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Racial Segregation and Health Disparities Between Black and White Older Adults

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Objectives. In this study, we examined whether racial segregation is associated with poorer self-rated health among older adults, and whether racial segregation helps explain race disparities in self-rated health between Black and White older adults.

Methods. We used multilevel data at the individual, neighborhood (tract), and county levels, from two national surveys—the Americans' Changing Lives (ACL) survey and the National Survey of Families and Households (NSFH). We used hierarchical linear models in order to regress self-rated health on county-, neighborhood-, and individual-level racial and socioeconomic variables.

Results. In the NSFH, there was an association between county racial segregation and poorer self-rated health among White but not Black older adults (net of county percent Black and percent poverty). In the ACL, there was no statistically significant association between racial segregation and self-rated health. In the NSFH, there was some indication that Black older adults had better self-rated health when living in neighborhoods with a higher percentage of Black residents than the county percentage.

Discussion. Although aggregate-level studies demonstrate associations between racial segregation and mortality rates, our multilevel analyses with two national data sets suggest only weak associations between racial segregation and self-rated health. However, socioeconomic status at multiple levels contributes to race disparities in health.

BLACK older adults generally have worse health than do White older adults (Bulatao & Anderson, 2004), and this disparity is often only partly mediated by individual socioeconomic status (SES; Clark & Maddox, 1992; Crimmins, Hayward, & Seeman, 2004; LeClere, Rogers, & Peters, 1998; Robert & Lee, 2002). Multilevel research on neighborhood context and health has demonstrated that the average lower socioeconomic neighborhood context of Black older adults contributes further to race disparities in health (Cagney, Browning, & Wen, 2005; Robert & Lee). Although there is a growing body of literature that examines the association between neighborhood or community context and health among older adults (Balfour & Kaplan, 2002; Cagney et al.; Krause, 1996; Robert & Lee; Robert & Li, 2001; Wen, Cagney, & Christakis, 2005), most of this research focuses on the socioeconomic rather than the racial context of neighborhoods. Moreover, although racial residential segregation in the United States is considerable and enduring (Fischer, 2003; Massey & Denton, 1993), we found no multilevel research that has explicitly investigated the role of racial residential segregation as a factor that might help explain race disparities in health among older adults. The purpose of this study was to examine whether racial residential segregation was associated with poorer self-rated health among older adults in the United States, and whether racial residential segregation helped explain race disparities in self-rated health between Black and White older adults.

Racial residential segregation (hereafter "racial segregation") refers to the differential distribution of individuals of different races across smaller residential units (e.g., census tracts) within a larger geographical unit (e.g., a city, county, or metropolitan area; Massey & Denton, 1988b). Research has shown that racial segregation produces and reinforces the economic segregation of Black people in the United States (Jargowsky, 1997; Massey, 1990; Massey & Denton, 1988a; Wilson, 1987). As a result of racial segregation, Black people and White people live in very different community contexts. For example, not only are Black people more likely than White people to live in lower socioeconomic communities, but Black people are more likely than White people of the same income level to live in lower socioeconomic communities (Jargowsky).

Research has demonstrated that various measures of racial segregation are associated with high rates of poverty, crime, homicide, dropping out of high school, and unemployment, as well as with lower rates of community participation (Peterson & Krivo, 1993; Shihadeh & Flynn, 1996; Wilson, 1987). All of these neighborhood factors are associated with health. However, few researchers have explicitly examined whether living in racially segregated neighborhoods is associated with poorer health.

Researchers theorize that racial segregation affects health through two general pathways (Acevedo-Garcia, Lochner, Osypuk, & Subramanian, 2003; Collins & Williams, 1999; LaVeist, 1989, 1993; Polednak, 1993, 1996; Schulz, Williams, Israel, & Lempert, 2002). First, racial segregation can reinforce racial differences in opportunity structures and access to resources that more proximately affect health (structural pathways), affecting the education, occupation, economic, and service opportunities in neighborhoods and for individuals. Among the current cohort(s) of older adults who have experienced a lifetime of exposure to racial residential segregation, these structural pathways may have both a cumulative effect across the life course, and a contemporaneous effect (e.g., quality of

and access to health, social, and transportation services, accessible and high quality markets, safe places to walk). Second, racial segregation may create an environment that heightens exposure to and perceptions of discrimination, which can affect stress and other psychosocial factors that are more proximal determinants of health (interpersonal pathways). In addition, causation can work the other way, such that people in poorer health may be more likely to move into (or, more plausibly, less likely to move out of) highly segregated neighborhoods. Regardless of causality, both scenarios suggest an aggregate association between racial segregation and health.

