RACIAL RESIDENTIAL SEGREGATION AND ACCESS TO HEALTH-CARE COVERAGE: A MULTILEVEL ANALYSIS

Kathryn Freeman Anderson and Andrew S. Fullerton

ABSTRACT

A developing body of research has demonstrated the impact of racial residential segregation on a variety of negative health outcomes. However, little is known about the effect of residential segregation on access to health care.

This study utilizes multilevel binary logit models based on individual-level health data from the 2008 Behavioral Risk Factor Surveillance System linked to metropolitan-area level data to examine the association between Black-White segregation in 136 metropolitan statistical areas in the United States and health-care coverage.

Overall, an increase in Black-White segregation is related to a decrease in the likelihood of having health insurance for Black residents and an increase in the Black-White gap in health-care coverage. These effects are substantial even when controlling for the effects of educational, social, and economic factors.

This study is the first to examine the impact of segregation on an individual's ability to access health-care coverage, which is an essential starting point for accessing health care in the United States.

Keywords: Segregation; health care; race/ethnicity

INTRODUCTION

Significant differences in health outcomes persist between racial and ethnic groups in the United States. African Americans in particular have the lowest health status of all racial and ethnic groups, and they experience some of the most detrimental health outcomes and environments of any group since the foundation of the United States, especially when compared to Whites (Byrd & Clayton, 2001, 2002; Patterson, 2009; Shavers & Shavers, 2006; Williams & Jackson, 2005). A growing body of literature focuses on documenting the differences in health and health-care access among racial groups in the United States. Researchers in this field consider several approaches to understanding why health disparities exist. More recently, this research emphasizes the mechanisms of racism as it relates to health and health care. Several previous studies consider residential segregation as a form of structural racism to view its impact on a variety of health indicators. However, few have undertaken to study the role that health-care access plays in these health disparities. Access to health care is the leading indicator of a population's health status (U.S. Department of Health and Human Services, 2000). Although access to health care is a multifaceted issue, in this study we specifically examine access to health insurance. Health-care coverage is the main gateway to accessing full and sufficient medical care in the United States. It is increasingly more difficult for Americans in general to access care due to the rising costs of health care and in turn health insurance. For example, 18% of the nonelderly U.S. population has no health-care coverage of any sort (Hoffman & Paradise, 2008). Racial and ethnic minorities in particular make up over half of the uninsured (Hoffman & Paradise, 2008). We posit that racism, in particular residential segregation, exacerbates these problems for the Black community. Furthermore, problems of health-care access may be a strong explanatory factor for the Black-White health gap in the United States.

We address two major research questions in this study. First, is residential segregation related to reduced health-care access for Black residents? Second, does residential segregation contribute to the Black-White gap in health-care coverage? More specifically, we will first examine the impact of residential segregation on access to health care for Black respondents in order to determine whether Black residents of segregated cities are less likely to have health-care coverage compared to Black residents of less segregated cities. To address this first research question, we examine data from Black residents drawing on Massey and colleagues' geographic concentration of poverty theory of segregation. Our hypothesis is that racial residential segregation is related to decreased health-care access. We also test several hypotheses related to different potential mechanisms for the hypothesized link between segregation and health-care access. Specifically, we expect that segregation, as it concentrates poverty and the social problems associated with poverty, will affect access to health-care coverage through reduced educational opportunities, social breakdown, and limited economic opportunity.

The second research question goes beyond the within-group analysis of segregation for the Black community, examining the differences between Blacks and Whites in health insurance coverage. We hypothesize that White residents of segregated cities will not be subject to any potentially negative effects of racial residential segregation because segregation buffers the racially dominant White group from the effects of concentrated poverty in segregated areas. Therefore, we expect that residential segregation will contribute to the Black-White gap in health-care coverage.

Although numerous studies have examined race and access to health care, the role of residential segregation has not been examined using data spanning several regions within the United States. Furthermore, few of the studies that examine race, place, and health-care use a traditional measure of segregation. Instead, previous studies tend to use a measure of the racial make-up of a city or place, which does not directly account for how racial groups are distributed throughout a geographical area. This study contributes to this burgeoning body of literature by examining one of the fundamental barriers to care in the United States, access to health insurance, and the role of racial residential segregation using multilevel models based on individual- and contextual-level data spanning 136 metropolitan statistical areas (MSAs) in the United States.

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

The Geographic Concentration of Poverty Theory of Segregation

While there are many explanations for the persistence of racial differences in health, this research focuses on the role of racial residential segregation as a form of systematic racism in creating a variety of social inequities, including disparities in health and health-care access. The theoretical basis of this study is rooted in Massey and colleagues' geographic concentration of poverty theory of segregation (Massey, 1990; Massey & Denton, 1993; Massey & Fischer, 2000). While residential segregation is no longer legally enforced, it remains an important and persistent part of the racial landscape of the United States. As a mechanism of racism, residential segregation has important consequences for those living in segregated areas. Massey and colleagues' overarching theoretical argument is that as poverty is more highly concentrated in the Black population of the United States, when Blacks are geographically concentrated in one area of a city, poverty and the effects of poverty are also concentrated within that group (Iceland & Wilkes, 2006; Krivo, Peterson, Rizzo, & Reynolds, 1998; Massey & Denton, 1993; Massey & Fischer, 2000). Conversely, they demonstrate that as poor Whites are much more evenly distributed throughout society, the effects of White poverty are also more evenly distributed (Massey & Denton, 1993; Massey, Gross, & Shibuya, 1994).

