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Racial/Ethnic Neighborhood Concentration and Self-Reported Health in New York City

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Objectives: To examine the relationship between racial/ethnic neighborhood concentration and self-reported health before and after adjustment of individual- and neighborhood-level characteristics and to determine whether this association varies by race/ethnicity and perception of neighborhood.

Design: The data are derived from the 1999 and 2002 New York City Social Indicator Survey, a cross-sectional survey. Logistic regression was used to assess the strength of the association between racial/ethnic neighborhood concentration and self-reported health before and after controlling for other covariates.

Setting: The survey was conducted in New York City in 1999 and 2002.

Participants: A final sample of 2,845 individuals who self-identified as White, Black, Hispanic, or Asian was linked by zip code to the 2000 US Census.

Main Outcome Measure: Self-reported health was used as a dichotomous variable, good health status (including responses of excellent, very good, pretty good, or good) and poor health status (including the responses fair or poor).

Results: Overall, 21.8% of respondents rated their health as poor, and those who live in neighborhoods with a high concentration of Blacks reported poorer health (27.2%) than those who live in neighborhoods with a low concentration of Blacks (17.3%, $P<.001$). Our findings suggest that individuals living in the most concentrated neighborhoods were almost two times more likely (odds ratio 1.77, 95% confidence interval 1.12–2.79) to perceive their health as poor compared to their counterparts living in less concentrated neighborhoods.

Conclusions: This study demonstrates that poor self-reported health varies with patterns of concentration of Blacks in a neighborhood, after adjusting for individual- and neighborhood-level characteristics and perception of neighborhood. The results underscore the need for elucidating the pathways by which racial/ethnic neighborhood concentration affects health. (*Ethn Dis.* 2006;16:900–908)

Key Words: Racial/Ethnic Neighborhood Concentration, Residential Segregation, Self-Reported Health Status

Introduction

Several studies have examined the role of racial/ethnic residential segregation as a fundamental contributor to inequalities in health outcomes.[1–3] Segregation as measured by the index of dissimilarity[4,5] or the isolation index[4] has been associated with higher rates of all-cause mortality,[4] cardiovascular disease-related mortality,[4] and infant mortality.[5] Although the mechanisms by which residential segregation influence health are not well understood, proposed pathways include the concentration of poverty, lack of access to high-quality medical care, unequal distribution of accumulated chronic and acute stressors, weakened neighborhood infrastructure, political disempowerment, and institutional neglect and disinvestment.[1,2,4–7]

In addition to the traditional measures of segregation, researchers have used the concentration of Blacks in a defined geographic area to study residential segregation.[8–11] Similar to traditional measures of segregation, concentration of Blacks is also associated with mortality and is purported to influence mortality through similar mechanisms.[9,11] Although, few studies

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have focused on self-reported health, an independent predictor of mortality, these studies[12,13] have underscored the role of neighborhood environment on self-reported health. The mechanisms by which neighborhoods affect self-reported health are unclear; however, several studies indicate that neighborhood-level characteristics (ie, percentage of adults without high school diplomas, proportion of adults unemployed, and the percentage of residents living below the poverty level) may play a role.[14–19] Neighborhood conditions may affect self-reported health by influencing health behaviors, promoting diffusion of health-related information, and increasing the adoption of healthy normative behaviors.[14,20,21]

Despite the fact that most studies examining neighborhood characteristics focus on census-level aggregate measures, some studies are beginning to emphasize the importance of self-reported neighborhood environment and quality as complements of the census measures.[15,22,23] Recent evidence suggest that individual reports of neighborhood safety and security (ie, crime, drug use, policing services, fear of safety), neighborhood satisfaction (ie, noise, litter, run-down and abandoned buildings, public services such as sanitation), and relationships with neighbors (ie, close-knit neighborhood, trustworthiness of neighbors)[20,22,24] may provide additional information by which neighborhood characteristics influence health outcomes.[22,24,25]

The availability of the New York City Social Indicators Survey (NYC-SIS), a biennial cross-sectional survey of NYC household residents, affords the

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opportunity to examine the relationship between racial/ethnic neighborhood concentration and self-reported health before and after adjustment of individual- and neighborhood-level characteristics. In addition, the study examines whether the association between racial/ethnic neighborhood concentration and self-reported health varies by race/ethnicity and individual perception of neighborhood.