Research using aggregate-level data shows that metropolitan areas with higher racial segregation have higher adult and infant mortality rates (Bird, 1995; Collins & Williams, 1999; Guest, Almgren, & Hussey, 1998; LaVeist, 1989, 1993; Polednak, 1993, 1996; Shihadeh & Flynn, 1996). To date, researchers have primarily examined mortality rates, but not other measures of health; investigators have not examined age-specific trends among adults. Moreover, multilevel studies are necessary in order to extend beyond aggregate-level findings (Acevedo-Garcia et al., 2003). For example, multilevel studies can examine whether the relationship between racial segregation and health (a) exists for both Black and White residents and for residents with other specific characteristics (e.g., age, SES); (b) operates through specific neighborhood and individual pathways; and (c) exists net of neighborhood and individual socioeconomic and other factors.

One recent study conducted a multilevel analysis with data at both the individual and metropolitan statistical area (MSA) levels. Subramanian, Acevedo-Garcia, and Osypuk (2005) examined racial segregation and self-rated health by using the March 2000 supplement of the Current Population Survey, which included a sample of more than 50,000 non-Hispanic White and Black adults residing in MSAs throughout the United States. Despite this large, comprehensive sample, they found only a weak association between racial segregation at the MSA level and poor self-rated health, net of age, gender, marital status, education, income, and race. Subramanian and colleagues examined two measures of racial segregation at the MSA level that are the most commonly used in the racial segregation literature (Acevedo-Garcia et al., 2003): the Dissimilarity Index and the Isolation Index. The Dissimilarity Index measures residential unevenness between two groups, and the Isolation Index measures the probability that a minority group member will come into contact with a majority group member. They found no statistically significant relationship between the Dissimilarity Index and health, or between White isolation and health. They did find a statistically significant association between high Black isolation and poor health among Black residents, but the magnitude was very small. These multilevel analyses suggest a weaker association between racial segregation and self-rated health than had been suggested by previous aggregate-level analyses.

Replication of such multilevel analyses is necessary. Moreover, as Subramanian and colleagues (2005) suggested, future studies should examine multilevel data not only at the metropolitan and individual level, but at the intermediary neighborhood level as well. Although living in a metropolitan area with greater racial segregation might be associated with poorer health, it is unclear whether that relationship is similar across the neighborhoods within the metropolitan area. It is likely that among people living in a highly segregated metropolitan area, living in a neighborhood with a high percentage of Black residents is a different experience than living in a neighborhood with few Black residents. Yet without neighborhood-level data, models assume that the average health effects of living in a more highly segregated MSA are the same across all residents in all neighborhoods in a particular MSA.

Our study rectifies these issues by using multilevel data at the individual, neighborhood, and county level, from two national surveys of adults in the United States, in order to examine the association between racial segregation and self-rated health among Black and White older adults. We examined whether racial segregation at the county level was associated with self-rated health for both Black and White older adults, net of county poverty, racial composition, and individual SES. Moreover, we extend research in this area by having examined whether the racial composition of one's neighborhood, when compared with the racial composition of the county, is associated with self-rated health. We also tested whether the Black disadvantage in self-rated health was partly explained by neighborhood- and county-level racial segregation, racial composition, and poverty.

Our three primary hypotheses were:

H1: Living in counties with greater racial residential segregation is associated with lower self-rated health for both Black and White older adults.

H2: The greater the percentage of Black residents in one's neighborhood, in comparison to the percentage of Black residents in one's county, the worse health one is likely to report.

H3: The Black disadvantage in self-rated health is partly explained by neighborhood- and county-level racial segregation, racial composition, and poverty status.

Methods

We used two nationally representative samples of adults. Individual-level data came from the first waves of two U.S. surveys: the Americans' Changing Lives (ACL) 1986 survey (House, 1989) and the National Survey of Families and Households (NSFH) 1987–1988 survey (Sweet, Bumpass, & Call, 1988). Based on respondents' addresses at Wave 1, we merged characteristics of their census tracts and counties from a 1990 census extract data file (Adams, 1992).

ACL Data

Researchers conducted Wave 1 of the ACL in 1986 through face-to-face surveys with 3,617 adults (House, 1989) from a multistage, stratified area probability sample of noninstitutionalized adults aged 25 and older. Black people and people aged 60 and older were oversampled. The household response rate was 70%. We restricted this sample to respondents aged 60 and older, eliminated 24 respondents whose self-rated race was neither Black nor White, excluded rural counties, and eliminated 7 urban and suburban counties with missing data on racial segregation, resulting in a final sample of 1,095 respondents (382 Black, 713 White) in 102 urban and suburban counties.

NSFH Data

Investigators conducted Wave 1 of the NSFH in 1987–1988 through face-to-face interviews with 13,007 adults (Sweet, Bumpass, & Call, 1988) from a multistage, area probability sample of noninstitutionalized adults aged 19 and older. Black people, Mexican Americans, Puerto Ricans, single parents, stepparents, cohabitors, and recently married persons were oversampled. The Wave 1 response rate was 74%. We restricted this sample to respondents aged 60 and older, eliminated 126 respondents whose self-rated race was neither Black nor White, excluded rural counties, and removed respondents with missing data on age, race, education, self-rated health, and county-level racial segregation, resulting in a final sample of 1,615 residents aged 60 or older (290 Black, 1,325 White) residing in 204 urban and suburban counties.

