

Exploring Neighborhood Effects on Health and Life Satisfaction: Disentangling Neighborhood Racial Density and Neighborhood Income

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Abstract This study examines the independent and synergistic influences of neighborhood racial density and neighborhood income on several indicators of health status and life satisfaction in a sample of 311 adult African Americans living in New York City. This is made possible by the two-stage sampling procedure that was used in the collection of the data, ensuring that respondents' neighborhoods vary on both racial density and income. Findings from a series of OLS regression models that adjust standard errors to account for the non-independence of observations demonstrate that neighborhood income moderates the relationship between racial density and health and life satisfaction. When neighborhood income is low, high neighborhood racial density is detrimental for health and life satisfaction. However, when neighborhood income is high, neighborhood racial density is protective for health and life satisfaction. These results indicate that the role of neighborhood income needs to be considered when examining the relationship between neighborhood racial density, health, and life satisfaction. Moreover, these findings may provide insight for understanding the past conflicting results.

Keywords Neighborhood racial density · Neighborhood income · Health · Life satisfaction

Introduction

Over the past four decades, researchers have explored the relationship between neighborhood characteristics and individual health and life satisfaction. Although studies have considered multiple aspects of neighborhoods, two of the most commonly examined are neighborhood racial/ethnic composition and neighborhood socioeconomic status (SES). In studies exploring these characteristics, findings consistently indicate that both neighborhood racial/ethnic composition and SES predict adults' physical (Ellen et al. 2001; Pickett and Pearl 2001; Pickett and Wilkinson 2008; Williams and Collins 2001) and mental health outcomes (Pickett and Pearl 2001; Pickett and Wilkinson 2008). Living in a low SES neighborhood is associated with less favorable outcomes, while findings regarding racial/ethnic composition are mixed.

Some research on neighborhood racial/ethnic composition has identified an "ethnic density effect", suggesting that ethnic minority individuals are at risk for worse mental and physical health outcomes when they live in neighborhoods where they constitute a smaller proportion of the population (Pickett and Wilkinson 2008). Conversely, scholars who study residential racial segregation have directly linked neighborhood racial/ethnic composition and neighborhood SES, arguing that racial disparities in health are a result of the concentration of racial/ethnic minority individuals in high-poverty areas (Williams and Collins 2001). This research has found that living in a segregated area (e.g., high racial/ethnic density) is detrimental for physical and mental ethnic minority health. However, as

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will be argued in our review of the literature presented below, the majority of the work in both of these areas has either ignored the influence of neighborhood SES or confounded neighborhood SES and racial/ethnic composition.

This study aims to disentangle the influences of neighborhood racial density, or living in a neighborhood with members of one's racial group, and neighborhood SES, as indicated by median neighborhood income, on several indicators of health status and life satisfaction in a sample of native-born adult African Americans living in New York City. As a city with incredible variation in both racial/ethnic make-up and SES, New York City provides an ideal setting for studying the neighborhood-level influences of these characteristics on health and life satisfaction. Drawing on a sample that varies on both neighborhood racial density and income makes it possible to assess the independent influences of neighborhood racial density and income. Moreover, it provides the opportunity to examine whether different combinations of these two factors are differentially associated with health and life satisfaction. Considering the ways that neighborhood racial/ethnic composition and SES may influence health and life satisfaction, either independently or in tandem, may provide a more nuanced understanding of the types of neighborhoods that can be either protective or detrimental for health and life satisfaction and offer insight into the past conflicting patterns of findings.

Neighborhood Racial Density and Physical and Mental Health

According to the ethnic density framework, risk for adverse health outcomes in ethnic minority individuals increases when they live in neighborhoods where they constitute a smaller proportion of the population (Faris and Dunham 1939). It has been suggested that this effect operates through psychosocial influences such as racism and social stigmatization (Pickett and Wilkinson 2008). The past research has demonstrated the existence of the ethnic density effect for different ethnic minority groups, including African Americans, Latinos, and various immigrant groups (Halpern and Nazroo 1999; Muhlin 1979; Neeleman et al. 2001; Rabkin 1979). The majority of the research on the ethnic density effect has focused on mental health and has shown relationships between living in low ethnic density neighborhoods and a variety of outcomes including suicide (Neeleman and Wesseley 1999), occurrence of deliberate self-harm (Neeleman et al. 2001), incidence of schizophrenia (Boydell et al. 2001), and self-reported neurotic and psychotic symptoms (Halpern and Nazroo 1999). The ethnic density effect also operates for physical health outcomes, including overall mortality (Fang et al. 1998), heart disease mortality (Franzini and Spears 2003), and self-rated health (Smaje 1995).