METHODS

The NYC-SIS, administered since 1997, is a biennial survey that measures individual and family well-being on a range of social and economic living conditions, adequacy of governmental services, and satisfaction and perception of the city. Data for this study are drawn from the 1999 and 2002 NYC-SIS, which uses similar sampling design and data collection methods. The study sampling scheme has been described elsewhere.[26] Briefly, interviews were administered to a random sample of household residents ≥18 years of age, throughout the five boroughs in New York City, by using random digit dialing and computer-assisted telephone interview technology. The survey used a clustered, stratified sampling design. Each survey was conducted in English and Spanish; however, the 2002 survey was also conducted in Mandarin, Cantonese, and Korean. The 1999 survey consisted of 1762 individuals, and data were collected between May 1999 and March 2000, with a response rate (including households in which a respondent was never reached) of 33%. Data for the 2002 survey were collected between March and June of 2002, with a total of 1803 individuals and a response rate of 30%. Sampling weights were generated to account for probability of selection and to correct for underrepresentation or overrepresentation of certain groups of individuals relative to the NYC population.[27]

The 1999 and 2002 waves of the NYC-SIS were combined to achieve a larger sample size totaling 3565 individuals. Exclusion criteria for the study consisted of subjects who self-identified race/ethnicity as American Indian, Alaskan Native, or "other" (*n*=160); missing data for the outcome of interest, education, age, health insurance, or for one of the five perception of neighborhood variables (*n*=308); and records where zip codes were missing, invalid, outside of the five boroughs, duplicated in one or more of the boroughs, post office box, or with no census-level information available (*n*=252). After excluding a total of 720 individuals, the final sample of 2845 individuals was distributed in 170 zip codes (with a median of 15.5 individuals per zip code, ranging between 1 to 47 individuals) and linked to the year 2000 US Census zip code-level data.

The questions from which the variables were derived for the present study were collected similarly in both the 1999 and 2002 waves of the survey, with the exception of the self-reported health question. In the 1999 NYC-SIS, responses to the question "In general, would you say your health is …" were based on a four-item scale, excellent, pretty good, fair, or poor, while the 2002 NYC-SIS responses were based on a five-item scale, excellent, very good, good, fair, or poor. Consistent with previous studies,[28,29] self-reported health was dichotomized for analysis as follows: one category for responses excellent or pretty good in the 1999 survey and excellent, very good, or good in the 2002 survey (good health status); and another category for fair or poor responses (poor health status) in both surveys. In order to rule out differences in the outcome distribution across the surveys, separate analyses comparing the association of racial/ethnic neighborhood concentration and self-reported health in each survey wave were conducted. No significant differences were found in the association between the prevalence of self-reported health and racial/ethnic neighborhood concentration across surveys (*P*=.10).

Consistent with previous studies[8,10,11,30] racial/ethnic neighborhood concentration was measured as the proportion of Blacks residing in a neighborhood, defined as zip codes, as a proxy for racial/ethnic residential segregation. The use of zip codes to characterize neighborhoods is currently employed by the New York City Department of Health and Mental Hygiene's annual telephone Community Health Survey (modeled after the Centers for Disease Control and Prevention Behavioral Risk Factor Surveillance System) to obtain neighborhood-specific estimates of health behaviors and outcomes to inform public health policy and practice.[31] The distribution of racial/ethnic neighborhood concentration in this study sample ranged from .02% to 94%, with a mean of 28.1%. Tertiles were used to characterize areas into the following categories: low (percentage of Blacks less than .053), medium (percentage of Blacks between .053 and .35) and high (percentage of Blacks greater than .35) racial/ethnic neighborhood concentration.