Individual-Level Variables

Self reported health, our dependent variable, is a multidimensional and subjective measure of health that has been shown to reliably predict mortality and morbidity after controlling for health risk factors (Idler & Benyamini, 1997; Idler & Kasl, 1995). Although Blacks and Whites and the old-old and young-old report their health differently, research has shown that self-rated health predicts mortality for these groups (Ferraro, 1980; Ferraro & Kelly-Moore, 2001). Investigators for both the NSFH and ACL asked about self-rated health, using slightly different wording and response choices. ACL respondents were asked: "How would you rate your health at the present time?" Response categories were: excellent, very good, good, fair, or poor. NSFH respondents were asked: "Compared with other people your age, how would you describe your health?" Response categories were: excellent, good, fair, poor, or very poor. In order to make items more comparable, we recoded them into four categories for each data set. We coded NSFH self-rated health reports as 1 = excellent, 2 = good, 3 = fair, and 4 = poor or very poor. We coded ACL self-rated health reports as 1 = excellent, 2 = very good or good, 3 = fair, and 4 = poor.

We included age (years) and gender as controls in all analyses. We coded education in years of education. We used family income for ACL respondents and household income for NSFH respondents. Annual income is a categorical variable: high income = $20,000 or more, medium income = $10,000 to $20,000, and low income = less than $10,000. For the NSFH, we included a missing income dummy; missing data for the ACL had previously been imputed via a regression prediction equation (House, 1989). We coded financial assets as a dummy variable comparing individuals with $10,000 or more, those with less than $10,000 (reference category), and those with missing assets data. For analyses, we centered continuous variables at their grand means.

County-Level Variables

We included three county-level variables: racial segregation, racial composition, and percent poverty. Massey and Denton (1988b) classified racial segregation indices into five dimensions: evenness, exposure, concentration, centralization, and clustering. Much of the research on racial segregation in the past two decades, particularly that focusing on health, has used either the Dissimilarity Index (to measure evenness) or the Isolation Index (to measure exposure). We initially used both the Dissimilarity Index and the Isolation Index, though we present here just the results for the Dissimilarity Index because the results were similar with both measures. The Dissimilarity Index measures the level of residential unevenness between two groups (James & Taeuber, 1985). It indicates the proportion of Blacks that would have to move to a White-dominated census tract in order for the races to be evenly distributed throughout the county. A higher value indicates higher levels of segregation. In preliminary analyses, the Dissimilarity Index had a nonlinear association with self-rated health that varied between data sets. Therefore, we coded the Dissimilarity Index in quartiles in order to capture nonlinearities. We compared the 25% of people in the most segregated counties (the omitted quartile with the highest dissimilarity scores) with those people in each of the less segregated quartiles. For race-specific analyses, we used race-specific dissimilarity quartiles in order to examine the association between residential segregation and self-rated health among Black or among White older adults.

We also included the percentage of Black people in a county (% Black) as a measure of racial composition. Percent Black is itself not a measure of racial segregation because counties with the same percentage of Black residents may have those residents distributed very differently across the county. Counties with relatively few Black people may be very segregated just as counties with many Black people may be very segregated. Though not a measure of racial segregation per se, racial composition of counties is a measure of racial context in its own right (Massey, Condran & Denton, 1987) that may be related to health. Regardless of segregation, communities with higher percent Black may have overall worse average health. Finally, we also included a continuous, centered, indicator of percentage of households in poverty in the county.

Tract-Level Variables

We included two tract-level variables: percentage of households in poverty (percent poverty) and neighborhood racial difference. Whereas the county-level dissimilarity measure indicates whether a person lives in a county with overall higher or lower segregation, it does not indicate where in that county a person lives (e.g., in a neighborhood with a high, average, or low percentage of Black residents). It is likely that living in a more segregated county does not affect everyone equally. Living in a county with high racial segregation might be more detrimental to those living in a neighborhood with a higher percentage of Black residents. We calculated neighborhood racial difference by subtracting the percent Black in one's county from the percent Black in one's tract. Respondents with a score greater than 0 live in a neighborhood with a greater percentage of Black people than the overall percentage in the county, and those with a negative score live in a neighborhood with a lower percentage of Black people than the overall percentage in the county. (We did not center this variable as we had with other continuous variables.) The greater the score, the greater the Black racial concentration of one's neighborhood in comparison with the county. Our research contributes significantly to the literature by computing neighborhood racial difference in order to test whether the gap between racial