In contrast, research on racial residential segregation posits that segregation is a fundamental cause of racial disparities in health, particularly for African Americans (Williams and Collins 2001). The past research has documented significant relationships between racial residential segregation, defined in a variety of ways, and physical health outcomes, including higher rates of adult and infant mortality (Collins and Williams 1999; Guest et al. 1998; Hart et al. 1998; Jackson et al. 2000), cardiovascular disease (Cooper 2001), and tuberculosis (Acevedo-Garcia 2000). Researchers have argued that racial segregation's influence on health outcomes occurs, in part, because segregated neighborhoods also tend to be characterized by concentrated poverty (Massey and Denton 1993). High levels of poverty produce neighborhoods that are physically deteriorated and have high rates of crime, poor-quality schools, and excess mortality rates. Racial segregation concentrates African Americans in high-poverty neighborhoods. While most poor white people live near non-poor people, most poor African Americans live near other poor people (Massey and Denton 1993; Wilson 1987). This concentration of disadvantage is further perpetuated by the fact that individuals in high-poverty areas lack access to educational and economic opportunities. Moreover, African American children who grow up in poor neighborhoods are more likely than white children who grow up in poor neighborhoods to remain in poor neighborhoods into adulthood (Sharkey 2008a). As a result, racially segregated neighborhoods and cities produce and maintain racial disparities in SES, which in turn promote disparities in health.

Although the influence of neighborhood racial/ethnic composition on physical and mental health has long been an area of research, understanding of how these factors are related remains relatively unclear. The past research has produced a complicated and often conflicting set of results. Understanding these findings is made even more difficult by the fact that studies vary in how residential settings, segregation, and racial density are defined. In addition, researchers have failed to consider whether the influence of neighborhood racial density may be moderated by other neighborhood characteristics, specifically SES.

Neighborhood SES and Physical and Mental Health

Living in a socioeconomically disadvantaged neighborhood has been associated with a variety of physical and mental health outcomes and health-related behaviors across urban, suburban, and rural areas (Ellen et al. 2001; Pickett and Pearl 2001). In empirical studies, living in a disadvantaged neighborhood, measured using a wide-variety of census data indicators, is associated with various physical health outcomes, including mortality rates (LeClere et al. 1997), cardiovascular disease (Diez Roux et al. 2001),

acquired immune deficiency syndrome (AIDS) incidence (Zierler et al. 2000), breast cancer incidence (Yost et al. 2001), and respiratory illness (Jones and Duncan 1995). Measures of neighborhood SES have also been positively associated with individuals' self-reported health (Franzini et al. 2005; Humphreys and Carr-Hill 1991; Reijneveld 1998; Robert 1998; Ross and Mirowsky 2001). In addition, neighborhood disadvantage has been related to individual reports of worse mental health outcomes, including higher levels of depression (Aneshensel and Sucoff 1996; Galea et al. 2007; Ross 2000; Silver et al. 2002), anxiety (Aneshensel and Sucoff 1996), psychological distress (Schulz et al. 2000), and lower life satisfaction (Schulz et al. 2000).

Recent research has been able to draw on quasi-experimental and experimental designs, longitudinal data, and analytical approaches that are robust to selection bias to estimate neighborhood effects (Harding 2003; Kling et al. 2005; Kling et al. 2004; Leventhal and Brooks-Gunn 2003; Rosenbaum 1995; Sharkey 2008b), addressing the question of whether individuals with pre-existing characteristics self-select into certain types of neighborhoods or whether characteristics of neighborhoods actually influence individuals. Some of this work has shown that moving into lower poverty neighborhoods is related to improvements in adults' mental health (Kling et al. 2005; Leventhal and Brooks-Gunn 2003). Overall, these advancements in the area of neighborhood research lend support to the notion that neighborhood poverty influences mental health.

Disentangling Neighborhood Racial Density and SES

An overarching limitation of much of the research examining the relationship between neighborhood SES, racial density, and adult physical and mental health is that neighborhood SES and racial density are rarely examined concurrently. Some studies have confounded neighborhood SES with neighborhood racial composition by using measures of racial composition to operationalize neighborhood disadvantage (Land et al. 1990; Sampson 1997). Although more recent research (Wickrama et al. 2005; Wight et al. 2005) has begun to explore the dual influences of neighborhood SES and racial composition by including measures of both in predictive models, these aspects of neighborhood often remain confounded because of the overrepresentation of African Americans in high-poverty areas.

While research examining the concurrent influences of neighborhood SES and racial density on health is scarce, research examining their joint influence is almost nonexistent. Research on racial residential segregation posits that segregation isolates African Americans in low resource neighborhoods, which in turn produce disparities in physical and mental health. Comparatively, research on neighborhood racial density argues that living in a neighborhood with

same race neighbors may offer increased access to resources and services and protect against discrimination. Therefore, it may be that neighborhood SES moderates the influence of neighborhood racial density on health and life satisfaction. Whereas living in a racially dense, under-resourced neighborhood may be detrimental, living in a racially dense, higher-resourced neighborhood may be protective for health and life satisfaction.

This study explores the dual influences of neighborhood racial density and neighborhood income on African Americans' health and life satisfaction. Moreover, it considers whether the relationship between neighborhood racial density and health and life satisfaction is moderated by neighborhood income. We hypothesize that living in a racially dense, high-income neighborhood may be associated with higher health and life satisfaction than living in a racially dense, low-income neighborhood.

Methods

Sample

Data for this study come from The Survey of Minority Groups, a study of midlife development in the United States (MIDUS) conducted between 1995 and 1996, as a part of the John D. and Catherine T. McArthur Foundation's Research Network on Midlife Development (Hughes and Shweder 2002). The sample consists of men and women, aged 25 and older. The full sample includes African Americans, Dominicans, and Puerto Ricans in New York City and Mexicans and Puerto Ricans in Chicago (Hughes 2001, 2003; Ryff et al. 2003).