Furthermore, Massey and Denton (1993) assert that the concentration of poverty within Black segregated areas then produces a variety of social problems and the creation of an "underclass." The effect of segregation is not merely limited to the concentration of poverty, but poverty is always accompanied by a number of social problems resulting from economic disenfranchisement (Massey & Denton, 1993). Furthermore, like poverty, the resulting social ills are geographically and spatially concentrated and continually reproduced within a specific community (Massey & Denton, 1993). A robust literature empirically demonstrates Massey and Denton's (1993) contention on the social problems that result from concentrated poverty in segregated neighborhoods. These studies show that segregated areas are subject to lower quality education (Collins & Williams, 1999; Hummer, 1996), limited employment and economic opportunities (Krivo et al., 1998; Wilson, 1987, 1996), and higher rates of social disorder, such as criminal activity, substance abuse, family breakdown, and female-headed

households (Greenberg & Schneider, 1994; Shihadeh & Flynn, 1996; Testa, Astone, Krogh, & Neckerman, 1993; Wilson, 1987). Furthermore, studies demonstrate that segregation may lead to physical disorder, such as poorer housing quality, decreased access to services, housing code violations, vacant lots, broken windows, litter, graffiti, and abandoned buildings (Chang, Hillier, & Mehta, 2009; Shihadeh & Flynn, 1996; Williams, 1999), increased exposure environmental hazards and toxins (Bullard, 2005), limited access to nutritional foods, and greater access to junk foods, fast foods, tobacco, and alcohol (Bahr, 2007; Chang et al., 2009; Grier & Kumanyika, 2008; Kwate, 2008; Larson, Story, & Nelson, 2009; LaVeist & Wallace, 2000). More recently, scholars have turned their attention to the impact that segregation and the resulting social conditions can have on health and health-care outcomes. A growing body of literature empirically examining these issues is reviewed here and informs the present study on access to health-care coverage.

Segregation, Health, and Health Care

Issues related to segregation play a central role in much of the work on racial health disparities. The literature above on the various impacts of segregation considers obvious health implications, such as environmental hazards and physical disorder that reduce access to safe, green space for recreation and exercise, lack of adequate spatial access to nutritional foods, and an increased access to foods of poor nutritional quality (Bahr, 2007; Bullard, 2005; Chang et al., 2009; Grier & Kumanyika, 2008; Kwate, 2008; Larson et al., 2009; LaVeist & Wallace, 2000; Shihadeh & Flynn, 1996; Williams, 1999). In addition, many researchers have directly examined the impact of residential segregation on health. Such scholarship tends to focus on mortality and life expectancy, infant mortality rates, birth weight, overall health, and nutrition and obesity (Chang, 2006; Collins, 1999; Ellen, Cutler, & Dickens, 2000; Grady, 2006; Hart, Kunitz, Sell, & Mukamel, 1998; Hearst, Oakes, & Johnson, 2008; Hummer, 1996; LeClere, Rogers, & Peters, 1997; Polednak, 1991; Polednak, 1997; Subramanian, Acevedo-Garcia, & Osypuk, 2004; Williams & Collins, 2001).

Although many studies have examined the effect of residential segregation on the health of the Black community, few studies have examined the differences in health-care access and health-care use as a result of segregation. As health-care access is so intimately tied to health outcomes, segregation's effect on health-care access may be a strong explanatory factor for the

association between segregation and negative health outcomes. The extant literature on segregation and health care demonstrates that the relationship between racial residential segregation and health-care access is multifaceted. Segregation may limit access to the health-care system initially because of the economic and educational factors as described above. Sufficient health care is expensive and because of the concentration of poverty in these areas, access may be limited due to economic forces (Williams & Collins, 2001). Additionally, most Americans receive health insurance through their places of employment, and because of the higher rates of unemployment and job instability in segregated areas, they may be less likely to have access to health insurance in that capacity. Also, due to lower rates of educational attainment, people may be less informed of the need to access medical care, especially preventative care (Kposowa, 2007). Furthermore, medical facilities are less likely to be located in or near segregated areas, which creates a physical barrier to access. This is especially true of more advanced or specialty facilities (Hayanga, Waljee, Kaiser, Chang, & Morris, 2009; Hayanga et al., 2009; Rodriguez et al., 2007). This barrier to health-care access may also be exacerbated if the individual does not have adequate transportation. The health facilities located in segregated neighborhoods also tend to be worse in quality with fewer resources (Smith, Feng, Fennel, Zinn, & Mor, 2007). Additionally, racial segregation persists within and across health-care facilities, especially long-term health facilities (Clarke, Davis, & Nailon, 2007; Sarrazin, Campbell, Richardson, & Rosenthal, 2009; Smith et al., 2007).