Table 1. NSFH Sample Descriptive Statistics for Full Sample and by Race

Variable	Full 60+ Sample	Black Adults	White Adults
Unweighted n[a]	1,615	290	1,325
Self-rated health	2.3 (0.9)	2.4 (0.9)	2.2 (0.8)**
Age, in years	70.4 (7.4)	69.4 (6.7)	70.6 (7.6)*
% Female	55	59	55
Mean education, in years	11.1 (3.3)	9.5 (3.6)	11.4 (3.1)**
Mean household income ($)	22,941 (33,555)	11,033 (11,137)	25,346 (35,973)**
Range ($)	0–632,300	0–70,500	0–632,300
Low income (%)	19	34	18**
Medium income (%)	16	14	17
High income (%)	33	11	36**
Missing income (%)	31	41	30*
Asset dummy indicators			
< $10,000 in assets (%)	39	84	34**
≥ $10,000 in assets (%)	45	8	48**
Missing response on assets (%)	16	8	17**
County-level variables			
Dissimilarity Index	60.8 (14.9)	64.7 (13.3)	59.9 (15.1)*
% Black in county	15.7 (14.2)	26.7 (16.0)	13.3 (12.6)**
% Poverty in county	12.4 (5.3)	15.3 (4.9)	11.8 (5.1)*
Census tract-level variables			
Neighborhood racial difference[b]	3.7 (25.5)	40.8 (29.4)	−4.4 (15.5)**
Range	−60.0–84.3	28.0–84.3	−60.1–77.7
% Poverty in tract	14.1 (13.6)	30.0 (17.4)	10.6 (9.6)**

Notes: NSFH = National Survey of Families and Households. Table data are means and standard deviations (in parentheses) for continuous variables and percentages for nominal variables. For later multivariate analyses, all continuous variables were centered.

[a]All analyses apply weights.

[b]Difference between each respondent's tract-level percent Black and the county-level percent Black.

*$p \leq .05$; **$p \leq .001$, t test for comparisons of means between two groups and tests for group differences in proportions.

composition at the neighborhood and county levels is associated with self-rated health.

Statistical Analyses

We weighted the data in order to correct for sample selection probabilities and nonresponse, which resulted in weighted samples that approximated the distribution of the demographic composition of the U.S. adult population during the first wave of interviews. We centered weights to the size of the sample for each race subsample. Because of the multilevel nature of our questions, as well as the clustering of individuals within counties and communities, we used SAS PROC MIXED in order to conduct iterative maximum likelihood estimation regression analyses (SAS Institute, 1996). We present fixed effect coefficients for independent variables at the individual and county, or individual and neighborhood (tract) levels while adjusting for random intercepts between counties or neighborhoods (Snijders & Bosker, 1999).

Results

Tables 1 and 2 present descriptive statistics for the NSFH and the ACL, respectively, showing distributions for the full sample, Black sample, and White sample.

Tables 3 and 4 present data from the test of our first hypothesis, namely that living in counties with greater racial residential segregation is associated with lower self-rated health for both Black and White older adults. In Table 3, Model 1 demonstrates that among older adults in the NSFH, respondents living in counties with the greatest dissimilarity (4th quartile, omitted here) had worse self-rated health than respondents living in counties categorized in the 2nd and 3rd quartiles of the Dissimilarity Index, controlling only for individual age and gender. For example, people living in a county with a Dissimilarity Index in the 3rd quartile had a self-rated health score .167 units better than those living in the most racially segregated counties (Dissimilarity Index in the 4th quartile). Model 2 demonstrates that once the county-level percent Black was added to the model, there was no longer a statistically significant association between racial segregation and self-rated health. This suggests that it is not necessarily county racial segregation that is associated with health, but rather higher Black population composition, regardless of the racial residential distribution within the county. However, adding respondents' race into Model 3 eliminated the statistically significant association between county-level percent Black and self-rated health. Black older adults had worse self-rated health than White older adults, regardless of the racial segregation or composition of the county, but racial segregation and composition no longer had independent associations with self-rated health. Model 4 adds county-level percent poverty and demonstrates that people living in counties with greater poverty had worse health, even net of race, age, gender, racial segregation, and racial composition. Note that county-level poverty only slightly reduced race differences in self-rated health. In Model 5, adding individual-level SES variables (income, education, and assets) eliminated the association between county-level poverty and self-rated health.