Because the majority of research on racial residential segregation has focused on African Americans, we chose to limit the study sample to the 311 native-born African American men and women nested within 50 block groups or neighborhoods. The number of respondents within neighborhood ranges from 1 to 20, with an average of 6 respondents per neighborhood ($SD = 5.00$). A full description of the sample is provided in Table 1.

Using information from the 1990 US Census, census block groups were categorized and selected according to whether they were high (>30 %) or low (10–30 %) ethnic density for a particular ethnic group and according to whether the median household income for the neighborhood was higher or lower than the median household income for each respective group in the city. Quotas were established that directed interviewers to recruit approximately equal numbers of target group members in each of four types of neighborhoods in a 2 (low vs. high density) by 2 (low vs. high income) design. An additional stratum was added to include African American adults living in

Table 1 Sample descriptives

| | N | %/Mean | SD |
|------------------------------|-----|--------|--------|
| Individual-level variables | | | |
| Female | 311 | 49 % | |
| Married | 309 | 28 % | |
| Employed | 300 | 47 % | |
| Highest level of education | | | |
| Less than high school | 294 | 20 % | |
| High school diploma | 294 | 34 % | |
| Some college and above | 294 | 47 % | |
| Age | 311 | 45.27 | 16.03 |
| Annual family income | 291 | 30,152 | 26,649 |
| Years in neighborhood | 310 | 14.27 | 12.35 |
| Neighborhood-level variables | | | |
| High racial density | 50 | 26 % | |
| Median neighborhood income | 50 | 30,657 | 10,312 |
| % Poverty | 50 | .17 | .11 |
| % Unemployed | 50 | .09 | .06 |
| % Public assistance | 50 | .13 | .10 |
| % Female-headed households | 50 | .23 | .11 |
| % White | 50 | .19 | .13 |
| % Puerto Rican | 50 | .18 | .18 |
| % Dominican | 50 | .06 | .13 |

“hyperconcentrated” (>70 % black, non-Hispanic) neighborhoods. Outside of neighborhoods that were hyperconcentrated, a high proportion of individuals who were black were also foreign-born. Because native-born African Americans were not directly identified in the Census, the identification of sample points for this group was done indirectly by using the difference between percent black, non-Hispanic, and percent foreign-born. There were 486 block groups that were black, non-Hispanic, but only 29 where the difference between percent black, non-Hispanic and percent foreign-born was 10 % or greater. These 29 block groups were the sampling universe for low concentration native-born African Americans. There were 155 block groups that were 45–70 % black, non-Hispanic, but only 28 where the difference was 40 % or greater. These 28 block groups were the sampling universe for high concentration native-born African Americans (Hughes and Shweder 2002). Within selected census block groups, interviewers identified eligible respondents by screening residents door to door. Eligible respondents were recruited from 50 of the 57 block groups that made up the sampling universe.

In this study, neighborhood is defined as the census block group. Census block groups are the smallest geographic areas for which census data information is available and generally consist of 600–3,000 individuals, compared with the 1,500–8,000 of a census tract. In the current sample of block groups, the number of residents per

block group ranges from 254 to 3,449 with a mean of 1,286 (SD = 687). In New York City, a census block group generally covers two to four city blocks. There are several reasons why block groups may be a more appropriate unit than census tracts for analyzing neighborhood effects. First, given their smaller size, block groups are more likely to be homogeneous in terms of social and physical characteristics than census tracts (O’Campo 2003). In addition, block groups are more consistent with the smaller areas that New York City residents often use when defining their neighborhoods (Yoskikawa 2011). As a result, block groups may provide more accurate measurements of neighborhood effects on health and life satisfaction (Huie 2001).

Measures

Health and Life Satisfaction

Multiple measures pertaining to respondents’ health status and life satisfaction were assessed. *Physical symptoms* were measured using a 13-item index that respondents rated on a 5-point scale (e.g., “How often in the past 3 months have you had headaches?”; 1 = very often to 5 = never; $\alpha = .91$). The log of this scale was taken to reduce positive skew. The item “In general, would you say your physical health is poor, fair, good, very good, or excellent?” was used to measure *self-reported health*. The item “In general, compared to most (men/women) your age, would you say your health is much better, somewhat better, about the same, somewhat worse, or much worse?” was used to measure *health compared to others*. *Psychological well-being* was measured with an 18-item index that respondents rated on a six-point scale (e.g., “I am good at managing the responsibilities of daily life”; 1 = strongly disagree to 6 = strongly agree; $\alpha = .80$) (Ryff 1995). One item that asked “At present, how satisfied are you with your life? Would you say a lot, somewhat, a little, or not at all” was used to measure *current life satisfaction*. All items were recoded so that positive values represent better outcomes and scales were z-scored to facilitate comparisons across outcomes. Correlations between the outcomes ranged from .29 to .37. This indicates that the scales shared between 8 and 14 % of their variance and, while correlated, still represent conceptually distinct constructs.

