Racial Segregation and Longevity among African Americans: An Individual-Level Analysis

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Objective. To test the relationship between racial segregation and mortality using a multidimensional questionnaire-based measure of exposure to segregation.

Data Sources. Data for this analysis come from the National Survey of Black Americans (NSBA), a national multistage probability sample of 2,107 African Americans (aged 18–101). The NSBA was conducted as a household survey. The NSBA was matched with the National Death Index (NDI).

Study Design. Prospective cohort study, where Cox regression analysis was used to examine the effect of baseline variables on time to death over a 13-year period.

Principal Findings. Respondents who were exposed to racial segregation were significantly less likely to survive the study period after controls for age, health status, and other predictors of mortality.

Conclusion. The results support previous studies linking segregation with health outcomes.

Key Words: race, segregation, social factors, mortality

The twentieth century witnessed tremendous expansion of the upper bounds of human life. At the beginning of the century, average life expectancy in the United States was 47 years old. By century's end, life expectancy had risen to excess of 70 years, and it was not unusual for Americans to exceed 80 years of age. However, although longevity in the U.S. population has increased substantially, race disparities in longevity have been persistent. African American life expectancy at birth is persistently five to seven years lower than whites.

During the 1960s and 1970s there was an increase in the number of studies of social determinants of mortality. Lehr (1982) published an extensive review of such studies. Since Lehr's (1983) review, several published reports have dealt with numerous social factors having varying degrees of success in predicting mortality (Somervell et al. 1989; Kaplan and Comacho 1983; Julius et al. 1986; Idler and Kasl 1991; Deeg et al. 1989; Lee and Markides 1990). Most prominent among the social factors associated with survival has been social support (Berkman and Syme 1979; House, Robbins, and Metzner 1982;

Blazer 1982; Seeman et al. 1987; Schoenbach et al. 1986; Yasuda 1997; Penninx et al. 1997) and socioeconomic status (Breeze, Sloggett, and Fletcher 1999; Sloggett and Joshi 1994; McDonough et al. 1999; Marmot and Shipley 1996; Sorlie, Backlund, and Keller 1995).

While there is an established literature focusing on social determinants of mortality, only a handful of studies have examined the applicability of previously observed social predictors of mortality among African Americans (LaVeist, Sellers, and Neighbors 2001; LaVeist, Sellers, and Elliott-Brown 1997; Bryant and Rakowski 1992; Onawala and LaVeist 1998; Astone, Ensminger, and Juon 2002; Jackson et al. 2000). However, although it is useful to replicate findings of social determinants of morbidity and mortality among African Americans, this alone will not explain race disparities in health. To begin to understand the causes of race disparities it is necessary to identify factors that either differentially impact African Americans compared with whites, or uniquely affect African Americans. Racial segregation may be such a social factor, as several studies have demonstrated a differential effect of segregation on whites and African Americans (LaVeist 1989, 1993; Yankauer 1950).

Although the first examination of an association between racial segregation and health was published more than a half century ago, it was only relatively recently that the association received rigorous empirical attention. Yankauer (1950) observed that infant mortality rates for whites and African Americans in New York City were highest in the most segregated black neighborhoods. This finding was not further elaborated for 22 years until, in a study of socioeconomic status and infant mortality among U.S. cities, Jiobu (1972) controlled for segregation in his models and found it to be associated with infant mortality rates.

Nearly two decades later, LaVeist (1989, 1993) specifically sought to test the hypothesis that segregation would aid in explaining race differences in infant mortality rates across cities. Analyzing 176 large and midsized cities, LaVeist found support for the hypothesis. Since LaVeist's studies, segregation has received increased attention as a determinant of race disparities in

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mortality. There have now been several replications (Polednak 1991, 1996a, 1996b; Collins and Williams 1999), and some conceptual and empirical extensions to other outcomes (Williams and Collins 2001; Hart 1997; Acevedo-Garcia 2000, 2001; Greenberg and Schneider 1994; Fang et al. 1998; Ellaway and Macintyre 1996; Jackson et al. 2000; Wallace and Wallace 1995). Yet, while segregation has begun to secure a foothold as a social predictor of health, this literature is still in its infancy. As Acevedo-Garcia (2000) noted, most studies of segregation and health are empirically rigorous, but lack a strong conceptual foundation. Some recent writings have begun to fill this gap (Williams and Collins 2001), arguing that racial segregation is a fundamental cause of health disparities, in the tradition of David McKeown (1976) and others (House 2002; Link and Phelan 1995, McKinlay and McKinlay 1977; Illich 1975).