Race/ethnicity, age, sex, education, family income, and health insurance were recognized as potential confounders in previous studies examining self-reported health and thus included in the analysis.[32,33] Race was collected through the question "Are you White, Black, Asian, or do you consider yourself part of another group?" and categorized as White, Black, or Asian. Ethnicity, ascertained by the following question, "Are you of Latino or Hispanic descent (yes/no)?" was asked before the race question. These two questions were combined to create the following mutually exclusive racial/ethnic categories: non-Hispanic White, non-Hispanic Black (from hereafter referred to as White and Black respectively), Asian, and Hispanic. Age was collected as a continuous variable and further categorized into four groups: 18–34, 35–44, 45–54, and ≥55. Education was collected on an 11-item ordinal scale through the question, "What is the highest grade or level of regular school ever completed?" and categorized as 12th grade or less; high school diploma, general equivalency diploma (GED), or trade school; vocational, technical, or trade school certificate; some college or associate's degree; bachelor's degree; and some graduate school or graduate or professional school degree. Income was collected as a continuous variable and categorized as ≤$19,999, $20,000–$39,999, $40,000–$59,999, $60,000–$79,999, and ≥$80,000. Sex (male/female) and presence of health insurance (yes/no) were used in the analysis as collected.

Survey participants were asked to rate selected features of their neighborhoods through the following four questions: "How comfortable would you feel asking your neighbors for help in an emergency?"; "How would you describe the conditions of houses and other buildings in your neighborhood?"; "How do you feel about police protection?"; and "How would you rate your neighborhood as a place to live?" With the exception of the first question,

which was rated on a three-item scale (very comfortable, somewhat comfortable, or not comfortable), answers were rated on a four-item scale (very good, pretty good, fair, or poor). Answers to each question were recoded, so that increasing scores represent better perception of neighborhood. Each variable was transformed to a z score by subtracting its value from the grand mean for that variable and dividing the result by the standard deviation of the grand mean. The sum of the z scores was used to generate a composite neighborhood perception summary score (ranging from −5.50 to 10.26), with increasing values indicating positive perception of neighborhood. Internal reliability of the items was reasonably good[34] (Cronbach α=.77). Based on the sample distribution of the summary score, quartiles were created, with increasing values reflecting better perception of neighborhood.

Zip codes were used as proxies for neighborhood. Neighborhood-level socioeconomic variables were derived from the 2000 US Census zip code level data. Although no agreement exists as to the specific neighborhood characteristics relevant to health, previous studies suggest that percentage of individuas age ≥25 with a bachelor's degree, median household income, median housing value, percentage of individuals unemployed, percentage of individuals on public assistance, housing tenure (rent vs own), and neighborhood poverty level are salient neighborhood features that may influence health status.[30,35] Consistent with previous studies,[19,36,37] a neighborhood summary score was constructed to describe the neighborhood socioeconomic environment. Specifically, factor analysis of several US Census variables (ie, age ≥25 with a bachelor's degree, log of the median household income, log of the median housing value, percentage of individuals unemployed, percentage of individuals on public assistance, housing tenure [rent vs own], neighborhood

poverty level) was performed to summarize the data to the most meaningful combination of variables. Based on the factor analysis, we found that percentage of individuals age ≥25 with a bachelor's degree, log of the median household income, and log of the median housing value loaded into a single factor (Eigen value: 4.88 and variance explained: .70). The internal consistency of the neighborhood socioeconomic status (SES) summary score was reasonably good (Cronbach α=.73). Each variable was transformed into a z score by using the grand mean and standard deviation and added to create the neighborhood SES summary score (ranging from −14.07 to 6.19), with increasing values reflecting an advantaged neighborhood environment. For the analysis, neighborhood score was modeled as a categorical variable based on quartiles.

STATISTICAL ANALYSIS

Descriptive statistics for individual- and contextual-level socioeconomic characteristics of the study population were presented by racial/ethnic neighborhood concentration tertiles and by health status. To determine significant differences, chi-square (categorical variables) and t tests (continuous variables) were used.

Logistic regression models were used to assess the strength of the association between racial/ethnic neighborhood concentration and self-reported health. A series of models were constructed to assess the association of racial/ethnic neighborhood concentration and self-reported health while controlling for a selected block of individual and neighborhood covariates. Specifically, six sets of analyses were performed: 1) unadjusted odds ratio (OR) (model 1); 2) OR adjusted for age, sex, race/ethnicity (model 2); 3) OR additionally adjusted for education, income, and health insurance (model 3); 4) OR additionally adjusted for respondent

perception of neighborhood (model 4); 5) OR adjusted for model 3 and neighborhood SES summary score (model 5); and 6) OR adjusted for model 4 and neighborhood SES summary score (model 6). To examine whether the association between racial/ethnic neighborhood concentration and self-reported health differed by race/ethnicity and perception of neighborhood, interaction terms were tested in the final model.