Neighborhood Racial Density and Neighborhood Income

All of the neighborhood characteristics were created at the level of the census block group using information from the Summary Tape File 3 of the 1990 Census. *Neighborhood racial density* was a dichotomous variable representing an estimate of the percentage of residents in the census block group who were African American. This variable was the

percentage of non-Hispanic blacks in the block group minus the percentage of foreign-born in the block group which parallels the approach used in the sampling procedure. Examination of the continuous variable revealed the distribution to be bi-modal. Therefore, the decision was made to dichotomize this variable using the sampling criteria as a cutoff. Block groups where more than 30 percent of the population was African American were categorized as high racial density neighborhoods while block groups where 30 percent or less of the population was African American were categorized as low racial density neighborhoods. *Neighborhood income* was the median household income of residents in the census block group. This variable was normally distributed. Therefore, the decision was made to use it as a continuous variable. Neighborhood income was divided by 1,000 to avoid very small coefficients and then centered around the sample mean.

Neighborhood-Level Covariates

Measures of *percentage white*, *percentage Puerto Rican*, and *percentage Dominican* were also included in these analyses. These groups represent the other predominant racial/ethnic groups present in the neighborhoods from which respondents were sampled. Inclusion of these variables enabled a more precise specification of relationships between racial density and health and life satisfaction, due to the fact that they may also be associated with both the main predictor variables (neighborhood racial density and neighborhood income) and the outcome variables. All models were also adjusted for a set of neighborhood-level characteristics commonly used as indicators of SES. These included *percentage of the population in poverty*, *percentage of the population unemployed*, *percentage of households receiving public assistance*, and *percentage of female-headed households*. While median neighborhood income was used as the main neighborhood SES predictor because of its use in sample stratification, additional indicators of neighborhood SES were also included to increase the precision of the estimates. Although median neighborhood income is correlated with the other indicators of neighborhood SES (–.31 to –.74), we felt that there was enough unique variance to keep these variables in the models. All neighborhood-level covariates were centered around the sample mean.

Individual-Level Covariates

The inclusion of individual demographics adjusted the models for individual-level differences that may be associated both with neighborhood characteristics and health and life satisfaction. *Marital status*, *gender*, and *employment status* were binary variables: married, female, and employed

each coded as 1. *Education* was represented with two dummy variables indicating individuals whose highest level of education was a high school diploma and individuals who had at least a college degree. Individuals with less than a high school degree were the reference group. *Age* and *years in neighborhood* were both continuous variables coded in years. *Annual family income* was in 36 categories. We generated a random number for each respondent within the boundaries of the income category they had indicated. This variable was then divided by 1,000. All continuous variables (age, years in the neighborhood, and annual family income) were centered around the sample mean.

Results

Analyses were conducted in Mplus version 5.2 (Muthen and Muthen 1998–2010) using full information maximum likelihood (FIML). FIML provides efficient estimation of statistical parameters from data with missing values, allowing retention of the complete sample for all analyses. Although there is a relatively small number of cases with missing data (46 cases with missing data on any of the variables included in the models, 15 % of the sample), the small sample size makes it important to use all available information. In order to account for the clustered nature of the data (individuals nested within neighborhoods), the TYPE = COMPLEX option with MLR estimation was used. This approach computes standard errors that are robust to non-normality and non-independence of observations (Muthen and Muthen 1998–2010). We decided to adjust the standard errors rather than modeling the non-independence of observations via multilevel modeling for two reasons. First, intra-class correlations indicated that the between neighborhood variation in outcomes was small (4–13 %). Second, our research questions concern fixed effects, and we did not hypothesize that the interaction between neighborhood racial density and neighborhood income would vary randomly across neighborhoods.

The Independent Influences of Neighborhood Racial Density and Income

The results of a series of regression models that assessed the influence of neighborhood-level racial density and income on individual health and income are presented in Tables 2 and 3. The results for the health variables are presented in Table 2, and the results for the life satisfaction variables are presented in Table 3.

The first column under each variable shows the results of a model in which each health status and life satisfaction variable was regressed on neighborhood racial density and neighborhood income adjusting for individual- and