Writings by Williams and Collins (2001) and Acevedo-Garcia (2000) have moved the segregation-health literature forward by advancing conceptual models linking segregation to health; however, the segregation-health literature remains largely reliant on an unsophisticated measurement of segregation. Previous studies have focused on current residential segregation, ignoring other life domains such as school, work, church, or previous residence. Yet, it seems obvious that individuals are exposed to health risks not only in their places of residence, but also in other locations.

Further progress in the development of the segregation-health literature may also have been hampered by the limitations imposed by ecological data, or the multilevel data needed to test hypotheses regarding individual-level health. In most previous studies, segregation has been specified as a characteristic of a geographic area and these studies have assessed the relationship between segregation (measured in the aggregate) and mortality rates (also measured as an aggregate). However, the limitations of ecological analysis are well known (Openshaw 1984). To extend the literature on segregation and health, the research must evolve beyond ecological analysis and demonstrate that segregation is a predictor of health status of the individual. To conduct such analysis using existing measures of segregation would require individual-level data matched with data from a second-order geographic unit, such as a census block group or census tract. In recent years the analytic software to conduct multilevel analysis has become widely accessible, however, the availability of multilevel databases have not kept pace. A brief questionnaire-based measure of racial segregation would be an important advance for social factor health research. Such a measure would

overcome the limitations of ecologic and multilevel analysis. This would likely lead to further development of research on segregation and health.

The multidimensional segregation measure was first used in the National Survey of Black Americans (Jackson 1991). Comparisons of the measure with census data have demonstrated that respondents are highly accurate in reporting segregation (LaVeist, under review). The questionnaire-based measure attempts to assess the level of segregation the respondent was exposed to across several life domains, as opposed to just current residence, as is the case of previously published measures of segregation and health (White 1983). This article examines the efficacy of the multidimensional segregation measure as a predictor of longevity. If the measure is effective, the analysis should replicate findings from previous studies, which show higher mortality rates in the presence of segregation.

METHODS

Sample

Data for this analysis came from the National Survey of Black Americans (NSBA), a national multistage probability sample of 2,107 African Americans (aged 18 to 101) conducted by the Program for Research on Black Americans of the University of Michigan, Institute for Social Research in 1979–1980 (Jackson 1991). Conducted as an in-home, face-to-face survey, the NSBA was designed to produce a nationally representative sample of the African American population.

The survey was matched with the National Death Index (NDI) to determine 13-year survival status for the baseline survey (1979–1880) as of 1992. Analysis, published elsewhere (LaVeist et al. 1996), found that the NSBA/NDI match was highly accurate—correctly identifying more than 93 percent of deceased respondents. This accuracy rate was consistent with other studies of the accuracy of the NDI (Boyle and Decoufle 1990; Williams, Demitrack, and Fries 1992; Edlavitch and Baxter 1988).

Measures

I used proportional hazards modeling (Cox regression, also referred to as event history analysis) to examine segregation as a predictor of survival. The dependent variable in the analysis was expressed in two parts—survival status of NSBA respondents (decedent or survivor) at follow-up, and the number of years from the midpoint of the field period of the baseline data collection

(January 1980) to the respondents death is the measure of survival time (specified in years). The follow-up period for the study was 13 years after the baseline survey.

Variables included in the analysis as covariates were: age (specified as a continuous variable in single years), sex (binary variable 1 = male, 0 = female), marital status (set of binary variables: married, separated, divorced, widowed, single), and number of diagnosed chronic health conditions (summary score of 11 chronic conditions, which have been diagnosed by a physician, experienced by the respondent at the time of the baseline interview). The number of chronic conditions summary score is coded as follows: 0 = zero chronic conditions, 1 = one condition, 2 = two conditions, 3 = three or more conditions. The chronic conditions included in this measure are: arthritis, ulcers, cancer, hypertension, diabetes, liver problems, kidney problems, stroke, a nervous condition, blood circulation problems, sickle cell disease, or other health problem. Smoking status is assessed by respondent report and specified as a binary variable where 1 = smoker and 0 = nonsmoker. Educational attainment is specified as a set of binary variables (< high school graduate, high school graduate, and > high school).

Table 1 outlines the items that comprise the segregation battery. Respondents were asked to indicate the racial distribution of the schools they attended, their church or place of worship, and the neighborhood where they grew up and currently live. The response categories for the battery are: (1) almost all white, (2) mostly white, (3) about half black, (4) mostly black, and (5) all black. The item-to-total correlation for the battery ranges from .69 to .79 and the scale has an Alpha reliability of .78. The segregation index is

Table 1: Racial Segregation Questions

Question: When you think about the places where you have lived, gone to school, or worked—were they mostly blacks or mostly whites there?

