limited research has examined the role of mental health, specifically depression, in the relationship between neighborhood perceptions and cognitive functioning.

Cognition and Neighborhoods: The Role of Depression

Impoverished neighborhoods have high rates of noise and litter which creates stressors that can lead to depression (Deeg, 2005; Latkin, 2003). These impoverished neighborhoods, in which African Americans are 1.7 times more likely to occupy than Whites, tend to have poor housing conditions that increase exposure to hazards that are related to high risk of depression (Timmermans & Deeg, 2016). Perceptions of the built environment can affect the mental health of older adults. Assari (2019) explained that there is an increased risk of depression and psychological distress linked to an individual's perception of their neighborhood as unsafe. Therefore, if the neighborhood is perceived as unsafe then an individual is less likely to participate in physical activity resulting in lower cognitive functioning via presence of chronic diseases such as cardiovascular disease, diabetes, hypertension, obesity, and cancer (Jang et al., 2014; Latkin & Curry, 2003; Spring, 2018). Cardiovascular disease has the highest risk for worse cognitive functioning. Researchers have found that there is a relationship between lack of

physical activity and lower cognitive function (Kerr, 2012). Furthermore, lack of physical activity is linked to depression which negatively impacts cognitive functioning.

The social aspect of neighborhoods is also associated with health. Living in a neighborhood with high social integration is negatively associated with depression (Stokes, 2020). Individuals with depression may be less likely to participate in social activities and more likely to use maladaptive coping behaviors such as overeating, undereating, smoking, and drinking. Moreover, impoverished neighborhoods have lower levels of social integration which is associated with higher rates of depressive symptoms (Beard et al., 2009; Bolstad et al., 2020). This explains the finding of Friedman et al. (2017) where individuals residing in a more socially integrated neighborhood had better cognitive functioning compared to those of similar ages in worse neighborhoods that were not socially integrated.

Due to systemic racism in America, many African Americans are not afforded access to healthcare for the diagnosis and treatment of mental health conditions such as depression. The underdiagnosis and lack of treatment of mental health outcomes in African American communities can affect underlying conditions such as cardiovascular disease, diabetes, arthritis, obesity, and dementia which creates a disparity (Jang et al., 2014; Shim, 2012). Furthermore, Jang et al. (2021) found that African Americans had higher levels of depressive symptoms than Whites and concluded that mental health has a critical association in shaping cognitive functioning. African Americans have an increased risk of experiencing depressive symptoms than Whites due to their stressful neighborhood environment (Beard et al., 2009). Bolstad et al. (2020) discovered that residing in a highly disadvantaged neighborhood is associated with a 70% greater likelihood of expressing depressive symptoms compared to living in a less disadvantaged neighborhood.

Moreover, African Americans experience higher rates of depressive symptoms than their White counterparts (Plant & Ericsson, 2004). Depression may also have a differential effect on cognition across race. Jang et al. (2021) found that depression may be a possible moderator in the relationship between cognitive function and cognitive health appraisals among African Americans. This means that depression could possibly affect self-rated cognitive health leading to cognitive decline. Also, Burholt and Scharf (2014) identified depression as a moderating cognitive process that affects a lonely individual's ability to participate in society. Considering that African Americans are more likely to reside in disadvantaged neighborhoods and be exposed to high volumes of stress which can lead to poor cognitive functioning, it is proposed that depression can also mediate the relationship of neighborhood characteristics and cognitive functioning (Kim, 2008).

Theoretical Framework

Disordered neighborhoods can affect the physical and mental health of individuals who reside there (Fritz, 2020). Existing research suggests that neighborhood characteristics can be a source of stress that could lead to a longer stress response. Constant exposure to stress can lead to chronic stress which is the state of an overacting hypothalamus that never returns to homeostasis. The overacting hypothalamus weakens the immune system which makes it harder to fight off diseases, thus leading to adverse health outcomes such as cardiovascular disease, hypertension, and worse mental health (Barr, 2014). This process is known as allostatic load, which is defined as the wear and tear or “weathering” of the body's response to stress during stressful situations (Forrester 2019; Juster et. al 2010, McEwen 1998).

Neighborhood environments have a weathering effect on the health of people, especially African Americans. African American individuals tend to live in neighborhoods with low walkability

scores because the neighborhood is perceived as unsafe. Most unsafe neighborhoods are linked to fear of crime (Latkin, 2003). This feeling of fear could lead to a constant release of hormones that leads to chronic stress. Schultz (2012) explained how neighborhood conditions can increase allostatic load due to psychosocial stress experienced by African Americans. An increased risk of psychosocial stress was found to be associated with residing in an impoverished neighborhood (Schultz, 2012). However, Schultz (2012) conceptual model did not include cognition or depression. Kim's (2008) systematic review on depression and neighborhood conditions describes that depression can be a mediating and moderating factor between neighborhood conditions and social disorder. Their conceptual model explains the possible pathways between neighborhood characteristics, stress, and mental health. Kim (2008) discovered that most of the literature uses neighborhood SES and depression with stress being along the pathway for adverse health conditions. This means that neighborhood SES may be associated with depression via stress. Moreover, Juster et al. (2010) linked chronic stress (allostatic load) to mental health and discovered that individuals who are exposed to high levels of stress have more symptoms of depression. However, the conceptual model proposed by Forrester et al. (2019) describes the effects of weathering on cognitive function by psychosocial, behavioral, and biological factors. Forrester et al. (2019) discovered that high levels of allostatic load were associated with worse cognitive functioning among African Americans. Therefore, future research on the psychosocial factors contributing to racial differences in cognitive functioning is warranted.