Table 2. ACL Sample Descriptive Statistics for Full Sample and by Race

Variable	Full 60+ Sample	Black Adults	White Adults
Unweighted n[a]	1,095	382	713
Self-rated health	2.3 (0.8)	2.4 (0.8)	2.2 (0.7)**
Age, in years	69.8 (7.4)	69.5 (7.4)	70.3 (7.5)
% Female	60	62.7	59.3
Mean education, in years	10.4 (3.7)	8.9 (3.9)	11.2 (3.3)**
Mean family income ($)	18,660 (20,574)	11,394 (13,894)	23,268 (22,913)**
Range ($)	2,500–110,000	2,500–110,000	2,500–110,000
Low income (%)	34	61	31**
Medium income (%)	28	21	29*
High income (%)	38	18	40**
Asset dummy indicators			
< $10,000 in assets (%)	29	63	25**
≥ $10,000 in assets (%)	59	28	63**
Missing response on assets (%)	12	9	12*
County-level variables			
Dissimilarity index	61.9 (14.1)	66.3 (11.9)	59.6 (14.6)*
% Black in county	17.4 (14.4)	27.0 (14.0)	12.0 (11.2)*
% Poverty in county	13.7 (6.6)	15.7 (5.0)	12.4 (6.8)*
Census tract-level variables			
Neighborhood racial difference[b]	−0.40 (21.7)	44.8 (25.1)	−5.3 (14.4)**
Range	−40.0–87.0	−18.0–87.0	−40.0–81.0
% Poverty in tract	13.0 (13.1)	30.6 (16.2)	11.3 (11.4)**

Notes: ACL = Americans Changing Lives. Table data are means and standard deviations (in parentheses) for continuous variables and percentages for nominal variables. For later multivariate analyses, all continuous variables were centered.

[a]All analyses apply weights.

[b]Difference between each respondent's tract-level percent Black and the county-level percent Black.

*$p \leq .05$; **$p \leq .001$, t test for comparisons of means between two groups and tests for group differences in proportions.

The results for the ACL are somewhat different than those for the NSFH. Table 4, Model 1 shows no statistically significant association between racial segregation and self-rated health. Model 2 shows no association between racial composition and self-rated health. Model 3 demonstrates that there was no statistically significant racial disparity in self-rated health. However, as with the NSFH, Model 4 shows that a greater county-level percent poverty was associated with worse self-rated health. In contrast to the results for the NSFH, this association remained statistically significant after controlling for individual-level SES in Model 5.

As a whole, results from Tables 3 and 4 provided little support for the hypothesis that racial segregation is associated with self-rated health among older adults in the United States, regardless of race. In preliminary analyses (not shown), we also examined MSA-level (instead of county-level) Dissimilarity Index in the ACL sample and found that there was no association between the MSA-level Dissimilarity Index and self-rated health. However, Tables 5 and 6 now describe race-specific models. Table 5 indicates that the slight association between racial segregation and health noted earlier was found only among White older adults. Model 1 shows that White older adults living in counties with the most racial segregation (4th quartile of Dissimilarity Index) had a self-rated health score .167 units worse than that of people in the 3rd quartile on the Dissimilarity Index, net of county-level percent Black, percent poverty, and individual age and gender. This association was reduced and was no longer statistically significant after we included individual SES controls in Model 2.

Among Black older adults, Model 3 demonstrates that only county poverty was associated with self-rated health. After controlling for individual SES, county poverty was still associated with worse self-rated health. An interesting finding is that county percent Black emerged as a statistically significant predictor, but in an unexpected direction. After controlling for individual SES, county poverty, and racial segregation, Black older adults living in counties with a higher percentage of Black residents had *better* self-rated health than those in counties with fewer Black residents. All else being equal, living in a county with a greater percent Black may be associated with poor health among White older adults, but better health among Black older adults.

Table 6 for the ACL demonstrates little new findings with the race-specific analyses. Neither racial segregation nor racial composition was associated with self-rated health for either White or Black older adults. In sum, we found little support for an association between racial segregation and self-rated health among older adults. The support we did find suggests that living in more segregated counties was associated with worse health for White older adults, whereas living in counties with a higher percent Black was associated with better health for Black older adults.

Our second hypothesis stated that the greater the percentage of Black residents in one's neighborhood, in comparison to the percentage of Black residents in one's county, the worse health one is likely to have. This hypothesis reflects our ability to use multilevel information to extend existing research by examining whether living in a segregated neighborhood per se,

Table 3. NSFH Sample: Self-Rated Health Regressed on County-Level Racial and Socioeconomic Variables, With Individual-Level Controls

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Race (Black)			0.224 (0.073)**	0.221 (0.072)**	0.038 (0.075)
County-level variables					
Quartile 1: (lowest) dissimilarity	0.015 (0.066)	0.093 (0.70)	0.092 (0.070)	0.088 (0.069)	0.093 (0.068)
Quartile 2: dissimilarity	−0.143 (0.071)*	−0.076 (0.074)	−0.082 (0.074)	−0.095 (0.073)	−0.092 (0.072)
Quartile 3: dissimilarity	−0.167 (0.077)*	−0.110 (0.082)	−0.115 (0.081)	−0.109 (0.081)	−0.095 (0.077)
Quartile 4: (highest)[a] dissimilarity	—	—	—	—	—
% Black in county		0.006 (0.002)*	0.004 (0.002)	0.001 (0.003)	0.001 (0.003)
% Poverty in county				0.014 (0.006)*	0.007 (0.006)
Deviance (−2 Res log likelihood)	4,245.9	4,239.5	4,230.9	4,225.5	4,142.8

Notes: NSFH = National Survey of Families and Households. For the table, $N = 1{,}615$. Table data are maximum likelihood estimation fixed-effects coefficients and were adjusted for random intercepts by county; standard errors are shown in parentheses. All models controlled for individual-level age and gender. Model 5 additionally controlled for individual socioeconomic status variables: education, income, and assets.