	Almost All White	*Mostly White*	*About Half Black*	*Mostly Black*	*All Black*	*Item to Total Correlation*
Elementary school	1.8	7.8	7.8	11.6	70.2	.71
Junior high school	2.4	11.7	12.8	15.9	56.2	.69
High school	3.4	17.8	16.2	15.1	46.3	.72
Childhood neighborhood	1.6	6.4	11.1	23.2	56.8	.74
Present neighborhood	2.5	7.0	13.5	34.5	41.7	.79
Church or place of worship	.7	3.1	5.0	20.4	69.9	.79
Alpha reliability						.78

computed by averaging across the six items. This results in an index ranging from 1 to 5.

RESULTS

To examine the bivariate association between racial segregation and each covariate, I recoded the segregation index, which ranges from 1 to 5, into three categories (1–1.68 racially isolated, 1.69–3.33 racially integrated, and 3.34–5.0 racially segregated). Racial isolation and segregation differed in that isolated African Americans are those whose segregation index score indicated they had little contact with other African Americans within the life domains assessed by the segregation index. Racially segregated individuals are those whose score indicated all of their life domains are largely all black. These categories are then used to compute percentages. Chi-square is used to determine statistical significance. The results of these analyses are displayed in Table 2.

The table shows a significant association between respondent's age and segregation. Older respondents are more likely to be racially segregated compared with younger respondents. In ascending age, the proportions who are racially segregated are, 37.2 percent, 63.1 percent, 70.5 percent, and 73.6 percent. There is also a strong significant relationship between educational attainment and segregation. While 66.7 percent of respondents with less than a high school education were racially segregated, 41.6 percent of respondents with more than a high school education were. Moreover, respondents with more than a high school education were more than seven times more likely to be racially isolated compared with those with less than a high school education. While more than half of all respondents who were high school graduates or who had more than a high school education were racially integrated or isolated, more than two-thirds of respondents with less than a high school education were segregated.

Marital status is associated with segregation such that nearly two-thirds of respondents who were single reported being isolated or integrated, but no other category was even 50 percent isolated or integrated. Also, more than 70 percent of widowers were segregated, more than 10 percentage points higher than the next most segregated group. This is likely a reflection of age differences, whereby widowers are more likely to be elders, and white single persons are more likely to be younger. Finally, there was no significant association between segregation and sex, health status, or smoking.

Table 2: Bivariate Association between Segregation and Covariates, Percentages

Variable	*Isolated*	*Integrated*	*Segregated*
Total Sample	3.3	42.9	53.9
Age			
18–34	3.9	58.9	37.2
35–64	3.5	33.4	63.1
65–74	.9	28.6	70.5
75 and older	1.8	24.5	73.6
Education			
<High School Grad	1.1	32.1	66.7
High School Grad	3.2	50.3	46.5
>High School Grad	7.1	51.3	41.6
Sex			
Male	3.6	42.7	53.7
Female	3.2	43.0	53.9
Marital Status	3.7	39.4	56.9
Married			
Divorced	6.2	42.4	51.4
Separated	1.4	38.2	60.4
Single	3.0	61.4	35.6
Widowed	1.7	28.1	70.2
No. Chronic Conditions	4.5	47.8	47.8
0 Conditions			
1 Condition	3.2	46.1	50.7
2 Conditions	1.9	35.0	63.1
3-Plus Conditions	2.5	34.9	62.6
Smoking Status			
No	3.1	42.2	54.7
Yes	5.4	47.3	47.3

In Table 3 we examine the bivariate relationship between segregation and survival. The Table shows a linear relationship between level of segregation and survival. There is a declining survival rate for each group.The 5-year survival rate for racially isolated, integrated, and segregated respondents was .958, .929, and .860. A similar pattern exists for 10-year and 13-year survival. Also, there is a steeper decline in survival for segregated respondents compared with the other groups. The decline in the survival rate for racially isolated respondents between 5 and 13 years was 5.2 percent. However, it was 10.8 percent and 19.4 percent for racially integrated and segregated respondents, respectively. Further, racially isolated respondents had a higher 13-year survival rate than the 5-year survival rate for segregated respondents (.908 versus .860 respectively).

Table 3: Summary Survival Data for Segregation

	Proportion Surviving		
Variable	*5 Years*	*10 Years*	*13 Years*
Segregation			
Isolated	.958	.933	.908
Integrated	.929	.862	.829
Segregated	.860	.756	.693

To examine whether these findings are robust in multivariate analyses, I conducted Cox regression analysis of survival regressed on segregation and the covariates. These analyses are displayed in Table 4. Model 1 displays the unadjusted effect of segregation and Model 2 adjusts for covariates. In both models, the segregation index is specified as a continuous variable, however, analysis of the binary form of the index (as presented in Table 3) resulted in substantively similar findings. Model 1 shows a positive relationship between segregation and mortality. That is, those who were exposed to more segregation had greater odds of dying over 13 years.