Conceptual Framework

Figure 1. Conceptual Model for the Role of Depression in the Relationship between Cognitive Functioning and Neighborhood Characteristics

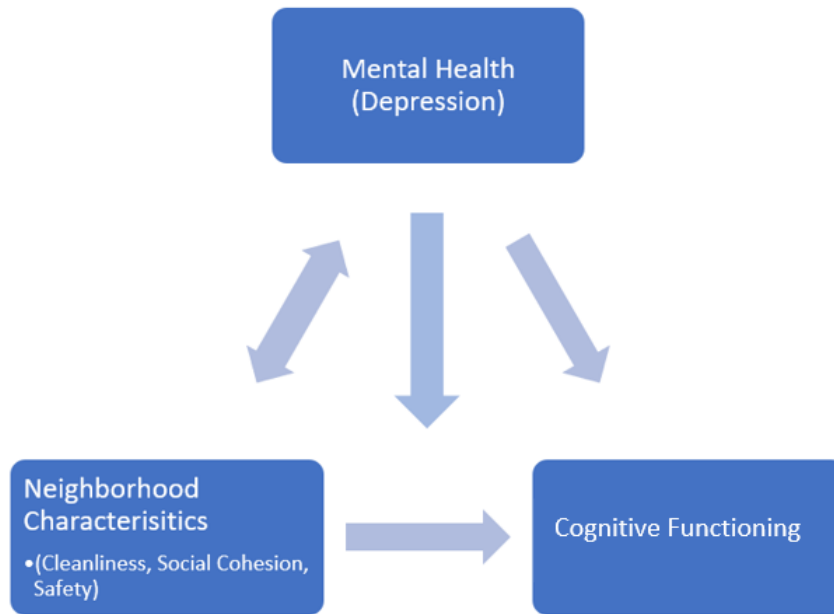


Figure 1 above is an illustration of the proposed relationship between neighborhood characteristics, depression, and cognitive functioning. Worse neighborhood perceived characteristics are directly associated with lower cognitive functioning. However, depression can mediate and/or moderate the relationship between cognitive functioning and perceived neighborhood characteristics.

Research Questions and Hypotheses

The following questions will be examined in this thesis:

- 1) What is the role of depression in the association between perceived neighborhood characteristics (safety, cleanliness, social cohesion) and cognitive functioning among older adults?

- a. Does depression act as a mediator of this relationship?
 - b. Does depression act as a moderator of this relationship?
- 2) Does the role of depression in the relationship between perceived neighborhood characteristics and cognitive functioning differ between African American and White adults?

Based on review of the literature, it is hypothesized that depression will play a moderating role in the relationship between neighborhood characteristics, such that negatively perceived neighborhood conditions among older adults with depression will increase the risk of poor cognitive functioning compared to older adults without depression. Further, depression will act as a mediator of the relationship between neighborhood characteristics and cognitive functioning. Among White individuals, mental health will act as a mediator of the relationship between neighborhood characteristics and cognitive functioning. However, in African American individuals, mental health will act as a moderator of the relationship between neighborhood characteristics and cognitive functioning.

METHODS

Study Population/ Data Source

Quantitative data were used to determine the role of depression in the relationship between perceived neighborhood characteristics and cognitive functioning. The data were retrieved from the University of Michigan's nationally representative Health and Retirement Study (HRS) which was started in the late 1980s. The HRS is supported by the National Institute on Aging and the Social Security Administration. The HRS surveys older adults (>50 years of age) in the United States every two years. HRS Core Survey, Psychosocial Leave-Behind Questionnaire, and RAND data files from waves 2010-2016 were used to determine the variables

to be included in the dataset. The analytic sample included 7,620 older adults ages ≥ 65 years (African American=1,040; White=6,580).

Study Variables/ Measures

Cognitive Functioning

The *cognitive functioning* variable was obtained from the RAND file for the HRS. Measures of cognitive functioning were collected with the 35-point Telephone Interview Cognitive Screen (TICS). Immediate and delayed word recall require participants to recall the ten words given to them during the interview and scores ranged from 0 to 10. In the immediate recall task, participants were asked to repeat the ten words right after they were given, yet with the delayed recall task there was a 5-minute wait before participants were asked to recall the 10 words. The object naming task asked participants to name the object used to cut paper (scissors), the plant that grows in the desert (cactus), the current president and vice president, and the date (month, day, year, day of the week). The naming task scores ranged from 0-8 where higher scores indicate more accurate answers. The serial subtraction portion scores ranged from 0-5 and reflected the number of correct answers. Participants were asked to subtract 7 from 100, and then continue to subtract from previous differences. For the backward count, participants were asked to count backwards from 20 as quickly as possible and scores range from 0-2 where (2) indicates if the respondent was successful in the 1st attempt, (1) indicates if the respondent was successful in the 2nd attempt, (0) indicates if the respondent failed to complete the task over two attempts. Cognitive functioning was measured using a sum score of participants' performances in immediate and delayed word recall, object naming, and serial subtraction. The overall score range from 0 to 35 with lower scores indicating lower cognitive functioning.

Perceived Neighborhood Characteristics

The HRS participants were asked questions about their perceptions of neighborhood disorder and social cohesion in the Psychosocial Leave-Behind Questionnaire. The variables *cleanliness*, *safety*, and *social cohesion* were scaled on the survey as 1= highly agree to 7= highly disagree. Cleanliness was measured as (1) this area is kept very clean and (2) no vacant/deserted houses. Safety was measured as (1) feel safe to walk alone after dark and (2) no vandalism and graffiti. Social cohesion was measured as (1) feel part of this area, (2) most people can be trusted, (3) most people are friendly, and (4) people help you if you in trouble. Each neighborhood variable was summed and averaged to create a summary variable for each neighborhood characteristic. Higher scores indicate worse perception of the neighborhood environment.

Depression

Depression was measured using the Center for Epidemiologic Studies Depression Scale (CES-D). Participants were asked to respond yes or no to the following statements: (1) Much of the time during the past week, I felt depressed, (2) I felt everything I did was an effort, (3) My sleep was restless, (4) I was happy, (5) I felt lonely, (6) I enjoy life, (7) I felt sad, (8) I could not get going. The yes responses were totaled for questions 1-3, 5, and 7-8 and the no responses were totaled for questions 4 and 6. Then, the values were summed to get a total depressive symptom score. The depression score range was 0 to 8 and the ≥ 3 cutoff was used to categorize adults with depression. Depression was used as a dichotomous variable (1=depression and 0=no depression).