[a]Omitted 4th quartile had the highest dissimilarity (most segregation).

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

rather than living in a county with high overall segregation, is associated with poorer health. Tables 7 and 8 show individual- and neighborhood-level (census tract) data, in contrast to the previous tables, which contained individual- and county-level data. Model 1 of Table 7 demonstrates that in the NSFH, Black older adults had worse self-rated health than did White older adults, but there was no association between neighborhood segregation (using the neighborhood racial difference variable) and self-rated health. Model 2 adds neighborhood (tract-level) percent poverty to the model and demonstrates that people living in higher poverty neighborhoods had worse health. Moreover, once we had controlled for percent poverty, there was a statistically significant coefficient for neighborhood racial difference. People living in neighborhoods with a greater percent of Black neighbors relative to the county average had *better* self-rated health. This association was no longer statistically significant after controlling for individual SES in Model 3. Further investigation showed that this relationship existed only for Black older adults in the NSFH, as demonstrated in Models 4–6.

These findings counter our second hypothesis, which is that living in a more racially segregated neighborhood is associated with worse health. However, neighborhood percent Black and the neighborhood racial difference variable were highly correlated, so we did not include them simultaneously. We cautiously conclude that net of percent poverty, either higher percent Black or neighborhood segregation is associated with positive self-rated health for Black older adults.

In contrast, Table 8 shows that there was no association in the ACL between neighborhood racial difference and self-rated health for the full sample; additional analyses found this to be true for the racial subsamples as well. However, neighborhood percent poverty retained its association with self-rated health among older adults, even net of individual SES.

Finally, we revisit Tables 3 and 4 in order to address our third hypothesis, that the Black disadvantage in self-rated health is partly explained by neighborhood- and county-level racial segregation, racial composition, and poverty status. Looking back at Table 3 for the NSFH, Models 3 and 4 demonstrate that Black older adults had worse self-rated health than did White older adults, and this association remained after controlling for county-level racial segregation, racial concentration, and percent poverty. Similarly, Table 7 shows that for the NSFH, the Black disadvantage in self-rated health persisted after controlling for neighborhood poverty and racial segregation. However, in both the county- and neighborhood-level models for the NSFH, the Black disadvantage in self-rated health was no longer statistically significant after further controlling for individual SES. In this urban and suburban sample of older adults, neighborhood- and county-level racial and poverty indicators explained little of the Black disadvantage in self-rated health. Moreover, in the ACL, there were no

Table 4. ACL Sample: Self-Rated Health Regressed on County-Level Racial and Socioeconomic Variables, With Individual-Level Controls

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Race (Black)			0.129 (0.076)	0.126 (0.075)	−0.097 (0.069)
County-level variables					
Quartile 1: (lowest) dissimilarity	0.014 (0.076)	0.104 (0.094)	0.094 (0.093)	0.098 (0.078)	0.084 (0.073)
Quartile 2: dissimilarity	0.079 (0.084)	0.127 (0.079)	0.117 (0.078)	0.081 (0.066)	−0.000 (0.060)
Quartile 3: dissimilarity	0.041 (0.083)	0.104 (0.086)	0.102 (0.085)	0.107 (0.072)	0.051 (0.062)
Quartile 4: (highest)[a] dissimilarity	—	—	—	—	—
% Black in county		0.005 (0.003)	0.003 (0.003)	−0.001 (0.003)	0.001 (0.003)
% Poverty in county				0.022 (0.004)***	0.011 (0.004)*
Deviance (−2 Res log likelihood)	2,732.7	2,711.0	2,708.3	2,686.8	2,572.3

Notes: ACL = Americans Changing Lives. For the table, $N = 1{,}095$. Table data are maximum likelihood estimation fixed-effects coefficients and were adjusted for random intercepts by county; standard errors are shown in parentheses. All models controlled for individual-level age and gender. Model 5 additionally controlled for individual socioeconomic status variables: education, income, and assets.

[a]Omitted 4th quartile had the highest dissimilarity (most segregation).