All analyses were conducted with SUDAAN.[38] SUDAAN accounts for the complex sampling design used for NYC-SIS, yielding unbiased standard error estimates. In addition, SUDAAN also accounts for the intra-neighborhood correlation of outcomes of individuals selected from the same zip codes. Therefore, ORs reported are population averages rather than unit-specific estimates. In the tables, the sample sizes were unweighted. However, estimates for means, proportions, standard errors, and ORs with their 95% confidence intervals (CI) were weighted.

RESULTS

Characteristics of the study population by neighborhood concentration of Blacks are presented in Table 1. As compared to those who live in neighborhoods with a low concentration of Blacks, individuals residing in neighborhoods with a high concentration of Blacks were in general, older, more likely to be female, more likely to be Hispanic, and have less education, income, and health insurance coverage (all *P*<.001). When neighborhood socioeconomic characteristics were considered, highly concentrated neighborhoods were generally more disadvantaged than less concentrated areas, exhibiting worse neighborhood SES context as indicated by lower values for education, income, and housing value. People living in highly concentrated neighborhoods were more likely

Table 1. Descriptive statistics for individual and contextual characteristics by degree of neighborhood concentration: New York City Social Indicators Survey (NYC-SIS), combined 1999 and 2002

	Low (*n*=921)	Medium (*n*=1064)	High (*n*=860)	Total (*N*=2845)	*P* value
Individual-Level Characteristics					
Age					*P*<.001
18–34	35.6	42.7	31.5	37.0	
35–44	19.9	20.2	20.5	20.2	
45–54	17.1	15.0	20.6	17.3	
≥55	27.3	22.1	27.4	25.5	
Sex					*P*<.001
Male	47.1	48.6	41.5	46.1	
Female	52.9	51.4	58.0	53.9	
Race/ethnicity					*P*<.001
White	70.4	36.7	8.0	41.5	
Black	3.0	18.7	65.0	25.6	
Asian	11.3	7.6	5.9	8.5	
Hispanic	15.3	37.0	21.2	24.4	
Education					*P*<.001
Less than high school	22.6	26.5	35.3	27.4	
High school diploma or GED	19.9	23.3	23.7	22.1	
Some college or trade school	26.0	24.1	26.2	25.4	
Bachelor's degree	16.4	12.5	8.7	12.9	
Some graduate or advanced degree	15.2	13.6	6.1	12.2	
Income					*P*<.001
≤$19,999	29.9	36.8	43.3	36.0	
$20,000–$39,999	19.2	24.4	22.5	21.9	
$40,000–$59,999	14.4	12.9	15.3	14.1	
$60,000–$79,999	12.4	10.3	9.6	10.9	
≥$80,000	24.1	15.6	9.3	17.1	
Health insurance					*P*<.001
Yes	81.2	77.4	74.3	77.9	
No	18.8	22.6	25.7	22.1	
Health status					*P*<.001
Good	81.2	77.4	72.8	78.2	
Poor	17.3	22.3	27.2	21.8	
Respondent perception of neighborhood score* (SE)	1.5 (.015)	−.3 (.015)	−1.1 (.016)	.15	*P*<.001
Contextual-Level Characteristics					
Neighborhood SES context (mean score)†	.38 (.027)	.02 (.037)	−.46 (.028)	.02	*P*<.001
Age ≥25 with bachelor's degree (%)	18.4	15.6	9.5	15.0	*P*<.001
Median household income ($)	46,979	38,777	31,449*	39,836	*P*<.001
Median housing value ($)	327,552	324,393	196,197	289,974	*P*<.001

* Respondent perception of neighborhood score created from four variables (''how comfortable would you feel asking your neighbors for help in an emergency;'' ''how would you describe the conditions of houses and other buildings in your neighborhood;'' ''how do you feel about police protection;'' ''how would you rate your neighborhood as a place to live'').