Demographic Characteristics

Sociodemographic factors from the HRS Core Survey were used in statistical analyses. *Race* was classified as African American=1 and White=0. *Nativity* (foreign-born=1), *gender*

(woman=1), and *partnership status*(coupled=1) were measured as dichotomous variables.

Education was measured as a continuous variable as the number of years completed and ranged from 0-17. *Age*, *household income*, and *wealth* were measured as continuous variables.

Household income and wealth were transformed using the natural log.

Health-Related Characteristics

Physical health status was measured using self-report of chronic conditions including high blood pressure, diabetes, arthritis, cancer, stroke, heart and lung disease for which 1 = disease present and 0 = absence of disease. The *number of chronic conditions* were summed to create the variable for total number of chronic conditions. Participants with a BMI ≥ 30 were categorized as *obese*. *Smoking status* was coded as 2=current smoker, 1=former smoker, 0=never smoker. *Alcohol use* was coded as 2= 3 or more drinks per day when drinking (heavy drinking), 1=1-2 drinks per day when drinking (moderate drinking), and 0= 0 drinks per day (never drinking). Two survey questions were combined to create a moderate to vigorous physical activity measure to identify how frequent the individual participated in physical activity. *Moderate to vigorous activity* was coded as never=2, sometimes (once a week or 1 to 3 times a week) =1, and frequently (at least once a week) =0. Dummy variables were created for the three behavioral risk factor variables.

Data Analysis

Descriptive statistics were weighted using the provided HRS survey weights and analyses were stratified by race. Means were calculated for continuous variables (neighborhood perceptions, education, age, income, wealth, and chronic conditions) and percentages were calculated for dichotomous variables (gender, marital status, nativity, depression, smoking, alcohol use, and physical activity). The adjusted Wald's test was used to compare the means and

percentages of variables between African Americans and Whites. All descriptive statistics can be found in Table 1. Tables 2 and 3 detail race-stratified multiple linear regression models used to analyze the relationship between cognitive functioning and perceived neighborhood characteristics across race. Cognitive functioning was regressed on each perceived neighborhood characteristic (safety, cohesion, cleanliness) controlling for sociodemographic, health, and behavioral risk factors (Model 1). Mediation was assessed by adding the depression variable into each regression model for perceived neighborhood characteristics predicting cognitive functioning (Model 2). Statistical significance was determined at $p < 0.05$. To understand the moderating role of depression in the relationship between neighborhood characteristics and cognitive functioning, the variable for depression was multiplied by each neighborhood characteristic to create interaction terms (Model 3). Significant interactions were identified at $p < 0.1$ and used to determine moderation. Also, figures were created to display significant interactions of depression in prediction of cognitive scoring based on neighborhood perceptions. All analyses were conducted using Stata 16/ SE.

RESULTS

Descriptive Statistics

Race-stratified means and proportions of each study variable can be found in Table 1. African Americans had the lower level of cognitive functioning as well as worse perceptions of neighborhood environment in terms of safety, cleanliness, and social cohesion relative to White older adults. African Americans were also more likely to be classified with depression than White older adults. Moreover, African American respondents on average had lower SES (education, marital status, income, and wealth) than Whites. For example, the percentage of African American participants reported being married or partnered was significantly lower

(40.6%) than among Whites (63.1%; $p < 0.001$). Behavioral risk factors differed between races.

African Americans were more likely to be current smokers and less likely to participate in physical activity. On the other hand, Whites were more likely to consume alcohol moderately and more frequently. Differences in the prevalence of chronic conditions was also seen between racial groups. African Americans had a higher prevalence in obesity, hypertension, diabetes, and stroke, yet Whites had a higher prevalence of cancer, lung disease, and heart disease. African American respondents had a significantly higher overall total of chronic conditions than Whites.

Table 1. Weighted Characteristics of Study Participants at Baseline, HRS (n=7,620)

	Overall (n= 7,620)	White (n=6,580)	African American (n=1,040)
Cognitive Functioning	22.24 (0.1)	22.55(0.11)	18.86(0.19)*
Neighborhood (Un)Safety	2.43 (0.03)	2.35(0.027)	3.27(0.07)*
Neighborhood (Un)Cleanliness	2.30 (0.02)	2.23(0.025)	3.09(0.06)*
Neighborhood (Dis)Cohesion	2.36 (0.02)	2.30(0.018)	3.04(0.05)*
Cesd >= 3 (Depression)	16.7%	16%	20% *
SOCIODEMOGRAPHICS			
Age, mean	74.2(0.17)	74.33(0.18)	73.22(0.34) *
Woman	55.8%	55.46%	59.9%
Years of Education	13.17(0.059)	13.28 (0.06)	11.93(0.12)*
Married/ Coupled	61.2%	63.1%	40.6% *
Foreign Born	4.2%	4.12%	5.00%
Income, mean (thousands)	4.60 (0.01)	4.62(0.01)	4.35(0.03)
Wealth, mean	4.96 (0.036)	5.08(0.04)	3.64(0.13)*
BEHAVIORAL CHARACTERISTICS			
Smoking Status			
Never Smoker	42.48%	42.62%	41.02%
Former Smoker	48.88%	49.08%	46.67%
Current Smoker	8.63%	8.29%	12.31% *
Alcohol use			
No Consumption	63.23%	61.95%	77.3% *
Moderate Consumption	31.31%	32.57%	17.5% *
Heavy Consumption	5.44%	5.47%	5.17%
Moderate/vigorous physical activity			
Never	22.11%	21.5%	28.76% *
Sometimes	25.26%	24.82%	30.1% *
Frequent	52.62%	53.67%	41.13% *
CHRONIC CONDITIONS			
Obesity	30.72%	29.75%	41.38% *
Hypertension	65.47%	64.01%	81.41% *
Diabetes	22.81%	21.5%	37.18% *
Heart Disease	30.79%	31.03%	28.10%
Stroke	10.00%	9.78%	12.39% *
Lung Disease	11.57%	11.76%	9.42% *
Cancer	20.65%	20.94%	17.56%
Number of Chronic Conditions	2.29 (0.019)	2.27(0.02)	2.56(0.053)*