Only two studies have directly examined the impact of residential segregation on an individual's ability to access health care, which is the emphasis of this research. However, neither study has examined health-care coverage specifically. The first study found that Black and Hispanic respondents living in counties with a higher percentage of the same racial or ethnic group were less likely to perceive barriers to access to care (Haas et al., 2004). They found a result opposite to what is hypothesized here. However, they were examining variation in health-care access by the percentage of racial and ethnic groups in each county, rather than examining how those groups are distributed throughout a county, such as with a segregation score (Haas et al., 2004). Another study, conducted by Gaskin, Price, Brandon, and LaVeist (2009), found an association between neighborhood racial integration and an increased likelihood of Black residents of those areas to have a health-care visit. This fits with the prior research on segregation and health, and contributes to our understanding of how segregation can impact health care (Gaskin et al., 2009). However, their analysis of an integrated neighborhood only involved one area in Baltimore, MD

(Gaskin et al., 2009). Multiple single-city studies or nation-wide studies would be necessary to systematically examine the relationship between segregation and access to health care.

Analytical Framework and Hypotheses

This study examines one main outcome for assessing segregation's impact on health-care access, access to health-care coverage or insurance. Specifically, we examine health-care coverage because it is the fundamental starting point for accessing health care in the United States. Many health researchers have proposed that equal access to health insurance, or universal coverage, would eliminate many of the social sources of health-care access disparities (Andrulis, 1998). People without insurance are less likely to have access to the entire health-care system. They are less likely to have a usual source of care when needed, less likely to access and use preventative care, more likely to have unmet health needs, and less likely to properly manage chronic health conditions (Hoffman & Paradise, 2008). Furthermore, those without health-care coverage experience diminished health-care outcomes when they are able to access sources of care (Hoffman & Paradise, 2008). They experience higher rates of illness and pain, trips to the emergency room, premature mortality, late-stage cancer diagnosis, and are more likely to experience preventable hospitalizations (Hoffman & Paradise, 2008). Thus, having health insurance is an important indicator of accessing health care in the United States, and furthermore experiencing better health-care treatment and results.

Access to health-care coverage is a complex and multifaceted issue. The health-care system in the United States utilizes both public and private sources of insurance, and individuals may receive their health care through a variety of sources, such as their employer, a family member, or through government programs. However, as the United States primarily relies on an employer-based system, most (61% of the working age population) receive their health-care coverage through their employer (Hoffman & Paradise, 2008). This system, though, has begun to erode in the United States through the changing nature of labor relations, and the extreme rise in the cost of health care (Hoffman & Paradise, 2008). Many low-wage workers are not able to receive coverage through their employers, and health-care coverage is unaffordable for many on the open market (Andrulis, 1998; Hoffman & Paradise, 2008). For example, 36% of the poor, and 30% of the near-poor are uninsured (Hoffman & Paradise, 2008). Racial and ethnic minorities

make up a disproportionate amount, over 50%, of the uninsured in the United States (Hoffman & Paradise, 2008). Therefore, we hypothesize that segregation, in this manner, may affect access to health-care coverage. Segregation, as it concentrates poverty and its effects, into one area and among one population, may limit access to health-care coverage for Black residents in such neighborhoods. In addition, we test three effects of concentration of poverty, which may play a role in access to care, particularly through employer-based access. The three facets of concentration of poverty and their effect on access to health insurance are discussed further below.

In this study, we examine the impact of Black-White residential segregation on the ability of Black individuals to obtain health-care coverage. We test several hypotheses regarding the influence of residential segregation on health-care coverage for Black residents and potential explanations for this relationship. The first hypothesis is:

H$_1$. Black residents of segregated cities, compared to Black residents of less segregated cities, will have diminished access to health insurance.

Furthermore, related to our first research question, in addition to examining the impact of residential segregation itself, we isolate the negative effects that residential segregation produces, affecting Black residents' ability to access health insurance. Following from concentration of poverty theory, we formulated the following three hypotheses on the sources of differing access to health care as a result of segregation. Although other sources of social problems from the concentration of poverty are described above, we chose three factors we thought most pertinent to the outcome of health-care coverage specifically. Our three hypotheses are as follows:

H$_2$. Segregation affects access to health-care coverage because it can limit educational opportunities, which can impact upward mobility and access to higher quality occupations.

H$_3$. Segregation affects access to health-care coverage because it can lead to social and family breakdown, which can limit access to health insurance through social and family ties.

H$_4$. Segregation affects access to health-care coverage because it can limit economic opportunity, which can reduce access to jobs that provide comprehensive benefits, including health insurance.

First, as detailed above, segregation can impact an individual's ability to access quality education at all levels. Education could increase one's access

to health care through improved job opportunities, health-care education, and the general upward mobility that education often provides. Our first hypothesis is that the negative effects of lower educational attainment in segregated areas, such as lower rates of college education and higher high school dropout rates, could reduce access to health care for individuals in segregated areas.

Second, as shown above, prior research indicates that segregation can compound the problems of social disorder leading to family instability and breakdown. As many people receive health insurance through a spouse or family member, we examine the impact of family breakdown, through the percentage of married-couple households and female-headed households, as a possible explanatory factor for the impact of residential segregation. Our second hypothesis is that lower marriage rates and higher rates of female-headed households in segregated areas can lead to a decrease in access to health insurance.

Finally, because the prior research on segregation demonstrates that there are lower rates of economic opportunity, we examine the impact of these economic factors on segregation and access to health care. As both the access to employment and quality of jobs available are important factors, we will examine income and poverty, unemployment, type of employment available, and union membership, as those jobs more often provide full benefits like health insurance. As many people receive health insurance through their places of employment, our second hypothesis is that Black residents of segregated areas will have reduced access to health care because of higher rates of poverty, unemployment, and lower quality jobs available. This study examines the impact of racial residential segregation on the ability of Black Americans to access health insurance, and additionally examines each of these three hypotheses in an attempt to understand the more specific effect that residential segregation can have on a variety of negative health outcomes.