† One unit increase in mean score corresponds to: 10% increase in the percentage of adults, $5,000 median income, $50,000 median housing value.

GED= general equivalency diploma; SE= standard error; SES= socioeconomic status.

Table 2. Individual and neighborhood characteristics by self-rated health and their association with self-rated health: NYC-SIS, combined 1999 and 2002

	% Good Self-Rated Health (N=2322)	% Poor Self-Rated Health (N=523)	Crude OR* (95% CI)
Overall	78.2	21.8	1.79 (1.23–2.59)
Individual-level characteristics			
Age			
18–34	40.4	24.6	1.00
35–44	20.4	19.1	1.54 (1.02–2.34)
45–54	17.1	18.2	1.75 (1.09–2.80)
>55	22.1	38.1	2.84 (1.85–4.37)
Sex			
Male	46.7	43.5	1.00
Female	53.3	56.5	1.14 (0.85–1.52)
Race/Ethnicity			
White	43.9	32.5	1.00
Black	25.8	24.9	1.30 (0.89–1.91)
Asian	8.8	7.7	1.18 (0.60–2.31)
Hispanic	21.5	34.9	2.19 (1.52–3.16)
Education			
Less than high school (HS)	21.7	47.9	8.57 (4.79–15.31)
HS diploma or GED	21.9	22.9	4.06 (2.26–7.30)
Some college or trade school	27.5	18.0	2.55 (1.39–4.70)
Bachelor's degree	14.4	7.5	2.00 (0.99–4.07)
Some grad or advanced degree	14.5	3.7	1.00
Income			
≤$19,999	29.9	58.0	4.77 (2.64–8.62)
$20,000–$39,999	22.6	19.6	2.14 (1.18–3.86)
$40,000–$59,999	15.7	8.4	1.31 (0.64–2.67)
$60,000–$79,999	12.2	6.0	1.20 (0.51–2.81)
≥$80,000	19.6	8.0	1.00
Health insurance			
Yes	80.0	70.6	1.00
No	20.0	29.4	1.67 (1.15–2.41)
Neighborhood concentration			
Low	39.9	30.0	1.00
Medium	34.3	35.3	1.37 (0.93–2.02)
High	25.9	34.7	1.79 (1.23–2.59)
Respondent perception of neighborhood score† (SE)	0.53	−1.21	0.62 (0.54–0.72)
Contextual-level characteristics			
Neighborhood SES context (mean score)‡	0.06 (0.067)	−0.11 (0.067)	0.80 (0.70–0.91)
(%)≥ 25 with bachelor's degree	15.4	13.3	0.76 (0.65–0.89)
($) Median household income	40,781	36,441	0.75 (0.66–0.86)
($) Median housing value	296,864	265,224	0.99 (0.91–1.08)

* OR for each variable category.
† Respondent perception of neighborhood score created from 4 variables ("How comfortable would you feel asking your neighbors for help in an emergency"; "How would you describe the conditions of houses and other buildings in your neighborhood"; "How do you feel about police protection"; "How would you rate your neighborhood as a place to live").
‡ One unit increase in mean score corresponds to: 10% increase in the percentage of adults, $5,000 median income, $50,000 median housing value.
GED=general equivalency diploma

to rate their health as poor (27.3%) when compared to their counterparts living in low (17.3%) and medium concentrated neighborhoods (22.3%; *P*<.001). In addition, people in highly concentrated neighborhoods tended to have poorer perception of neighborhood as indicated by a lower mean respondent perception score when compared to those who lived in less concentrated neighborhoods (−1.1 vs 1.5; *P*<.001).

Overall, 21.8% of respondents reported poor health. Table 2 shows that poor self-rated health was significantly associated with being older, Hispanic, less educated, having a lower income, and being uninsured (*P*<.001). Individuals who reported their health as poor, in comparison to people who reported their health as good, had higher mean scores for perception of neighborhood and lived in neighborhoods with worse neighborhood SES conditions as indicated by low estimates for education, income, and wealth (*P*<.001).