Abbreviations: HRS, Health and Retirement Study; SE, standard error; CESD-D, Center for Epidemiological Studies Depression Scale
Note: Values reported as number (percentages) of participants unless noted otherwise.
*indicates significant difference from White group at p <.05

Regression Analyses

Fully adjusted regression models for Whites can be found in Table 2. Results for Model 1 show a negative association between neighborhood characteristics and cognitive functioning. There also was indication of depression partially mediating the relationship between neighborhood characteristics and cognitive scoring as presented in Model 2 in Table 2. Though there was a decrease in the beta coefficient for perceived neighborhood characteristics between Model 1 and Model 2 when depression was entered into the model, the effect remained statistically significant indicating partial mediation. Depression did moderate the relationship between neighborhood perceptions of cleanliness and dis cohesion and cognitive functioning among Whites. This finding is indicated by statistically significant interactions between depression and neighborhood perceptions as shown in Model 3 in Table 2. Among Whites with depression there was a significantly negative relationship between neighborhood perceptions (cleanliness and dis cohesion) and cognitive functioning as shown in Figures 2 and 3, respectively. However, among depressed White adults, there was a significantly stronger negative association between cognition and dis cohesion than cleanliness.

Table 2. Linear Regression Models of the Association between Cognitive Functioning and Perceived Neighborhood Characteristics by CESD among White Older Adults (n=6,580; HRS 2010-2016).

	Model 1 b (SE)	Model 2 b (SE)	Model 3 b (SE)
Panel A			
Unsafe	-0.162(0.042) ***	-0.153(0.042) ***	-0.124(0.046) **
CESD		-0.86(0.156) ***	-0.518(0.293) †
CESD x Unsafe			-0.135(0.093)
Constant	24.94(1.06)	25.41(1.07)	25.38 (1.07)
R^2	0.30	0.31	0.31
Panel B			
Unclean	-0.084(0.038) *	-0.073(0.038) *	-0.028(0.04)
CESD		-0.878(0.16) ***	-0.34(0.331)
CESD x Unclean			-0.222(0.11) *
Constant	24.76(1.09)	25.22(1.1)	25.14(1.11)
R^2	0.30	0.31	0.31
Panel C			
Discohesion	-0.168 (0.05) **	-0.146(0.054) **	-0.083(0.059)
CESD		-0.85(0.154) ***	-0.026(0.35)
CESD x Discohesion			-0.32(0.11) **
Constant	25.05(1.11)	25.4(1.12)	25.37(1.14)
R^2	0.30	0.31	0.31

Note: Models control for gender, wave, nativity, partnership status, log income, log wealth, obesity, physical activity, smoking status, alcohol use, and number of chronic conditions.

†p < 0.1; *p < 0.05; **p < 0.01; ***p < 0.001

Figure 2. Perceived Unclean Neighborhood by Depression Predicting Cognitive Scores in White Older Adults (n=6,580; HRS 2010-2016)

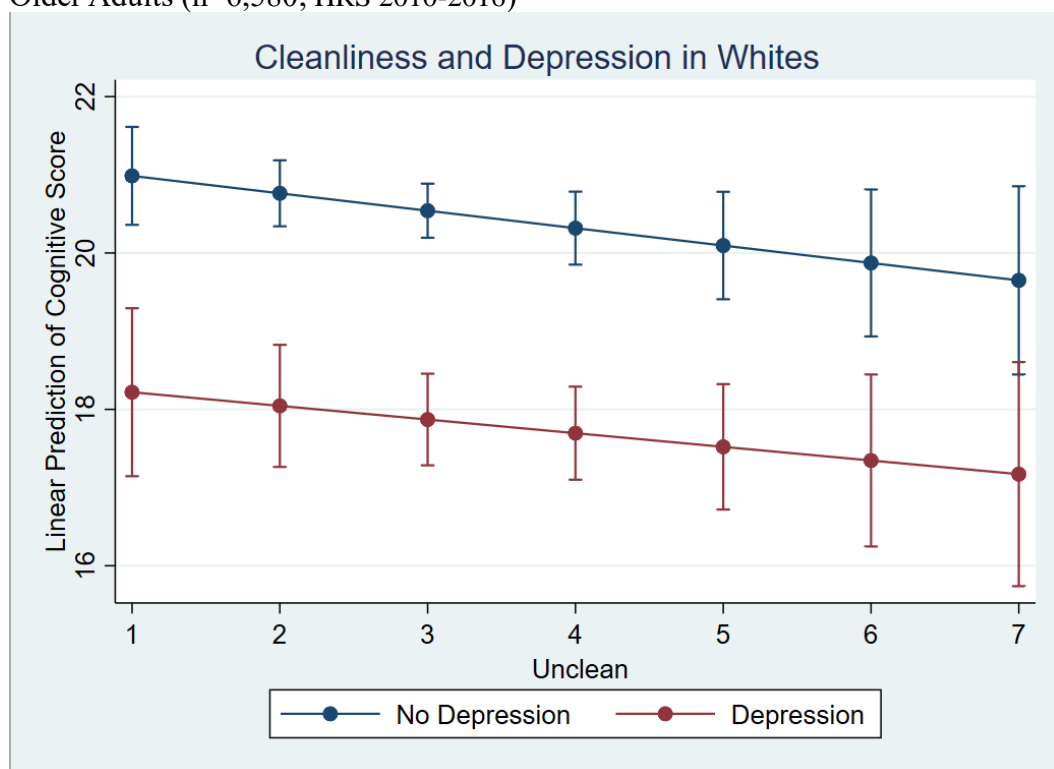
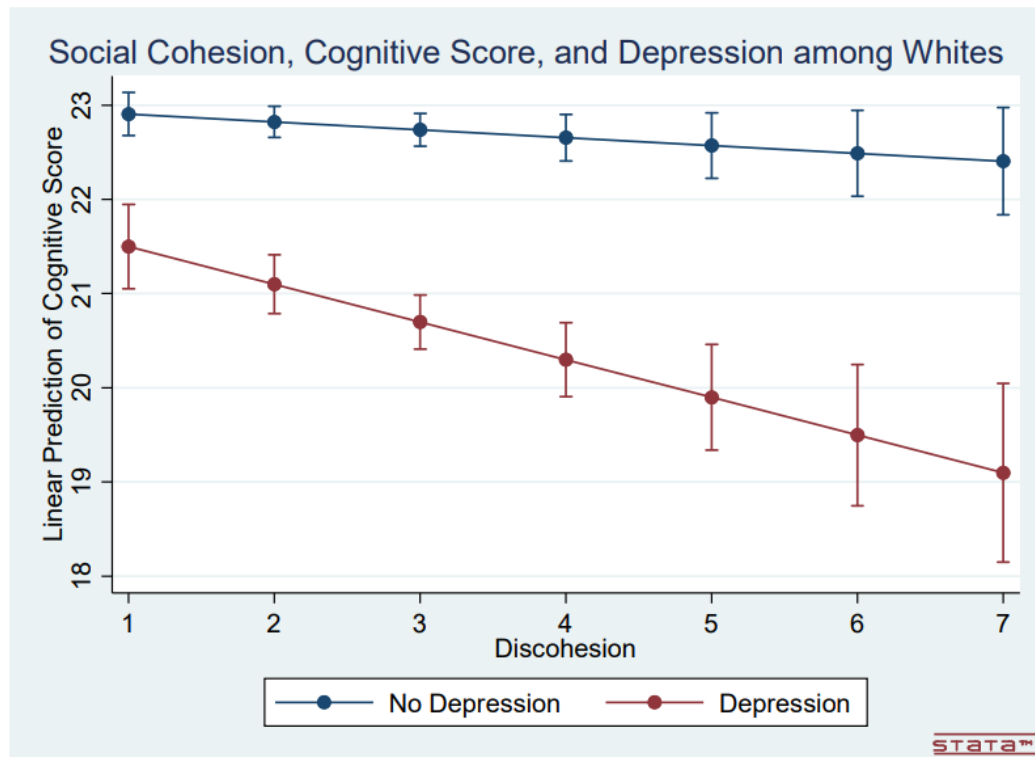