Moreover, with regards to our second research question, we examine whether segregation affects the ability of Black residents to access health-care coverage compared to their White counterparts within the same metropolitan area. We also formulated one final hypothesis regarding the influence of residential segregation on racial disparities in health-care coverage:

H$_5$. Black residents of segregated cities, compared to their White counterparts, will have reduced access to health-care coverage.

DATA

We test these hypotheses using individual-level data from the 2008 Behavioral Risk Factor Surveillance System (BRFSS) and contextual data from several publicly available sources. The BRFSS is an annual survey conducted by the Centers for Disease Control and Prevention (CDC) to monitor trends in health risk behaviors and illness in the United States. The survey is collected by telephone interviews with noninstitutionalized adults using random sampling in all U.S. states and territories. We use the selected metropolitan/micropolitan area risk trends (SMART) version of the data, which organizes the data geographically by MSAs and only includes those areas with 500 or more respondents. The MSAs are comprised of groups of counties that contain at least one urbanized area of 50,000 or more inhabitants. The original BRFSS data set included identifiers for micropolitan statistical areas, which are areas with a population less than 50,000, but still greater than 10,000. These were not included in this study as level 2 data was not available for these geographic divisions. Additionally, the data set included geographical units called Metropolitan Divisions, which are smaller divisions of particularly large MSAs. We combined some of these areas into the original, larger MSA in order to match the segregation data. After dropping cases due to missing data, the final sample sizes are 14,633 Black respondents and 106,679 White respondents nested within 136 MSAs.

Individual Level

The dependent variable, *health-care coverage*, is a binary indicator for whether or not the respondent has any kind of health-care coverage or insurance (1 = yes, 0 = no). The questionnaire item is specifically worded as, "Do you have any kind of health-care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?" As the health-care coverage variable includes government health programs such as Medicare, we limited the sample to the working age population (ages 25–64) to remove the effect of Medicare, which is a nearly universal health-care program for those older than 65. We control for several socio-demographic independent variables at level 1, including *age* (in years), *female* (gender: 1 = female, 0 = male), *education* (in years), *income* (binary variables for <$15K [reference], $15K to <$25K, $25K to <$35K, $35K to <$50K, $50K or more, and don't know or refused), *married* (marital status: 1 = married, 0 = else), *employment status* (binary variables for wage/salary worker [reference], self-employed, unemployed, and not in labor force), and

city center (metropolitan area status: $1 =$ inside city center, $0 =$ else). We also control for *general health status*, which reflects the respondent's self-assessment of their general health. The variable ranges from excellent (1) to poor (5). We control for health-care status as poor health status or chronic health problems may be a barrier to affordable care and health insurance coverage.

Metropolitan Area Level

The key independent variable in this study, segregation, is conceptualized as having five dimensions: evenness, exposure, concentration, centralization, and clustering (Massey & Denton, 1988, 1989). The most commonly used of these is evenness, and the most commonly used measure of evenness is the index of dissimilarity, which numerous other studies on segregation and health have used (Ellen et al., 2000; Farley, 2005, 2008; Hart et al., 1998; Polednak, 1991). However, more recent studies suggest that the exposure indices are better measures to capture the social isolation from segregation and the health effects it could produce (Collins & Williams, 1999; Subramanian et al., 2004). In this study, we use one such exposure index, *Black isolation*, which measures the extent to which a Black resident of a MSA is likely to be in contact with another Black resident based on residence. A higher likelihood of within-group contact indicates higher levels of racial segregation and group isolation. Therefore, the index measures the extent to which Blacks as a group are isolated from the rest of the population. For the purpose of this study, we used the calculations of the Black isolation index for each MSA as published by the Lewis Mumford Center (2002). The Black isolation index was calculated using the following formula:

$$\text{Black Isolation}_j = 100 \times \sum \left(\frac{B_{ij}}{B_j}\right)\left(\frac{B_{ij}}{T_{ij}}\right) \tag{1}$$

where B_j is the Black population in metropolitan area j, B_{ij} is the Black population of tract i in metropolitan area j, and T_{ij} is the total population of tract i in metropolitan area j (Lewis Mumford Center, 2002). Black isolation ranges from 0 to 100, with a higher score indicating higher amounts of Black isolation, or more racial residential segregation. We also estimated the models using the index of dissimilarity and found very similar results.

We also include several MSA-level independent variables in order to test the hypotheses we introduced earlier. We compiled the MSA-level data from the 2000 U.S. Census, the Lewis Mumford Center, the U.S. Department of

Commerce, American Factfinder, Diversity Data, City and County Extra, and Union Stats. We use the Black isolation index to test Hypotheses 1 and 5. For Hypothesis 2 (educational opportunities), we include *bachelor's degree* (% of residents with a four-year college degree) and *high school dropout* (% of residents who dropped out and did not complete high school) in order to capture the positive effects of higher education and negative effects of educational breakdown, respectively. In order to test Hypothesis 3 (social and family breakdown), we include *married couples* (% of households that are married couples) and *female-headed households* (% of households that are single-parent with a female head of household). For Hypothesis 4 (economic opportunity), we include *percent poverty* (% of households at or below the official poverty level), *unemployment* (% of workers not employed but looking for work), *percent manager/professional* (% of workers employed in managerial or professional occupations), *percent manufacturing* (% of workers employed in the manufacturing sector), and *union density* (% of workers that are union members). Finally, we also control for *population size* (logged), *median income per capita* (logged), and *population density* (population per square mile) in the statistical models.