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 5. NSFH Sample: Self-Rated Health Regressed on County-Level Racial and Socioeconomic Variables, With Individual-Level Controls, by Race

	White (n = 1,325)		Black (n = 290)	
County-Level Variables	Model 1	Model 2	Model 3	Model 4
Quartile 1: (lowest) dissimilarity	0.071 (0.071)	0.079 (0.069)	0.105 (0.186)	−0.001 (0.187)
Quartile 2: dissimilarity	−0.130 (0.074)	−0.120 (0.071)	0.236 (0.159)	0.185 (0.151)
Quartile 3: dissimilarity	−0.167 (.082)*	−0.151 (0.077)	0.065 (0.204)	−0.053 (0.211)
Quartile 4: (highest)[a] dissimilarity	—	—	—	—
% Black in county	0.002 (0.003)	0.003 (0.003)	−0.007 (0.005)	−.009 (0.004)*
% Poverty in county	0.010 (.007)	0.004 (0.006)	0.048 (0.014)**	0.044 (0.013)**
Deviance (−2 Res log likelihood)	3,381.9	3,310.7	791.9	774.2

Notes: NSFH = National Survey of Families and Households. Table data are maximum likelihood estimation fixed-effects coefficients and were adjusted for random intercepts by county; standard errors are shown in parentheses. All models controlled for individual-level age and gender. Models 2 and 4 additionally controlled for individual socioeconomic status variables: education, income, and assets.

[a]Omitted 4th quartile had the highest dissimilarity (most segregation).

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

race differences in self-rated health net of individual-level, neighborhood-level, or county-level variables (Tables 4).

Discussion

By using multilevel data from two national studies of adults in the United States, we found little evidence of an association between racial segregation and self-rated health among older adults. In the ACL, we found no association between racial segregation and self-rated health at either the county or neighborhood level among Black and White older adults. In the NSFH, we found a small but statistically significant association between higher racial segregation and poorer self-rated health among White older adults. This association remained net of county-level percent Black and percent poverty, suggesting both that it is racial segregation and not just racial composition or poverty that is associated with health among these White older adults, and also that poverty does not mediate this association. The association disappeared after controlling further for individual SES, suggesting that (a) racial segregation may impact individuals' SES attainment, which is more proximally related to health; or (b) White older adults with lower SES are more likely than their higher SES counterparts both to move into or to not move out of more highly segregated counties and to have poorer health.

We also found unexpected evidence in the NSFH that there may be something about living in a more highly concentrated Black neighborhood that is associated with better health for Black older adults, once neighborhood poverty is controlled. We cautiously report these results because we were unable to determine whether it was living in a high percent Black neighborhood, or living in a neighborhood with a higher percent Black than the average neighborhood in the county, that was associated with better health. It is also possible that unique features of the NSFH sample are responsible for this finding, or that response rates in these neighborhoods were selective by health status. If future research replicates these findings, it would be consistent with previous research regarding greater mental health among residents of enclaves with a high concentration of people sharing their race or ethnicity (Halpern, 1993).

In the NSFH, we also demonstrated that race differences in self-rated health were only slightly reduced after considering neighborhood- and county-level racial and socioeconomic factors, but were eliminated after controlling further for individual SES.

We will discuss here four primary conclusions. First, there was, at best, only weak evidence of an association between racial segregation and self-rated health among Black and White older adults, based on two nationally representative multilevel studies. This is consistent with evidence from Subramanian and colleagues (2005), who used a very large multilevel sample but who nevertheless found (a) no associations between the Dissimilarity Index at the MSA level and self-rated health, and

Table 6. ACL Sample: Self-Rated Health Regressed on County-Level Racial and Socioeconomic Variables, With Individual-Level Controls, by Race

	White (n = 713)		Black (n = 382)	
County-Level Variables	Model 1	Model 2	Model 3	Model 4
Quartile 1: (lowest) dissimilarity	0.058 (0.089)	0.091 (0.081)	0.199 (0.126)	0.048 (0.124)
Quartile 2: dissimilarity	−0.027 (0.074)	−0.068 (0.063)	0.133 (0.114)	0.032 (0.107)
Quartile 3: dissimilarity	0.058 (0.072)	0.038 (0.067)	0.190 (0.132)	0.136 (0.124)
Quartile 4: (highest)[a] dissimilarity				
% Black in county	−0.002 (0.003)	0.001 (0.003)	0.003 (0.004)	0.003 (0.004)
% Poverty in county	0.024 (0.004)***	0.011 (.004)*	0.010 (0.013)	0.007 (0.012)
Deviance (−2 Res log likelihood)	1,574.6	1,491.3	925.9	900.6

Notes: ACL = Americans Changing Lives. Table data are maximum likelihood estimation fixed-effects coefficients and were adjusted for random intercepts by county; standard errors are shown in parentheses. All models controlled for individual-level age and gender. Models 2 and 4 additionally controlled for individual socioeconomic status variables: education, income, and assets.

[a]Omitted 4th quartile had the highest dissimilarity (most segregation).