Figure 3. Perceived Neighborhood Discohesion by Depression Predicting Cognitive Scores in White Older Adults (n=6,580; HRS 2010-2016)



Fully adjusted regression models stratified by race for African Americans can be found in Table 3 which shows the association between cognitive functioning and perceived neighborhood characteristics. Results for African Americans in Model 1 show that there were not any statistically significant relationships between neighborhood perceptions and cognitive functioning. However, there was a statistically significant negative association between depression and cognitive functioning among African Americans meaning that depressed African Americans have lower cognitive functioning than African Americans who are not depressed which is shown in Model 2. Depression did not mediate or moderate the relationship between any neighborhood characteristic and cognitive functioning among African Americans.

Table 3. Linear Regression Models of the Association between Cognitive Functioning and Perceived Neighborhood Characteristics by CESD among African American Older Adults (n=1,040; HRS 2010-2016).

	Model 1 b (SE)	Model 2 b (SE)	Model 3 b (SE)
Panel A			
Unsafe	-0.064(0.134)	-0.058(0.13)	-0.069(0.14)
CESD		-1.48(0.31) ***	-1.63(0.64) **
CESD x Unsafe			0.046(0.152)
Constant	17.04(2.71)	18.06(2.76)	18.1(2.79)
R^2	0.34	0.35	0.35
Panel B			
Unclean	-0.219(0.14)	-0.212(0.135)	-0.223(0.14) †
CESD		-1.46(0.315) ***	-1.62(0.623) **
CESD x Unclean			0.048(0.158)
Constant	17.6(2.71)	18.62(2.74)	18.62(2.74)
R^2	0.35	0.36	0.36
Panel C			
Discohesion	-0.167(0.177)	-0.154(0.17)	-0.124(0.17)
CESD		-1.46(0.32) ***	-1.06(0.58) †
CESD x Discohesion			-0.126(0.136)
Constant	17.37(2.75)	18.36(2.78)	17.13(2.66)
R^2	0.34	0.35	0.35

Note: Models control for gender, wave, nativity, partnership status, log income, log wealth, obesity, physical activity, smoking status, alcohol use, and number of chronic conditions.

†p < 0.1; *p < 0.05; **p < 0.01; ***p < 0.001

DISCUSSION

This research sought to understand racial differences in the role of depression within the relationship between perceived neighborhood characteristics (cleanliness, safety, discohension) and cognitive functioning. It was hypothesized that depression would play a role in the relationship between neighborhood characteristics and cognitive functioning, such that depressive symptomology in the context of negatively perceived neighborhood conditions would increase the risk of worse cognitive functioning in older adults. Moreover, depression would act as both a mediator and a moderator of the relationship between neighborhood characteristics and cognitive functioning but differing by race. According to the results, depression mediated and moderated the relationship between perceived neighborhood characteristics of cleanliness and social cohesion and cognitive functioning among Whites but not for African American adults. However, among African Americans there was a significant association between depression and cognitive functioning.

Evidence supporting the relationship proposed within the conceptual framework that depression acts a mediator and moderator of the relationship between cognitive functioning and perceived neighborhood characteristics, specifically cleanliness and social cohesion, was found among White adults only. Perceived neighborhood aspects of cleanliness and safety cannot be controlled, therefore creating a possible stressor which explains the findings for Whites. Uncontrollable stressors such as cleanliness (litter) and safety (crime) can cause chronic stress which leads to higher morbidity (St. John, 1993; Spring 2018). High rates of crime create fear which is linked to neighborhood disorder and worse health (Latkin & Curry, 2003; Beard et. al, 2009). However, with high rates of crime, it may be expected that the individuals' fear would cause them to stay inside, putting them at risk for social isolation. Moreover, social isolation is

linked to more depressive symptoms (Barnett et al., 2018). Not feeling a part of the community or trusting someone within the community could cause stress, which could in turn could lead to lower cognitive functioning. Additionally, low social cohesion is linked to other negative neighborhood characteristics such as lack of access to healthcare, grocery stores, and community centers (Levasseur et al., 2015). Taken together, these may explain why we see a significant association between dis cohesion and worse cognitive functioning in Whites. Lastly, Whites had a higher percentage of maladaptive behaviors such as drinking alcohol and smoking which are mostly used as coping mechanisms for stress. These coping mechanisms lead to adverse health outcomes potentially leading to cognitive decline which is directly in line with the framework presented by Forrester et al. (2019) and Kim (2008).