Table 2 Neighborhood racial density and income predicting health outcomes

| | Physical symptoms | | | | Physical health | | | | Health compared to others | | | |
|---------------------|-------------------|--------|---------|--------|-----------------|--------|---------|--------|---------------------------|------|---------|--------|
| | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | | Model 6 | |
| | B | SE | B | SE | B | SE | B | SE | B | SE | B | SE |
| Intercept | -.26 | .23 | -.15 | .05 | -.02 | .22 | .05 | .21 | -.15 | .23 | -.05 | .24 |
| NB income | .14 | .14 | -.10 | -.05 | .10 | .09 | -.05 | .09 | .10 | .14 | -.13 | .13 |
| Racial density (RD) | -.11 | .26 | -.36 | -.34 | -.19 | .20 | -.34 | .22 | -.06 | .22 | -.30 | .23 |
| NB income by RD | | | .48 | .30** | | | .30 | .15** | | | .46 | .20** |
| Female | .30 | .13** | .29 | .06** | .06 | .12 | .06 | .12 | .09 | .11 | .09 | .11 |
| Married | .04 | .13 | .02 | -.27 | -.26 | .13** | -.27 | .12** | -.04 | .12 | -.06 | .11 |
| Employed | .31 | .17* | .31 | .01* | .01 | .11 | .01 | .10 | .07 | .11 | .07 | .12 |
| High school | .03 | .16 | .03 | .17 | .17 | .15 | .17 | .15 | .24 | .18 | .24 | .18 |
| College | .04 | .16 | .04 | .22 | .22 | .14 | .22 | .14 | .09 | .19 | .10 | .19 |
| Age | -.01 | .01*** | -.01 | -.02** | -.02 | .00*** | -.02 | .00*** | -.01 | .00 | -.01 | .00** |
| Family income | .02 | .03 | .03 | .09 | .09 | .03*** | .09 | .02*** | .06 | .02 | .07 | .02*** |
| Years in NB | .08 | .05* | .10 | .05** | .04 | .05 | .05 | .05 | .07 | .06 | .09 | .06 |
| % Poverty | .91 | .89 | .72 | .11 | .21 | .88 | .11 | .96 | -.97 | .81 | -1.14 | .93 |
| % Unemployed | 1.79 | 1.49 | 1.39 | .64 | .90 | 1.29 | .64 | 1.16 | 1.36 | 1.21 | .93 | .97 |
| % Public assist. | 1.20 | 1.21 | 1.10 | 1.18 | 1.24 | 1.12 | 1.18 | 1.07 | 1.41 | 1.38 | 1.33 | 1.17 |
| % Female head. | -1.79 | 1.05* | -1.70 | -.57* | -.62 | .95 | -.57 | .82 | .48 | .84 | .56 | .69 |
| % White | -.10 | .72 | -.36 | -.18 | .00 | .43 | -.18 | .45 | -.11 | .60 | -.37 | .60 |
| % PR | -.52 | .59 | -1.01 | -.26 | .06 | .47 | -.26 | .50 | -.26 | .66 | -.73 | .71 |
| % Dominican | -1.07 | .91 | -2.14 | -.66* | .03 | .74 | -.66 | .76 | -.29 | .93 | -1.34 | .93 |
| R ² | .13*** | | .17*** | | .25*** | | .26*** | | .08** | | .11** | |

* < .10, ** < .05, *** < .01

neighborhood-level differences. None of the coefficients representing the main effects of neighborhood racial density and income were statistically significant in the models predicting physical symptoms (Table 2, Model 1), self-reported health (Table 2, Model 3), health compared to others (Table 2, Model 5), or current life satisfaction (Table 3, Model 3). However, neighborhood income was significantly related to psychological well-being. Contrary to expectations, higher neighborhood income was related to lower psychological well-being ($B = -.25, (.09), p = .01$) (Table 3, Model 1).

The Interactive Influence of Neighborhood Racial Density and Income

To examine the interactive relationship between neighborhood racial density and income on health and life satisfaction, a neighborhood racial density by income interaction term was entered into the model. Adjusting for individual and neighborhood characteristics, findings indicate that the interaction between neighborhood racial density and income significantly predicted physical symptoms ($B = .48, (.30), p = .02$) (Table 2, Model 2), self-reported health ($B = .30, (.15), p = .04$) (Table 2, Model 4), health compared to

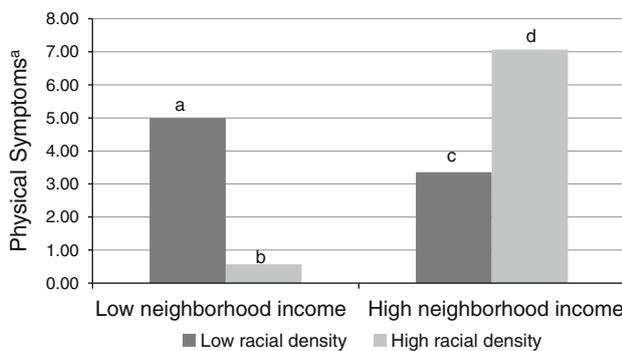
others ($B = .46, (.20), p = .02$) (Table 2, Model 3), and current life satisfaction ($B = .33, (.15), p = .03$) (Table 3, Model 4) but was not significantly associated with psychological well-being (Table 3, Model 2). The nature of these interactions is shown in which we plotted the interaction at \pm one standard deviation of each of the predictors. A value of 1 was added to each predicted value in order to avoid graphing negative values. Figures 1, 2, 3, 4 display the interactive relationship between neighborhood racial density and income and physical symptoms, self-reported health, health compared to others, and current life satisfaction respectively. It should be noted that physical symptoms is coded so that higher values indicate lower symptoms as to be consistent with the other outcome variables. Examining the four figures, it is apparent that all of the interactions have a similar cross-over shape, in which one of the neighborhood characteristics decreases as the other increases. Therefore, the influence of each neighborhood characteristic may cancel the other out, explaining the lack of main effects for neighborhood racial density and neighborhood income in models predicting physical symptoms, self-reported health, health compared to others, and life satisfaction.