METHOD

We examine the relationship between residential segregation and health-care access using multilevel binary logit models, which simultaneously account for the multilevel nature of the data (i.e., individuals nested with metropolitan areas) and the fact that the outcome is binary rather than continuous (Raudenbush & Bryk, 2002). The multilevel binary logit models include a random intercept and fixed slopes. Hypotheses 1 through 4 focus on the relationship between segregation and health-care access for Black residents. Therefore, we restrict the sample to Black respondents in the first set of models in order to test these hypotheses. Hypothesis 5 refers to the racial gap in health-care coverage. As a result, we also estimate the final model for White respondents in order to test this hypothesis.

RESULTS

We present descriptive statistics for the individual- and metropolitan area-level variables in Table 1. On average, Blacks are less likely to have health-care coverage from any source (83%) compared to Whites (92%) before

Table 1. Descriptive Statistics for Variables Used in Multilevel Binary Logistic Regression Models of Health Insurance.

Variable Name	Blacks		Whites		Range	Description
	Mean	SD	Mean	SD		
Dependent variable						
Health-care coverage	0.83	0.38	0.92	0.28	0–1	1 = insured, 0 = not insured
Independent variables						
Level 1						
Age	46.30	10.76	48.08	10.35	25–64	Age in years
Female	0.69	0.46	0.61	0.49	0–1	1 = female, 0 = male
Education	14.08	2.93	15.28	2.82	0–18	0 = no school, 5 = elementary, 10 = some high school, 12 = high school, 14 = some college, 18 = college graduate
Income						
<$15,000 (reference)	0.15	0.36	0.05	0.21	0–1	1 = less than $15,000, 0 = else
$15,000 to $25,000	0.18	0.39	0.08	0.26	0–1	1 = $15,000 to $25,000, 0 = else
$25,000 to $35,000	0.12	0.33	0.07	0.25	0–1	1 = $25,000 to $35,000, 0 = else
$35,000 to $50,000	0.15	0.35	0.13	0.33	0–1	1 = $35,000 to $50,000, 0 = else
$50,000 or more	0.31	0.46	0.60	0.49	0–1	1 = $50,000 or more, 0 = else
Don't know/Refused	0.08	0.28	0.08	0.27	0–1	1 = don't know/refused, 0 = else
Married	0.35	0.48	0.65	0.48	0–1	1 = married, 0 = else
Employment status						
Employed (reference)	0.59	0.49	0.63	0.48	0–1	1 = employed for wages, 0 = else
Self-employed	0.06	0.23	0.11	0.31	0–1	1 = self-employed, 0 = else
Unemployed	0.09	0.29	0.05	0.21	0–1	1 = unemployed/out of work, 0 = else
Other	0.26	0.44	0.22	0.41	0–1	1 = homemaker/student/retired/unable to work, 0 = else
City center	0.65	0.48	0.40	0.49	0–1	1 = live in city center, 0 = else
General health status	2.70	1.09	2.29	1.03	1–5	1 = excellent, 2 = very good, 3 = good, 4 = fair, 5 = poor

Table 1. (Continued)

Variable Name	Mean	SD	Range	Description
Level 2				
Black isolation	31.88	22.86	0.64–79.02	0 = no isolation, 100 = complete isolation (LMC)
Bachelor's degree	16.86	3.92	7.18–31.17	Percent with a bachelor's degree in MSA (AF)
High school dropout	9.62	2.83	4.16–18.25	Percent of high school dropouts in MSA (AF)
Married couples	51.28	3.82	39.8–69.8	Percent of married couple households in MSA (AF)
Female-headed households	12.19	2.32	7.7–18.9	Percent of female-headed households in MSA (AF)
Percent poverty	11.46	3.42	5.6–25.4	Percent of population in poverty of MSA (AF)
Unemployment	3.87	2.61	1.6–29.9	Unemployment rate of MSA (CCE)
Percent managerial/Professional	34.18	4.93	22.2–50.2	Percent manager/professional occupations in MSA (DD)
Percent manufacturing	12.67	5.69	2–39.4	Percent manufacturing occupations in MSA (AF)
Union density	11.62	6.29	0–31.1	Percent union membership in MSA (US)
Population size	14.39	1.05	11.11–16.07	Log of population size in number of people (LMC)
Median income per capita	10.39	0.18	9.79–11.01	Log of median household income in dollars (USDC)
Population density	532.62	789.74	12.5–8158.7	Population per square mile of land area of MSA (AF)

Note: Black Model: Level 1 $N = 14,633$ and Level 2 $N = 136$. White Model: Level 1 $N = 106,679$ and Level 2 $N = 136$.
Level 1 data come from the 2008 Behavioral Risk Factor Surveillance System.
Level 2 data come from the 2000 United States Census, the Lewis Mumford Center (LMC), the United States Department of Commerce (USDC), American Factfinder (AF), Diversity Data (DD), City and County Extra (CCE), and Union Stats (US). The source of each level 2 variable is indicated in parentheses in the variable description.