The findings for African Americans were different from what was expected, as there was no association between perceived neighborhood characteristics (safety, cleanliness, and social cohesion) and cognitive functioning. While these findings run counter to much of the existing literature, there was a similar finding within Kim's (2008) systematic review. It was suggested that African Americans have high exposures to other stressors that create behaviors that may be more important than the relationship between neighborhood characteristics and cognitive functioning (Ailshire, 2012; Jackson et al. 2010; Mezuk et al., 2010). Although it is known that there is a high rate of uncleanliness and crime in disadvantaged neighborhoods, other stressors such as individual-level low SES, discrimination, and lack of job mobility could be more salient for African Americans and thus contribute a larger role for health (Brown, 2007; Elo et al., 2009; Plant & Ericsson, 2004). Depression was found to be negatively associated with lower cognitive functioning which was directly in line with the frameworks of Juster et al. (2010) and Forrester et al. (2019). Other studies have also shown that depression is associated with lower cognitive

functioning (Bolslad et al., 2020; Plant, 2004). The literature suggests that higher exposures to stressors for African Americans are directly linked to lower cognitive functioning because of the higher risk for adverse health outcomes such as cardiovascular disease, diabetes, and cancer. Although, there is not much literature to explain the findings for African Americans, there are endless assumptions that could explain why there were not any significant findings between perceived neighborhoods and cognitive functioning. However, African Americans should be studied more in depth to better understand the mechanisms related to cognitive functioningspecific to this population.

This research has its strengths. The study used a diverse sample from the Health and Retirement Study which is a nationally representative survey used to study older adults. This study also used a nationally used depression scale that validates depressive symptoms among different nationalities. There are also strengths in the measures used to determine cognitive functioning and neighborhood characteristics. However, this research has limitations. The research was cross-sectional which limited the causal inference that can be given with longitudinal data about the role of depression as it relates to perceived neighborhood characteristics and cognitive functioning. Proposed literature suggests that longitudinal data could validate the connections of stress pathways with depression as a mediator and moderator in the relationship between perceived neighborhood characteristics and cognitive functioning (Juster et al., 2010). Another limitation would be that income, education, and discrimination were not examined as possible mediators and moderators in the relationship, although they can be sources of stress. Examining these variables as both mediators and moderators could possibly show associations that would create better understanding of possible pathways that could capture the relationship between perceived neighborhood characteristics, depression, and cognition.

Moreover, this research used neighborhood characteristics as subjective measures. Objective measures of the built environment could give context for the physical aspect of the neighborhood such as proximity to healthcare, green spaces, and grocery stores which also shape an individual's lifestyle (Frank et al., 2019). For future research, it is suggested to examine depression in a longitudinal state as it relates to neighborhood characteristics and cognition. Another suggestion would be to include an individual's SES as a possible pathway linking depression, neighborhood characteristics, and cognition. Also to look at the different neighborhoods such as rural and urban environments to look at possible relations in cognitive functioning.

Overall findings show that depression is negatively associated with cognitive functioning and that neighborhood characteristics are perceived differently by race. Public health professionals should rethink the role of perceived neighborhood environment for African Americans in a way that can influence the data more. They are advised to study African Americans without comparing them to another race because their pathways may have a deeper history which may be due to constant stress and discrimination. Moreover, this study adds to the gap in literature in displaying the association in the role of depression between cognitive functioning and neighborhood characteristics. This study also exposed other gaps within the literature that should be addressed in future research.

References

- Ailshire, J., Karraker, A., & Clarke, P. (2017). Neighborhood social stressors, fine particulate matter air pollution, and cognitive function among older U.S. adults. *Social Science and Medicine*, 172. <https://doi.org/10.1016/j.socscimed.2016.11.019>
- Assari, S. (2019). Perceived Neighborhood Safety Better Predicts Risk of Mortality for Whites than Blacks. *Physiology & Behavior*, 176(3), 139–148.
- Barnett, A., Zhang, C. J. P., Johnston, J. M., & Cerin, E. (2018). Relationships between the neighborhood environment and depression in older adults: A systematic review and meta-analysis. *International Psychogeriatrics*, 30(8), 1153–1176.
<https://doi.org/10.1017/S104161021700271X>
- Barr, D. A. (2014). *Health disparities in the United States: Social class, race, ethnicity, and health*. JHU Press.
- Beard, J. R., Cerdá, M., Blaney, S., Ahern, J., Vlahov, D., & Galea, S. (2009). Neighborhood characteristics and change in depressive symptoms among older residents of New York City. *American Journal of Public Health*, 99(7), 1308–1314.
<https://doi.org/10.2105/AJPH.2007.125104>
- Besser, L. M., McDonald, N. C., Song, Y., Kukull, W. A., & Rodriguez, D. A. (2017). Neighborhood Environment and Cognition in Older Adults: A Systematic Review. In *American Journal of Preventive Medicine* (Vol. 53, Issue 2).
<https://doi.org/10.1016/j.amepre.2017.02.013>