Table 3 presents the crude and adjusted ORs with the 95% CI for the associations between racial/ethnic neighborhood concentration and self-reported health. The odds of reporting poor health for individuals who lived in neighborhoods with a high concentration of Blacks was 1.79 (95% CI 1.23–2.59) times higher than for their counterparts residing in neighborhoods with a lower concentration of Blacks. This pattern persists after adjusting for age, sex, and race/ethnicity (model 2: OR 1.67, 95% CI 1.08–2.57) and additional adjustment for education, income, and health insurance (model 3: OR 1.76, 95% CI 1.13–2.73). Additional adjustment for perception of neighborhood rendered the association insignificant (model 4); however, when neighborhood SES summary score was added to the model with perception of neighborhood, a significant association was observed (model 6: OR 1.68, 95% CI 1.05–2.69). The association did not differ by race/ethnicity or

Table 3. Crude and adjusted* odds ratio and 95% confidence intervals for self-rated general health by degree of neighborhood minority composition: NYC-SIS, combined 1999 and 2002

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Neighborhood concentration						
Low	1.00	1.00	1.00	1.00	1.00	1.00
Medium	1.37 (.93–2.02)	1.22 (.82–1.82)	1.33 (.89–1.99)	1.15 (.76–1.75)	1.36 (.91–2.03)	1.22 (.81–1.84)
High	1.79 (1.23–2.59)	1.67 (1.08–2.57)	1.76 (1.13–2.73)	1.49 (.93–2.40)	1.83 (1.16–2.88)	1.68 (1.05–2.69)
Age group						
18–34		1.00	1.00	1.00	1.00	1.00
35–44		1.67 (1.12–2.50)	2.19 (1.43–3.36)	2.17 (1.41–3.34)	2.19 (1.43–3.34)	2.16 (1.41–3.31)
45–54		2.04 (1.30–3.19)	2.48 (1.54–3.99)	2.70 (1.68–4.33)	2.47 (1.55–3.96)	2.71 (1.70–4.30)
≥55		3.62 (2.38–5.51)	3.15 (1.97–5.03)	3.57 (2.25–5.66)	3.13 (1.97–4.97)	3.55 (2.27–5.57)
Sex						
Male		1.00	1.00	1.00	1.00	1.00
Female		.88 (.66–1.17)	.92 (.67–1.27)	.97 (.71–1.33)	.93 (.67–1.27)	.97 (.71–1.33)
Race/ethnicity						
White		1.00	1.00	1.00	1.00	1.00
Black		1.03 (.67–1.57)	.62 (.40,.97)	.53 (.34–.82)	.64 (.41–1.01)	.56 (.36–.89)
Asian		1.53 (.80–2.91)	1.23 (.63–2.39)	1.14 (.59–2.18)	1.25 (.64–2.42)	1.16 (.62–2.20)
Hispanic		2.61 (1.78–3.83)	1.33 (.89–1.98)	1.04 (.68–1.60)	1.37 (.90–2.08)	1.12 (.72–1.72)
Education						
Less than high school			4.88 (2.40–9.89)	4.39 (2.18–8.83)	4.95 (2.37–10.34)	4.60 (2.23–9.52)
High school diploma or GED			2.45 (1.22–4.94)	2.19 (1.11–4.33)	2.47 (1.20–5.07)	2.28 (1.13–4.58)
Some college or trade school			2.00 (1.00–4.03)	1.94 (.96–3.93)	2.01 (.99–4.09)	2.00 (.98–4.08)
Bachelor's degree			1.97 (.95–4.11)	1.85 (.88–3.87)	1.96 (.94–4.06)	1.82 (.88–3.78)
Some graduate or advanced degree			1.00	1.00	1.00	1.00
Income						
≤$19,999			2.68 (1.27–5.66)	2.51 (1.22–5.17)	2.73 (1.31–5.66)	2.62 (1.31–5.24)
$20,000–$39,999			1.56 (.79–3.09)	1.43 (.73–2.78)	1.59 (.81–3.09)	1.48 (.78–2.80)
$40,000–$59,999			1.00 (.44–2.29)	.99 (.44–2.24)	1.01 (.45–2.29)	1.03 (.46–2.27)
$60,000–$79,999			1.10 (.46–2.67)	1.17 (.50–2.74)	1.11 (.46–2.66)	1.19 (.52–2.75)
≥$80,000			1.00	1.00	1.00	1.00
Health insurance						
Yes			1.00	1.00	1.00	1.00
No			.78 (.49–1.25)	.78 (.49–1.25)	.78 (.49–1.25)	.78 (.49–1.24)
Respondent perception of neighborhood†						
Quartile 1				3.46 (2.21–5.40)		3.72 (2.34–5.93)
Quartile 2				1.52 (.89–2.58)		1.60 (.93–2.76)
Quartile 3				1.42 (.87–2.32)		1.46 (.89–2.40)
Quartile 4				1.00		1.00
Neighborhood contextual score						
Quartile 1					.89 (.50–1.58)	.67 (.38–1.20)
Quartile 2					.90 (.55–1.47)	.74 (.44–1.23)
Quartile 3					1.00 (.62–1.60)	.90 (.55–1.49)
Quartile 4					1.00	1.00