In addition, we tested whether simple slopes calculated at one standard deviation above or below each of the

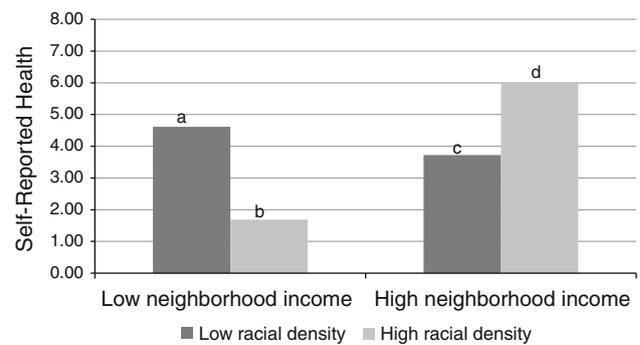
Table 3 Neighborhood racial density and income predicting life satisfaction outcomes

| | Psychological well-being | | | | Current life satisfaction | | | |
|------------------|--------------------------|--------|---------|--------|---------------------------|--------|---------|--------|
| | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
| | B | SE | B | SE | B | SE | B | SE |
| Intercept | -.13 | .22 | -.05 | .24 | -.25 | .21 | -.17 | .21 |
| NB income | -.25 | .09*** | -.21 | .12* | -.05 | .11 | -.21 | .14 |
| Racial density | -.16 | .17 | -.12 | .19 | -.24 | .19 | -.41 | .20** |
| NB income by RD | | | -.08 | .14 | | | .33 | .15** |
| Female | -.02 | .12 | -.01 | .12 | .02 | .10 | .02 | .10 |
| Married | .09 | .11 | .09 | .12 | .30 | .14** | .28 | .14** |
| Employed | -.05 | .15 | -.05 | .15 | .11 | .11 | .11 | .11 |
| High school | .15 | .16 | .15 | .16 | .22 | .17 | .22 | .17 |
| College | .36 | .17** | .36 | .17** | .35 | .18** | .36 | .17** |
| Age | .01 | .00* | .01 | .00* | .01 | .00*** | .01 | .00*** |
| Family income | .05 | .02*** | .05 | .02** | .04 | .03 | .04 | .03 |
| Years in NB | -.02 | .05 | -.03 | .05 | -.02 | .04 | -.01 | .05 |
| % Poverty | -3.29 | .87*** | -3.26 | .86*** | -1.48 | .76* | -1.60 | .87* |
| % Unemployed | -.23 | 1.04 | -.15 | 1.04 | -1.45 | 1.15 | -1.75 | 1.01* |
| % Public assist. | 1.07 | 1.11 | 1.09 | 1.12 | 1.39 | 1.25 | 1.32 | 1.24 |
| % Female head | 1.07 | .64* | 1.06 | .61* | 1.22 | .72* | 1.27 | .55** |
| % White | -.01 | .45 | .04 | .44 | -.14 | .45 | -.32 | .47 |
| % PR | -.02 | .65 | .06 | .64 | -.46 | .56 | -.80 | .57 |
| % Dominican | -1.98 | .81** | -1.80 | .88** | -1.59 | .83* | -2.34 | .83*** |
| R ² | .14*** | | .14*** | | .15*** | | .16*** | |

* < .10, ** < .05, *** < .01

^aHigher scores indicate fewer symptoms**Fig. 1** Interaction between neighborhood racial density and income predicting physical symptoms

predictors differed from zero. When neighborhood income was low, there was a consistent negative relationship between racial density and outcomes (a to b slope): physical symptoms ($t(292) = -2.27, p = .02$), self-reported health ($t(292) = -2.10, p = .04$), health compared to others ($t(292) = -2.40, p = .02$), and current life satisfaction ($t(292) = -2.32, p = .02$). Among individuals living in low-income neighborhoods, those living in high racial density neighborhoods

**Fig. 2** Interaction between neighborhood racial density and income predicting self-reported health

had worse outcomes than those living in low racial density neighborhoods. In contrast, when neighborhood income was high, there was a consistent positive relationship between racial density and outcomes (c to d slope): physical symptoms ($t(292) = 2.35, p = .02$), self-reported health ($t(292) = 1.87, p = .06$), health compared to others ($t(292) = 2.33, p = .02$), and current life satisfaction ($t(292) = 2.04, p = .05$). Among individuals living in high-income neighborhoods, those living in high racial density neighborhoods had better outcomes than those living in low-density neighborhoods.

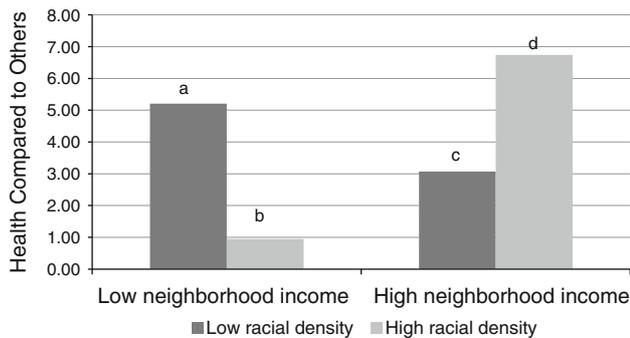


Fig. 3 Interaction between neighborhood racial density and income predicting health compared to others