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Table 7. NSFH Sample: Self-Rated Health Regressed on Census Tract-Level Racial and Socioeconomic Variables, With Individual-Level Controls

	Full Sample (n = 1,615)			Black Sample (n = 290)		
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Individual level						
Race (Black)	0.307 (0.094)**	0.237 (0.098)*	0.094 (0.094)			
Tract level						
Neighborhood racial difference[a]	−0.001 (0.001)	−0.003 (0.001)*	−0.002 (0.001)	−0.003 (0.002)	−0.005 (0.002)*	−0.004 (0.002)
% Poverty in tract		0.009 (0.003)***	0.005 (0.002)*		0.010 (0.004)**	0.007 (0.004)
Deviance (−2 Res log likelihood)	4,235.9	4,222.0	4,141.8	789.5	783.4	771.0

Notes: NSFH = National Survey of Families and Households. Table data are maximum likelihood estimation fixed-effects coefficients and were adjusted for random intercepts by county; standard errors are shown in parentheses. All models controlled for individual-level age and gender. Models 3 and 6 additionally controlled for individual socioeconomic status variables: education, income, and assets.

[a]Neighborhood racial difference = Tract % Black–County % Black (high = greater % Black in one's tract than one's county).

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

(b) small but statistically significant associations between the Black Isolation Index and self-rated health, but only among Black adults (odds ratio predicting poor self-rated health for the interaction between individual Black race and Black Isolation Index was only 1.05 [95% confidence interval 1.00–1.12]). This means it is less likely that our results are due simply to the weaknesses of using two smaller national probability samples to address this question.

However, our results reported average effects across the country, and therefore our study may be masking stronger associations between racial segregation and health in local regions (such as Detroit; Schulz et al., 2002). Moreover, we examined only self-rated health as an outcome in this study. Future research should examine other measures of both physical and mental health. In addition, gerontological theory and research suggest that community context may be particularly salient to the subsequent outcomes of older adults who have already experienced some decline in physical or mental health (Lawton, 1998; Wen et al., 2005). Therefore, future research should examine whether some subgroups are more vulnerable to the health consequences of living in segregated neighborhoods.

Table 8. ACL Sample: Self-Rated Health Regressed on Census Tract-Level Racial and Socioeconomic Variables, With Individual-Level Controls

Variable	Model 1	Model 2	Model 3
Individual level			
Race (Black)	0.098 (0.096)	0.057 (0.099)	−0.043 (0.098)
Tract level			
Neighborhood racial difference[a]	0.001 (0.002)	−0.003 (0.002)	−0.002 (0.002)
% Poverty in tract		0.013 (0.003)***	0.005 (0.002)*
Deviance (−2 Res log likelihood)	2,686.2	2,656.2	2,559.7

Notes: ACL = Americans Changing Lives. For the table, N = 1,095. Table data are maximum likelihood estimation fixed-effects coefficients and were adjusted for random intercepts by county; standard errors are shown in parentheses. All models controlled for individual-level age and gender. Model 3 additionally controlled for individual socioeconomic status variables: education, income, and assets.

[a]Neighborhood racial difference = Tract % Black – County % Black (high = greater % Black in one's tract than one's county).

*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$.

Our second conclusion is that race, racial segregation, racial composition, and poverty are so intertwined over time and space that it is difficult (even with multilevel data) to examine them simultaneously in order to determine separate, overlapping, and causal relationships. This is particularly a problem in national data sets that employ probability samples not designed to take representative samples from each neighborhood. These data include insufficient numbers of the rare counterfactual people, such as the White people who live in neighborhoods with a high percentage of Black residents (and vice versa). Despite the weak associations between racial segregation and self-rated health, and given potential data limitations, we encourage further work on this topic in light of the persisting racial segregation of U.S. neighborhoods (Massey & Denton, 1993), particularly among those who are poor and Black (Fischer, 2003).

Our third conclusion is that, despite the weak evidence for an association between racial segregation and self-rated health, we showed clearer evidence for associations between health and SES at multiple levels, which confirms the results of previous research (Balfour & Kaplan, 2002; Cagney et al., 2005; Krause, 1996; Robert & Lee, 2002; Robert & Li, 2001; Subramanian et al., 2005; Wen et al., 2005). Moreover, our results showed that SES at multiple levels contributes to race disparities in health among Black and White older adults, a finding that contributes to a small literature on this topic (Cagney et al.; Robert & Lee). This is not surprising, as the greatest increases in residential segregation according to income during the past decades have occurred among African Americans and Hispanics (Jargowsky, 1997). Future research should examine the mechanisms linking socioeconomic and other neighborhood characteristics to health, with an aim toward understanding how they contribute to race disparities in health.

Finally, in order to fully understand race differences in health among older adults, researchers need to look beyond urban environments. This study, like other studies on racial segregation and health, excluded rural respondents because racial residential segregation is typically investigated as an urban and suburban phenomenon. Ironically, we noted greater racial health disparities among older rural respondents than among urban and suburban respondents in our preliminary

analyses (data not shown). Therefore, a full understanding of race disparities in health among older adults requires examining the large disparities that exist within rural areas rather than focusing only on race disparities within urban and suburban areas.

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