 * Models adjusted for age, sex, race/ethnicity (Model 1); additional adjustment for education + income + health insurance (Model 2); additional adjustment for neighborhood perception (Model 3); adjusted for additional adjustment for neighborhood SES context (Model 4).

 † Respondent perception of neighborhood score created from four variables (''How comfortable would you feel asking your neighbors for help in an emergency?''; ''How would you describe the conditions of houses and other buildings in your neighborhood?''; ''How do you feel about police protection?''; ''How would you rate your neighborhood as a place to live?'').

 GED= general equivalency diploma.

respondent perception of neighborhood (*P* values for the interactions .15 and .10, respectively). Because two years of the NYC-SIS were used for these analyses, analyses were repeated adjusting for survey years. However, the results remain nearly identical.

DISCUSSION

This is the first study, to the best of our knowledge, to examine the effects of racial/ethnic neighborhood concentration and self-reported health in New York City. Our findings suggest that individuals living in neighborhoods with a high concentration of Blacks were twice as likely to report poor health when compared to their counterparts living in neighborhoods with a lower concentration of Blacks. This association persists after adjustment for individual-level characteristics, perception of neighborhood, and neighborhood contextual characteristics, which suggests that racial/ethnic neighborhood concentration may be a determinant of poor health.

Although no prior study has examined the relationship between racial/ethnic neighborhood concentration and self-rated health at the local level (ie, in a specific city), this relationship has been studied with a nationally representative sample of the United States. Specifically,

Our findings suggest that individuals living in neighborhoods with a high concentration of Blacks were twice as likely to report poor health when compared to their counterparts living in neighborhoods with a lower concentration of Blacks.

Mellor and Milyo, using data from a national sample, did not find an association between health status and racial concentration, defined at either county or state level, after the adjustment for individual-level characteristics and regional influences.[10] In contrast, our study found an association between self-reported health and concentration of Blacks at the zip code level. The differences in conclusions between studies may have been a result of the level of geography studied. Further, the effect of segregation within a large geographic area such as a state could be diluted or cancelled out. The investigation of smaller geographic levels could identify specific structural characteristics of segregated places that may affect health and help better capture the attributes of a neighborhood that are considered health promoting or damaging.

Findings from a recent investigation[39] of self-reported health and residential segregation, as measured by the index of dissimilarity and the isolation index at the metropolitan statistical area, have been mixed. For example, Subramanian et al[39] compared the association of the index of dissimilarity and the isolation index on self-reported health and demonstrated that residential segregation as measured by the isolation index was a significant predictor of health status, while the index of dissimilarity was not. The authors attribute the differences in the effect of segregation measures to the fact that the index of dissimilarity may be less strongly associated with concentrated neighborhood disadvantage than the isolation index.[40] Neighborhood concentration of Blacks may also influence health through similar mechanisms as the isolation index by concentrating disadvantage, which oftentimes translates into communities that are isolated from economic resources, institutions that support community life, and opportunity structures.[41]