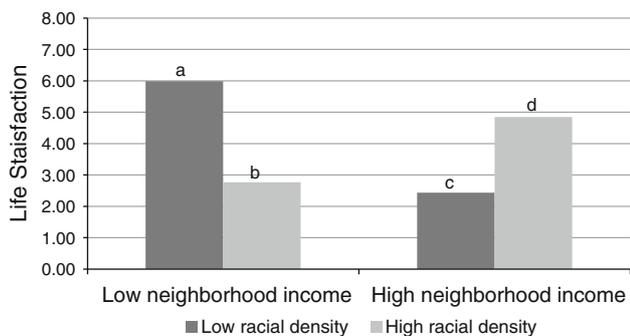


Fig. 4 Interaction between neighborhood racial density and income predicting life satisfaction

We also examined the slope of neighborhood racial density at different levels of neighborhood income. When racial density was low, there was no difference in outcomes for individuals living in low- versus high-income neighborhoods (a to c slope). However, when racial density was high, there was evidence of a positive relationship between neighborhood income and health outcomes (b to d slope): physical symptoms ($t(292) = 2.56, p = .01$), self-reported health ($t(292) = 1.75, p = .08$), and health compared to others ($t(292) = 2.13, p = .03$). For individuals living in high racial density neighborhoods, those living in high-income neighborhoods had better outcomes than those living in low-income neighborhoods.

Discussion

The findings from this study indicate that the influence of neighborhood racial density on individual health and life satisfaction may be contingent upon neighborhood income. While neither neighborhood racial density nor income consistently predicted health or life satisfaction, the interaction between neighborhood racial density and income was associated with physical symptoms, self-reported health,

health compared to others, and current life satisfaction. The shape of the interactions is consistent across outcomes and indicates that among individuals living in low-income neighborhoods, those living in high racial density neighborhoods have *lower* levels of health and life satisfaction than those living in low racial density neighborhoods. This supports research from the racial segregation literature that has argued that the residential segregation of African Americans in high-poverty areas perpetuates health disparities in the United States. Segregation fosters neighborhoods defined by concentrated disadvantage, producing settings lower in resources than comparable low-income, low racial density neighborhoods. In comparison, the interactions also indicate that among individuals living in high-income neighborhoods, those living in high racial density neighborhoods have *higher* levels of health and life satisfaction than those living in low-density neighborhoods. This parallels findings from research on the “ethnic density effect” that suggest that racially dense neighborhoods may be protective for individual health and life satisfaction. This work emphasizes the fact that not only should neighborhood racial density and income not be equated, they need to be considered in tandem to fully understand their relationship to health and life satisfaction.

In order to better understand how these neighborhoods may be affecting health and life satisfaction, we contextualized the block groups within the framework of New York City neighborhoods. The majority of respondents living in high-density, low-income block groups are concentrated in two New York City neighborhoods: Bedford-Stuyvesant and Fort Greene. Bed-Stuy, as it is known, is a predominantly African American neighborhood located in the borough of Brooklyn. In this sample, the two block groups located in Bed-Stuy have very high concentrations of African Americans, purposefully selected to be “hyperconcentrated” (>70 % African American). Historically, the neighborhood has also been characterized by high rates of poverty and crime. In 1995, during the period of data collection, the New York Times reported that Bed-Stuy was one of the few areas in the city where murder rates were on the rise compared with decreasing crime rates throughout the rest of the city (Krauss 1995). Fort Greene, also located in Brooklyn, is a neighborhood known for its long-standing racial and social class diversity (Rosenberg 1998). However, there is a divide between the affluent residents who live in the neighborhood’s brownstones and the neighborhood’s low-income residents concentrated in public housing projects. In the late 1990s, these projects were characterized by overwhelming poverty, joblessness, homogenous minority populations, and dangerous conditions. The highly racialized, extremely poor, nature of the racially dense, low-income neighborhoods in this sample suggest that there may be something qualitatively different about these types of

neighborhoods that may affect resident health and life satisfaction.

One way that these neighborhoods may differ is in terms of differential levels of neighborhood resources (e.g., health care, nutritious food options). Small and McDermott (2006) found that the number of organizational resources, such as grocery stores, laundries, child care centers, and banks, available in a neighborhood increases as the poverty rate of the neighborhood increases. However, the number of neighborhood resources decreases as the proportion of the neighborhood that is black increases. Moreover, they examined the interaction between neighborhood poverty and proportion black and found some support for the hypothesis that poor, black neighborhoods have the lowest access to resources. These differences in access across types of neighborhoods may in turn affect health and life satisfaction.

Although this explanation would explain the pattern of effects in the low-income neighborhoods (a to b slope), it would not address the differences that exist across the two high-density neighborhoods (b to d slope). An additional explanation may be that behavioral norms differ across the low- and high-income African American neighborhoods. In low-income, largely African American neighborhoods, African American residents may face concerns about conforming to American cultural stereotypes about their group (Contrada et al. 2000). For example, the past research has found stereotypes about African Americans as lazy and preferring to be on welfare over working to be prevalent among the American public (Gilens 1999). These negative stereotypes may be particularly salient for African Americans living in poor, under-resourced neighborhoods where high numbers of residents may be unemployed and reliant on public services. Concerns about confirming negative own-group stereotypes may arise as a result of the juxtaposition of societal expectations and the daily challenges of living in an impoverished neighborhood. This conflict may lead to stress, which in turn, can negatively affect health. In addition, residents may internalize negative stereotypes about their group, which may lead to unhealthy behaviors such as alcohol and tobacco use. Alternatively, African Americans living in high-income, largely African American neighborhoods may feel that they are refuting negative stereotypes about their group. Feeling positively about oneself and one's group may translate into healthier behavioral norms and overall better health and life satisfaction.