accounting for the impact of place and segregation. This difference is statistically significant ($p < .001$). When race was included in a binary logistic regression model of health insurance (not shown in the tables), being Black, compared to White, decreased the odds of having health insurance by 53%. Black respondents are also more likely to be in poor health (2.70 compared to 2.29 for Whites). Blacks are far more likely to be unemployed compared to Whites (9% vs. 5%). Blacks in this sample are also much less likely to be married compared to Whites (35% vs. 65%). Additionally, they are more likely to live in an urban setting, are overrepresented in the lower income groups, and are underrepresented in the higher income groups. We can see from the descriptive statistics that Blacks are in a disadvantaged social position compared to Whites.

The level 2 results for Black respondents from all six multilevel binary logistic regression models can be found in Table 2. We control for several socio-demographic variables at level 1 but do not show those results in the tables (the results are available upon request). In Model 1, we include Black isolation with no additional level 2 variables, and we add control variables in Model 2. The effect of Black isolation is negative and statistically significant in both models, and the effect actually gets stronger when the control variables are added. Based on the results in Model 2, we see that a one standard deviation increase in Black isolation is predicted to decrease the average odds of health-care coverage by a factor of 0.81 (or 19%).

In Models 3 through 6, we attempt to explain this relationship between segregation and health-care coverage using measures related to educational opportunities, social and family breakdown, and economic opportunities. In Model 3, we add the educational opportunity variables to the model. Metropolitan areas with higher rates of high school dropouts have significantly lower average odds of health-care coverage. However, the strength of the relationship between Black isolation and health-care coverage is unaffected by the educational opportunities in the metropolitan area. The measures of social and family breakdown in Model 4 also have a modest influence (10%) on the magnitude of the Black isolation coefficient, but neither variable has a significant direct effect on health-care coverage. In Model 5, we add the five measures of economic opportunities. The results indicate that metropolitan areas with higher rates of managerial/professional employment have a higher average odds of health-care coverage. Conversely, metropolitan areas with higher poverty rates have a lower average odds of health-care coverage. Additionally, economic opportunities explain a modest portion (10%) of the relationship between segregation and health-care coverage. Finally, the Black isolation effect increases somewhat

Table 2. Coefficients (Standard Errors), X-Standardized Odds Ratios, and Discrete Change Coefficients for Level 2 Variables from Multilevel Binary Logistic Regression Models of Health Insurance for Black Respondents.

Variable Name	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		
	β	OR	β	OR	β	OR	β	OR	β	OR	β	OR	DC
Fixed effects													
Level 2 variables													
Black isolation	−0.007*	0.849	−0.009**	0.814	−0.010***	0.803	−0.008*	0.828	−0.008**	0.842	−0.013***	0.736	−0.036
	(0.003)		(0.003)		(0.003)		(0.004)		(0.003)		(0.004)		
Bachelor's degree					−0.003	0.989							
					(0.019)								
High school dropout					−0.062**	0.840					−0.005	0.987	−0.002
					(0.020)						(0.022)		
Married couples							−0.003	0.990			−0.009	0.967	−0.004
							(0.020)				(0.021)		
Female-headed households							−0.012	0.972			0.087*	1.223	0.024
							(0.038)				(0.038)		
Percent poverty									−0.063**	0.807	−0.101***	0.708	−0.041
									(0.024)		(0.030)		
Unemployment									0.084	1.244	0.069	1.197	0.021
									(0.066)		(0.066)		
Percent managerial/ professional									0.063***	1.365	0.063***	1.365	0.037
									(0.015)		(0.018)		
Percent manufacturing									0.010	1.059	0.013	1.079	0.009
									(0.010)		(0.010)		

	β	β	OR	β	OR	β	OR	β	OR	β	OR	DC
Union density		0.088	1.096	0.132	1.149	0.086	1.094	0.017	1.112	0.016	1.102	0.012
		(0.069)		(0.068)		(0.069)		(0.009)		(0.011)		
Population size		0.252	1.046	−0.003	0.999	0.197	1.035	0.039	1.041	0.065	1.070	0.008
		(0.382)		(0.442)		(0.420)		(0.060)		(0.062)		
Median income per capita		0.060[a]	1.048	0.042[a]	1.033	0.067[a]	1.054	−1.435**	0.775	−1.554**	0.759	−0.033
		(0.060)[a]		(0.059)[a]		(0.069)[a]		(0.489)		(0.481)		
Population density								0.096[a]	1.079	0.082[a]	1.067	0.008
								(0.061)[a]		(0.058)[a]		
Constant	2.168***	−1.608		1.098		−0.751		14.312**		15.274**		
	(0.137)	(3.591)		(4.149)		(4.460)		(4.806)		(4.855)		
Random Effects												
Intercept variance	0.199	0.166		0.141		0.165		0.089		0.073		
Deviance	11371.558	11363.094		11353.894		11362.988		11338.754		11333.648		
AIC	11405.560	11403.090		11397.890		11406.990		11388.750		11389.650		
BIC	11534.600	11554.920		11564.900		11573.990		11578.530		11602.200		
Level 2 R^2	0.078	0.232		0.344		0.235		0.585		0.659		

Note: Level 1 $N = 14{,}633$ and Level 2 $N = 136$.