While the present study did not use traditional measures of segregation, the

findings parallel those of previous research focusing on mortality in New York City[8] and self-reported health in Detroit[42] that used percentage of Black as an indicator of segregation. For example, Fang et al[8] investigated mortality in New York City neighborhoods defined by zip codes and demonstrated an independent association between residential segregation (as defined by the proportion of Blacks in a neighborhood) with all-cause and cardiovascular disease mortality. Although this study did not adjust for neighborhood-level factors, our study is consistent with Fang's finding that health outcomes vary with the pattern of Black concentration across neighborhoods. Similarly, our findings correspond with those of Schultz et al[42] who have studied racial and spatial relations in Detroit. Although the Detroit study used a less specific definition of segregation (predominately Black neighborhoods in or surrounding Detroit) and did not focus on the influence of neighborhood context or perception of neighborhood, Schultz et al found significant variations in self-reported health, corresponding with the patterns of predominantly Black neighborhoods after adjusting for individual socioeconomic characteristics and individual stressors such as exposure to discrimination. These studies are part of the increasing pattern toward studying the macrosocial processes that shape the spatial distribution of racial groups and the distribution of resources among them in large hypersegregated urban areas.[3,41,43]

Although we found an association between neighborhood concentration and self-reported health, our study has several limitations that are worth addressing. First, the cross-sectional nature of the data precludes us from making any inference regarding cause and effect. However, the growing evidence suggesting an association between residential segregation and health outcomes are based on cross-sectional studies.[4,5,8,9,11] Second, spatial temporality cannot be

accounted for in this study; therefore, this study did not capture the movement of people between neighborhoods, determine how long an individual has to live in a neighborhood before his or her health is influenced, or account for the role of other environments (eg, work or school) in the determination of health status. Third, though the response rates of the NYC-SIS may be considered low, response rates from other surveys conducted in New York (ie, the New York City Department of Health and Mental Hygiene's Community Health Survey and the New York State Behavioral Risk Factor Surveillance System [BRFSS]) are within the same range of the response rate for NYC-SIS. For example, the 2002 Community Health Survey had a response rate of 21%.[44] Further, the response rate for the 2002 New York State BRFSS was 29.8%.[45] Thus, the response rate of the NYC-SIS is consistent with samples of state and local survey collections. Fourth, recent research suggests that zip codes may not be the best geographic area to use as a proxy for neighborhood.[46] However, the NYC Department of Health and Mental Hygiene's Community Health Survey uses the United Hospital Fund neighborhood designation, which represents aggregates of zip codes to define neighborhoods. The results of the Community Health Survey are used to produce citywide and neighborhood-specific estimates of various chronic and behavioral risk factors.[47] Furthermore, zip codes may underestimate health effect estimates because the heterogeneity of neighborhood characteristics at the census block group or census tract may not be captured.[48] Therefore, our results may be real and perhaps underestimated. Lastly, although racial composition at the zip code level may not be a true indicator of racial segregation, and a high level of residential segregation as defined by the index of dissimilarity may not necessarily co-occur with a high percentage Blacks,[1] a true effect of segregation may have been captured

because New York City has been documented as a hypersegregated area for at least two decades.[49] Among the strengths of the study are availability of a representative New York City sample in terms of race/ethnicity and information on self-perception of the neighborhood environment. Unlike previous studies examining neighborhood concentration or residential segregation, this study included a representative sample of the four largest racial/ethnic groups residing in New York City. Further, the addition of the subjective assessment of neighborhood may facilitate the understanding of how residents actually perceive or rate their neighborhoods beyond what objective neighborhood characteristics convey.

This study demonstrates that poor self-reported health varies with patterns of concentration of Blacks in a neighborhood, after adjusting for individual and neighborhood-level characteristics and perception of neighborhood. Many of the studies examining neighborhood residential concentration or racial/ethnic residential segregation have focused on mortality. An emphasis on self-reported health has the ability to link the occurrence of various adverse psychosocial states such as social isolation, negative life events, and job stress to health outcomes[50] and direct new leads into the study of morbidity and mortality risks. The continuous investigation of highly concentrated and highly segregated neighborhoods at the local level is critical to identify the potential pathways that may help to illuminate how the spatial differentiation of groups leads to pernicious health disparities as well as the coping mechanisms that groups use to foster health-promoting behaviors. Future studies should pay close attention to the social and physical features of neighborhoods and the interplay with individual-level characteristics as it relates to the distribution of health risks and resources in order to target specific interventions and policies toward these neighborhoods.

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