- Bolstad, C. J., Moak, R., Brown, C. J., Kennedy, R. E., & Buys, D. R. (2020). Neighborhood disadvantage is associated with depressive symptoms but not depression diagnosis in older adults. *International Journal of Environmental Research and Public Health*, 17(16), 1–10. <https://doi.org/10.3390/ijerph17165745>
- Bonaccorsi, G., Manzi, F., Del Riccio, M., Setola, N., Naldi, E., Milani, C., Giorgetti, D., Dellisanti, C., & Lorini, C. (2020). Impact of the built environment and the neighborhood in promoting the physical activity and the healthy aging in older people: An umbrella review. *International Journal of Environmental Research and Public Health*, 17(17), 1–27. <https://doi.org/10.3390/ijerph17176127>
- Brown, A. F., Ang, A., & Pebley, A. R. (2007). The relationship between neighborhood characteristics and self-rated health for adults with chronic conditions. *American Journal of Public Health*, 97(5), 926–932. <https://doi.org/10.2105/AJPH.2005.069443>
- Burholt, V., & Scharf, T. (2014). Poor health and loneliness in later life: The role of depressive symptoms, social resources, and rural environments. *Journals of Gerontology - Series B Psychological Sciences and Social Sciences*, 69(2), 311–324. <https://doi.org/10.1093/geronb/gbt121>
- Clarke, P. J., Ailshire, J. A., House, J. S., Morenoff, J. D., King, K., Melendez, R., & Langa, K. M. (2012). Cognitive function in the community setting: The neighborhood as a source of 'cognitive reserve'? *Journal of Epidemiology and Community Health*, 66(8), 730–736. <https://doi.org/10.1136/jech.2010.128116>.Cognitive

Clarke, PhD, P. J., Weuve, PhD, J., Barnes, PhD, L., Evans, MD, D. A., & Mendes de Leon,

PhD, C. F. (2016). *Cognitive decline and the neighborhood environment*. 25(11), 849–854.

<https://doi.org/10.1016/j.annepidem.2015.07.001>.Cognitive

Darden, J., Rahbar, M., Jezierski, L., Li, M., & Velie, E. (2010). The measurement of neighborhood socioeconomic characteristics and black and white residential segregation in metropolitan detroit: Implications for the study of social disparities in health. *Annals of the Association of American Geographers*, 100(1), 137–158.

<https://doi.org/10.1080/00045600903379042>

Deeg, D. J. H., & Thomése, G. C. F. (2005). Discrepancies between personal income and

neighbourhood status: Effects on physical and mental health. *European Journal of Ageing*,

2(2), 98–108. <https://doi.org/10.1007/s10433-005-0027-4>

Elo, I. T., Mykyta, L., Margolis, R., & Culhane, J. F. (2009). Perceptions of neighborhood

disorder: The role of individual and neighborhood characteristics. *Social Science Quarterly*,

90(5), 1298–1320. <https://doi.org/10.1111/j.1540-6237.2009.00657.x>

Elwert, F., & Sharkey, P. (2012). *The legacy of disadvantage: Multigenerational neighborhood effects on cognitive ability*. 116(6).

Everson-rose, S. A., Skarupski, K. A., Barnes, L. L., Evans, D. A., & Leon, C. F. M. De. (2012).

Neighborhood socioeconomic conditions are associated with psychosocial functioning in older Black and White adults. 17(March 2008), 793–800.

<https://doi.org/10.1016/j.healthplace.2011.02.007>.Neighborhood

Frank, L. D., Iroz-Elardo, N., MacLeod, K. E., & Hong, A. (2019). Pathways from built

environment to health: A conceptual framework linking behavior and exposure-based

impacts. *Journal of Transport and Health*, 12(November 2018), 319–335.

<https://doi.org/10.1016/j.jth.2018.11.008>

Fitzpatrick, K. M., & Willis, D. (2020). Chronic disease, the built environment, and unequal health risks in the 500 largest U.S. cities. *International Journal of Environmental Research and Public Health*, 17(8). <https://doi.org/10.3390/ijerph17082961>

Forrester, S. N., Gallo, J. J., Whitfield, K. E., & Jr, R. J. T. (2019). A framework of minority stress: From physiological manifestations to cognitive outcomes. *The Gerontologist*, 59(6), 1017–1023. <https://doi.org/10.1093/geront/gny104>

Friedman, E. M., Shih, R. A., Slaughter, M. E., Weden, M. M., & Cagney, K. A. (2017). Neighborhood age structure and cognitive function in a nationally-representative sample of older adults in the U.S. *Social Science & Medicine*, 174, 149–158. <https://doi.org/10.1016/j.socscimed.2016.12.005>.Neighborhood

Fritz, H., Cutchin, M. P., Gharib, J., Haryadi, N., Patel, M., & Patel, N. (2020). Neighborhood characteristics and frailty: A scoping review. *Gerontologist*, 60(4), e270–e285. <https://doi.org/10.1093/geront/gnz072>

Garcia, M. A., Downer, B., Chiu, C.-T., Saenz, J. L., Rote, S., & Wong, R. (2019). Racial/ethnic and nativity differences in cognitive life expectancies among older adults in the United States. *The Gerontologist*, 59(2), 281–289. <https://doi.org/10.1093/geront/gnx142>

Gilster, M. (2016). Racial and ethnic differences in the neighborhood context of mastery. *Journal of Community Psychology*, 44(1), 38–50. <https://doi.org/10.1002/jcop.21741>

- Jackson, J. S., Knight, K. M., & Rafferty, J. a. (2010). Race and unhealthy behaviors: chronic stress, the HPA axis, and physical and mental health disparities over the life course. *American Journal of Public Health, 100*(5), 933–939.
<https://doi.org/10.2105/AJPH.2008.143446>
- Jang, Y., Park, N. S., Kang, S. Y., & Chiriboga, D. A. (2014). Racial/ethnic differences in the association between symptoms of depression and self-rated mental health among older adults. *Community Mental Health Journal, 50*(3), 325–330. <https://doi.org/10.1007/s10597-013-9642-2>
- Jang, Y., Choi, E. Y., Franco, Y., Park, N. S., Chiriboga, D. A., & Kim, M. T. (2021). Racial and ethnic differences in cognitive health appraisals: a comparison of non-Hispanic White, non-Hispanic Black, and Hispanic older adults. *Aging and Mental Health, 0*(0), 1–7.
<https://doi.org/10.1080/13607863.2021.1899132>
- Juster, R. P., McEwen, B. S., & Lupien, S. J. (2010). Allostatic load biomarkers of chronic stress and impact on health and cognition. *Neuroscience and Biobehavioral Reviews, 35*(1), 2–16.
<https://doi.org/10.1016/j.neubiorev.2009.10.002>
- Kerr, J., Rosenberg, D., & Frank, L. (2012). The Role of the Built Environment in Healthy Aging: Community Design, Physical Activity, and Health among Older Adults. *Journal of Planning Literature, 27*(1), 43–60. <https://doi.org/10.1177/0885412211415283>
- Kim, D. (2008). Blues from the neighborhood? Neighborhood characteristics and depression. *Epidemiologic Reviews, 30*(1), 101–117. <https://doi.org/10.1093/epirev/mxn009>

Krieger, J., & Higgins, D. L. (2002). Housing and health: Time again for public health action.