β = Coefficient; OR = X-standardized odds ratio (factor change); DC = Discrete change coefficient.

For each discrete change coefficient, the remaining variables are held at their means. The discrete change coefficients reflect a change in the predicted probability associated with a standard deviation increase, centered around its mean.

$*p < 0.05$; $**p < 0.01$; $***p < 0.001$ (two-tailed).

[a]These coefficients and standard errors have been multiplied by 1,000 for ease of presentation.

in magnitude in Model 6, the full model, which suggests that the Black isolation effect is even stronger if one controls for all of these factors simultaneously. It is possible that changes in coefficients across models are due to changes in unobserved heterogeneity (Mood, 2010). We addressed this potential concern by calculating y-standardized coefficients (based on the latent Y) for Black isolation and found very similar changes across models.

Overall, the results in Table 2 provide support for Hypotheses 1 and 4 and partial support for Hypothesis 3, but do not support Hypothesis 2. Blacks living in metropolitan areas with higher rates of Black isolation (i.e., more racial segregation) are predicted to have significantly lower chances of having health insurance than Blacks living in metropolitan areas with lower rates of Black isolation. Part of this influence of segregation for Blacks is due to limited economic opportunities in racially segregated metropolitan areas.

In order to examine the effect of Black isolation on the racial gap in health-care coverage, we estimated the models from Table 2 for both Black and White residents and generated predicted probabilities based on the Full Model (6) for each group. We present the predicted probabilities for Blacks and Whites across the range of Black isolation in Fig. 1. As Black isolation increases from its minimum to maximum levels (i.e., 0–80), the predicted probability of health-care coverage decreases substantially for Black residents (0.90 to 0.77) but remains relatively unchanged for White residents
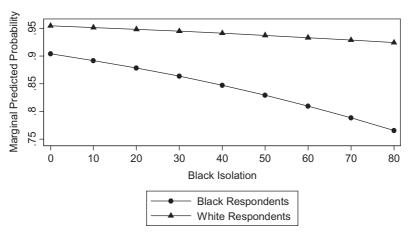

Fig. 1. The Effect of Black Isolation on the Predicted Probability of Having Health Insurance.

(0.95 to 0.92). At the lowest level of segregation, there is a very modest racial gap in the predicted probability of health-care coverage (0.05), but this grows to a very substantial gap at the highest level of segregation (0.15). In other words, as Black isolation increases the racial gap in health-care coverage increases as well, which provides support for Hypothesis 5.

DISCUSSION AND CONCLUSIONS

There are several main ways that people access health-care coverage, principally through their employment, through a family member, or through social assistance for those that qualify. Health insurance is a fundamental component of health-care access in the United States, especially for advanced and specialty care, which is usually unavailable through alternative forms of access such as free clinics, and too expensive to pay out of pocket. We hypothesized, drawing on Massey and colleagues' geographic concentration of poverty theory of segregation, that racial residential segregation could impact the ability of Black residents of segregated cities to access adequate health-care coverage (Krivo et al., 1998; Massey, 1990; Massey & Denton, 1993; Massey et al., 1994; Massey & Fischer, 2000). As segregation compounds poverty and social problems into one geographical area, these socioeconomic effects, which could impact one's access to health insurance, could lead to reduced access to health insurance. From the results, we found a substantial impact of Black isolation for working-age Black residents of 136 U.S. metropolitan areas on the likelihood of having health-care coverage. This effect was significant even when controlling for more obvious socio-economic factors such as education, employment, and income at both the individual-level and the city-level. As Black residential segregation increased, Black residents of those cities were less likely, compared to Black residents of cities with lower levels of segregation, to have health-care coverage of any type. This result addresses our first research question, confirms our hypo-thesis, and confirms Massey and colleagues' theory that informs this study.

Related to our first research question, we also specified three hypotheses on the mechanisms by which segregation could impact access to health insurance. Using the effects of geographic concentration of poverty from Massey and colleagues' theory that we reasoned would be pertinent to the outcome of health-care coverage, we included the effects of educational opportunities, social breakdown, and economic opportunity in models predicting health-care coverage (Krivo et al., 1998; Massey, 1990; Massey & Denton, 1993; Massey et al., 1994; Massey & Fischer, 2000). However, when

we tested these various negative impacts that segregation could have on access to health care at the metropolitan-area level, none of them substantially decreased the effect of Black isolation. Although a few of these measures were important indicators of either increased or decreased access to health insurance, none were able to account for the effect of residential segregation.

First, the educational factors that indicate the lack of educational achievement, by examining high school dropout rates, at the MSA-level did contribute to reduced access to health insurance. However, a high degree of achievement, a bachelor's degree, was not related to increased access to health insurance. Perhaps a variable for the percent of people in an MSA who have a bachelor's degree (versus more inclusive educational measures that would include associates degrees or vocational training programs) is not the best indicator of upward mobility and access to higher quality jobs that might provide benefits.