The racially dense, high-income block groups in this sample are predominantly located in Clinton Hill and Fort Greene. Clinton Hill is Fort Greene's more affluent neighbor to the west. During the 1970s, these neighborhoods underwent a period of revitalization. The primary concerns of neighborhood activists at the time were the prevention of racial and class displacement (Rosenberg

1998). By the mid-1980s, it was clear that these efforts had been largely successful. A unique aspect of revitalization in Clinton Hill and Fort Greene was that the proportion of non-white residents increased (DeGiovanni 1984). This is surprising given that when revitalization has occurred in other minority neighborhoods throughout the United States, the efforts have generally resulted in a reduction in the minority population. In the 1980s, a large black artistic community had also begun to emerge in Fort Greene's higher-income areas, and the neighborhood became a desired destination for the black middle class. By the 1990s, this cultural movement was at its peak, reflecting and informing residents' racial identity. Given this context in which there was not only a commitment to maintaining the racial makeup of these neighborhoods, but a positive racial identity directly drawn from the neighborhood, it is easy to imagine how, for the middle class, this setting could be protective for health and life satisfaction.

While the interaction between neighborhood racial density and income predicted the three health status variables and current life satisfaction, it did not predict psychological well-being. In addition, neighborhood income was negatively related to psychological well-being, indicating that individuals living in higher-income neighborhoods reported lower levels of psychological well-being. This finding is surprising given the large body of literature linking neighborhood disadvantage to worse mental health. However, there are a growing number of studies suggesting that *relative* economic position may be as important for well-being as absolute economic standing alone (e.g., Wilkinson and Pickett 2009). Work in this area has found relative disadvantage (i.e., being in a lower economic position than salient others) to be negatively related to happiness (Luttmer 2005). If the majority of the current study sample has a household income that falls below the income of their neighbors, neighborhood income may be a proxy for relative disadvantage. As such, a negative relationship between neighborhood income and psychological well-being would parallel the past findings on relative disadvantage and well-being. Alternatively, this counter-intuitive finding may be a result of the measure of psychological well-being used in this study. The Ryff Scales of Psychological Well-Being was developed to measure six facets of psychological well-being: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance (Ryff 1995). Because of low reliabilities for individual sub-scales, the decision was made to use all items as an overall measure of psychological well-being. As a result, the global measure may be masking the nuances of the measure and therefore may not be functioning as intended.

There are several limitations to this study that warrant discussion. First, the data are cross-sectional, making it

impossible to draw causal inferences about the results. Although we hypothesize that neighborhood racial density and income are affecting individuals' health and life satisfaction, in actuality, it may be that the racial density and income of the neighborhood is shaped by the presence or absence of healthy people. Future research needs to draw on longitudinal data to better explore the temporal relationship between neighborhood variables, health, and life satisfaction. Similarly, the selection of people into and out of neighborhoods can bias the estimates of neighborhood-level effects (Tienda 1991). For example, African Americans who choose to live in racially dense neighborhoods may differ in unmeasured ways from those who do not. Because it is difficult to randomly assign people to neighborhoods, it is hard to determine what unmeasured factors may both steer people into particular neighborhoods and also influence their health and life satisfaction. In addition, caution should be used when generalizing results from this study to other samples. The sampling procedure used in this study was not designed to yield a representative sample of African Americans in New York City, but rather to permit a test of hypotheses regarding race/ethnicity and social context during midlife. Additional work is needed to test these hypotheses across different samples and settings. Also, while the data used in these analyses are well suited to address the questions of interest given the sampling methodology that was used, it is 16 years old. Even though this is the case, an examination of neighborhood characteristics in 2010 indicates that the neighborhoods used in these analyses are relatively stable in terms of income and racial density. Neighborhood income and percent African American in 1990 are each positively correlated with these same characteristics in 2010¹ (.40 and .38 respectively), suggesting that despite the age of the data, these neighborhoods remain salient settings for considering influences on health and life satisfaction. Finally, although the interaction between neighborhood racial density and income was established, the underlying processes behind it were not explained. However, findings from the past research suggest that the availability of neighborhood resources and behavioral norms surrounding health behaviors may be driving this relationship and suggest that future work should explore these factors as potential mediating processes.

The findings from this study highlight the importance of considering both neighborhood racial density and income when examining relationships to health. Moreover, this study demonstrates that the influence of racial density on health and life satisfaction may operate differently at different levels of neighborhood income. Specifically,

while neighborhood racial density can be detrimental to health and life satisfaction in the context of low neighborhood income, it appears to be protective when neighborhood income is high. This pattern of results may offer insight into understanding the past findings that have produced conflicting effects for neighborhood racial density. This study also highlights the importance of considering when and how racially dense settings may positively influence individual outcomes.

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¹ Given the changes that were made to the 2010 census, it is impossible to examine neighborhood income at the block group level. Therefore, these calculations were made using American Community Survey 5 year (2006–2010) estimates.

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