American Journal of Public Health, 92(5), 758–768. <https://doi.org/10.2105/AJPH.92.5.758>

Latkin, C., & Curry, A. D. (2003). Stressful Neighborhoods and Depression : A Prospective

Study of the Impact of Neighborhood Disorder Author (s): Carl A . Latkin and Aaron D .

Curry Published by : American Sociological Association Stable URL :

<http://www.jstor.org/stable/1519814> REFEREN. *Journal of Health and Social Behavior*, 44(1), 34–44. <https://www.jstor.org/stable/1519814>

Landrine, H., & Corral, I. (2009). Separate and unequal: Residential segregation and black health disparities. *Ethnicity and Disease*, 19(2), 179–184.

McEwen, B. S. (1998). Protecting and damaging effects of stress mediators. *The New England Journal of Medicine*, 338(3), 171–179. <https://doi.org/10.1056/NEJM199801153380307>

Mezuk, B., Rafferty, J. A., Kershaw, K. N., Hudson, D., Abdou, C. M., Lee, H., Eaton, W. W., & Jackson, J. S. (2010). Reconsidering the role of social disadvantage in physical and mental health: stressful life events, health behaviors, race, and depression. *American Journal of Epidemiology*, 172(11), 1238–1249. <https://doi.org/10.1093/aje/kwq283>

Plant, E. A., & Sachs-Ericsson, N. (2004). Racial and Ethnic Differences in Depression: The Roles of Social Support and Meeting Basic Needs. *Journal of Consulting and Clinical Psychology*, 72(1), 41–52. <https://doi.org/10.1037/0022-006X.72.1.41>

Schulz, A., Williams, D., Israel, B., Becker, A., Parker, E., James, S. A., & Jackson, J. (2000).

Unfair treatment, neighborhood effects, and mental health in the Detroit metropolitan area.

Journal of Health and Social Behavior, 41(3), 314–332. <https://doi.org/10.2307/2676323>

Schulz, A. J., Mentz, G., Lachance, L., Johnson, J., Gaines, C., & Israel, B. A. (2012).

Associations between socioeconomic status and allostatic load: Effects of neighborhood poverty and tests of mediating pathways. 102(9), 1706–1714.

<https://doi.org/10.2105/AJPH.2011.300412>

Shim, R. S., Ye, J., Baltrus, P., Fry-Johnson, Y., Daniels, E., & Rust, G. (2012). Racial/ethnic

disparities, social support, and depression: Examining a social determinant of mental health.

Ethnicity and Disease, 22(1), 15–20. <https://doi.org/10.13016/gkbbk-54vq>

Spring, A. (2018). Short- and Long-Term Impacts of Neighborhood Built Environment on Self-Rated Health of Older Adults. *Gerontologist*, 58(1), 36–46.

<https://doi.org/10.1093/geront/gnx119>

Stokes, J. E. (2020). Implications of perceived neighborhood quality, daily discrimination, and depression for social integration across mid- And later life: A case of person-environment

fit? *Gerontologist*, 60(4), 661–671. <https://doi.org/10.1093/geront/gnz103>

Thierry, A. D. (2019). Association between telomere length and neighborhood characteristics by race and region in US midlife and older adults. *Health and Place*.

<https://doi.org/10.1016/j.healthplace.2019.102272>

The health and Retirement study: An introduction. (n.d.). Retrieved March 08, 2021, from

[https://hrs.isr.umich.edu/documentation/video-](https://hrs.isr.umich.edu/documentation/video-tutorials/introduction?_ga=2.25872445.1607633279.1615135180-572052669.1612230701)

[tutorials/introduction?_ga=2.25872445.1607633279.1615135180-572052669.1612230701](https://hrs.isr.umich.edu/documentation/video-tutorials/introduction?_ga=2.25872445.1607633279.1615135180-572052669.1612230701)

Timmermans, E., & Deeg, D. (2016). NEIGHBOURHOOD LIVABILITY AND DEPRESSIVE SYMPTOMS IN OLDER ADULTS. *The Gerontologist*, 56(Suppl_3), 36–37.

<https://doi.org/10.1093/geront/gnw162.150>

Weuve, J., Barnes, L. L., Rajan, K. B., Aggarwal, N. T., Hebert, L. E., Bennett, D. A., Wilson,

R. S., Evans, D. A., Sciences, B., & Arbor, A. (2019). Cognitive aging in black and white

Americans: Cognition, cognitive decline, and incidence of alzheimer disease dementia.

Epidemiology, 29(1), 151–159. <https://doi.org/10.1097/EDE.0000000000000747>.Cognitive

Williams, D. R., & Collins, C. (2001). Racial residential segregation: A fundamental cause of racial disparities in health. *Public Health Reports*, 116(5), 404–416.

<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1497358&tool=pmcentrez&rendertype=abstract>

Williams, D. R., Mohammed, S. A., Leavell, J., & Collins, C. (2010). Race, socioeconomic

status, and health: complexities, ongoing challenges, and research opportunities. *Annals of the*

New York Academy of Sciences, 1186, 69–101. [https://doi.org/10.1111/j.1749-](https://doi.org/10.1111/j.1749-6632.2009.05339.x)

[6632.2009.05339.x](https://doi.org/10.1111/j.1749-6632.2009.05339.x)