Second, social and family indicators did not have a significant effect on health-care access. Although none of the variables were significant, the model did slightly reduce the size of the coefficient for Black isolation. This facet of the negative consequences of segregation as a form of structural racism is emphasized in Massey and Denton's work (1993), as well as elsewhere in the literature, but does not appear to have a substantial effect. In the final, full model, percent of female-headed households was actually statistically significant and positively related to health-care coverage access. As this outcome specifies health-care coverage of any type, including social assistance, this effect may be significant as single mothers are often able to get coverage for their children and themselves through social assistance. Conversely, being married, as measured at the individual level, had a substantial positive effect on health insurance. Thus, these factors, as a structural, city-level effect were not important for understanding disparate access to health insurance and certainly did not diminish the effect of residential segregation.

Finally, the economic opportunity factors provided the best understanding of the outcome, but could still not completely account for the effect of segregation. An increased presence of professional or White collar jobs demonstrated an increased access to health-care coverage. Also, an increase in the percent of people in poverty decreased the likelihood of having health insurance. However, the effect of residential segregation remained strong in both of the models in which these measures were included. It is obvious, using both the measures at the individual-level and the metropolitan-level that socioeconomic factors play a role in obtaining health-care coverage, but

these results demonstrate that segregation itself has a substantial effect on the outcome.

In sum, the results presented here only partially account for the causal mechanisms by which residential segregation can affect access to health-care coverage. We hypothesized, based on the geographic concentration of poverty theory, that segregation could affect health-care access by limiting educational opportunities, increasing the prevalence of family breakdown and social disorder, and limiting economic and occupational opportunities. However, none of these variables or even the combination of these variables could account for the effect of racial residential segregation. Although we included many measures for each of these different hypothesized effects, perhaps more variables or even a different operationalization of such variables could better account for the effect of segregation. Additionally, although the previous theory and research highlights these facets of segregation, perhaps racial residential segregation itself, as a form of institutionalized, structural racism, produces these effects and does not rely solely on the pathway of the three mechanisms hypothesized and tested here. These findings provide a framework for future research on the issue, which could assess more specifically how racial residential segregation can affect health-care access in a variety of ways.

Furthermore, when assessing our second research question, whether or not segregation contributes to the Black-White gap in health insurance, the results are quite noteworthy. While residential segregation demonstrates a strong decrease in the likelihood of having health-care coverage for Black respondents, there is no such effect for White respondents. While segregation for White respondents does actually slightly decrease their likelihood of having health insurance, the effect for White respondents was not substantial. Even without taking into account the effect of segregation, Blacks are less likely to have health insurance, but residential segregation further increases this gap, as evidenced in Fig. 1. These results affirm our expectations based on Massey and colleagues' theory. They argue that members of the dominant group not subject to segregation are spatially buffered from the negative effects of concentrated poverty resulting from segregation, which is what these results demonstrate.

Thus, these results present some evidence for applying Massey and colleagues' concentration of poverty theory to the outcome of health-care access. The results affirm the first implication of their theory, that segregation concentrates poverty, which produces certain negative social effects, in this case by limiting access to health-care coverage. Additionally, the results affirm the second implication of their theory, that by concentrating poverty in

one racial group, the White dominant group is buffered from the negative effects of segregation, which was evidenced by showing that segregation contributes to the Black-White gap in health-care coverage. While the results conform to these aspects of the theory, the results fail to reveal some of the mechanisms brought forth by the concentration of poverty theory of segregation. The educational variables did not mitigate the effect of segregation at all. The social and economic opportunity variables provided some explanation for the effect of segregation on access to health insurance, but they could not account for much of this effect. Further work to understand the mechanisms of poverty concentration in segregated neighborhoods on the effect of reduced health-care access is an important consideration for future research to further build this argument and the evidence for concentration of poverty theory.

Overall, the findings presented here contribute to our understanding of the Black-White gap in health-care outcomes. The findings demonstrate that higher levels of segregation in cities limit access to health-care coverage for Black residents. Additionally, while segregation produces this effect for the Black community, White residents of these same areas are shielded from the effects of segregation. This study makes several major contributions to our understanding of these issues. First, while there has recently been a lot of literature demonstrating the effect of segregation on health outcomes, little is known about the impact of segregation on health care. While this study only examines one health-care outcome, health insurance, future studies on other facets of health-care access and use would be useful to further our understanding of this association. Second, this study uses a large, national sample and a multilevel statistical method, examining both individual and metropolitan-area levels of data. Other studies on the topic have either used a geographically limited area or methods that do not capture the full scope of the effect of segregation. Given these advantages, studies using a variety of methods and samples would be necessary to further our understanding of the impact of segregation on health-care outcomes.

Furthermore, these findings could contribute to our understanding of the Black-White health gap in the United States. Lack of access to health care, which has been shown to have detrimental health consequences, could have an intervening effect on health outcomes overall for the U.S. Black population. Previous studies as well as the descriptive statistics within this study have demonstrated that Black Americans in general are less likely to have health insurance compared to Whites (Hoffman & Paradise, 2008). The findings here demonstrate that residential segregation may play an important part in the perpetuation of both health and health-care racial inequities.

Since enforced segregation was made illegal by the Fair Housing Act of 1968, efforts to combat segregation and its effects for Black Americans have sharply declined. Although no longer legal, de facto segregation remains an important part of the social landscape of the United States. This study, among a growing body of literature on the subject, shows that the negative consequences of our failure to racially integrate as a society continue to produce deleterious effects for the Black community. The findings in this study indicate that in order to effectively address and combat the glaring health and health-care inequalities that persist in the United States, residential segregation must be a part of that discussion.

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