In Model 2, I add covariates to Model 1. Model 2 includes age, health status, sex, marital status, and educational attainment. The results show that after controls are added, the effect of segregation is attenuated, but persists (OR = 1.20, 95 percent CI:1.02, 1.41).

DISCUSSION

In this article I examined the National Survey of Black Americans to assess the segregation/mortality hypothesis in an individual-level analysis. Using Cox proportional hazards modeling, I found the multidimensional questionnaire-based measure of segregation resulted in findings similar to those of previously published studies that used aggregate measures of segregation. That is, exposure to racial segregation is associated with greater odds of death.

The questionnaire-based segregation index will be of benefit in future studies because of ease of use in terms of data collection and analysis. Also, the questionnaire-based measure allows for an examination of the relationship between segregation and health at the individual level. All previous studies of

Table 4: Mortality Regressed on Segregation and Covariates, Cox Regression.

Variable	*Model 1 Odds Ratio (95% CI)*	*Model 2 Odds Ratio (95% CI)*
Segregation (continuous)	1.75 (1.48,2.08)	1.20 (1.02,1.41)
Age		1.06 (1.05,1.07)
Chronic Conditions (comparison category: zero)		1.07
One condition		(.78,1.47)
		1.43
Two conditions		(1.03,1.97)
		1.35
Three conditions		(.99,1.94)
Sex (comparison category: female)		1.89
Male		(1.52,2.35)
Marital Status (comparison category: never married)		1.02
Divorced		(.65,1.60)
		1.06
Separated		(.67,1.68)
		.72
Widowed		(.46,1.13)
		.73
Married		(.49,1.08)
Smoking Status (comparison category: non-smoker)		1.19 (.81,1.75)
Education (comparison category: <High School)		1.08
High School Grad		(.82,1.41)
>High School Grad		.89 (.65,1.21)
Model Statistics	$X^2 = 42.46$ df = 1 p.00	$X^2 = 492.91$ df = 13 p.00

segregation and health have been ecological analyses. Before the validation of this measure (LaVeist, under review), testing the effect of segregation on individual health would require multilevel data. The questionnaire-based measure can be used in survey research without additional data requirements, and previous measures of segregation require the use of software capable of analyzing hierarchical data, while the questionnaire-based measure can be analyzed using widely available statistical software, and using standard analytic techniques.

Moreover, this measure will allow for further tests of the interrelationships among segregation and other psychosocial variables (such as stress, racism, coping, human capital, social support, religiosity, and the social or material environment). There may also be joint or interaction effects between segregation and other determinants of health. Future research on these relationships will be facilitated with a questionnaire-based segregation measure. An additional advance is the multidimensionality of the measure. Previous studies of racial segregation have been able to assess only residential segregation. A questionnaire-based measure can assess segregation in other life domains such as employment, schooling, and social clubs. Multiple periods in the life course can also be assessed.

Recent advances in genomic research have cast serious doubt on the promise of biological or genetic factors to resolve the puzzle of racial health status disparities (Cooper, Kaufman, and Ward 2003; Risch et al. 2002). As such, future efforts to understand health disparities must turn to social and behavioral factors for answers. The United States remains a highly racially segregated country (Massey and Hajnal 1995). The ways in which whites and African Americans experience American society can differ greatly. Also, with the expansion of educational, housing, and occupational opportunities for African Americans that has occurred over the past four decades, there is now significant variation in the ways in which African Americans "experience" America. The multidimensional segregation index attempts to capture this variation.

A full explanation of the mechanisms that link segregation with health awaits us. However, I argue that it is not segregation in itself that is predictive of health outcomes. Rather, segregation is reflective of race differences in the social infrastructure, material living conditions, and life chances of whites and African Americans. A consequence of these "different Americas" is that different race groups have different levels of exposure to health risks. These different exposures can be environmental, socioeconomic, or political. African Americans for whom America is integrated (and thus experience America more like most whites) have less exposure to environmental and social risks. To cite a few examples, LaVeist and Wallace (2000) demonstrated that liquor stores in Baltimore City had greater than eight times the odds of being located in a low-income African American community compared with other communities. African American communities have greater exposure to environmental hazards (Greenberg and Schneider 1994; Bullard 1983). Morland et al. (2002) demonstrated that grocery and other food service stores were less available in minority communities. And Morrison et al. (2000)

demonstrated that certain pharmaceuticals were unavailable in segregated African American and Latino neighborhoods in New York. Given these exposures (or the lack of availability of health protective resources) there should be no surprise that African Americans have the worst health profile of any racial/ethnic group in the United States (LaVeist 1995, 2000).

The literature on segregation and health (including these analyses) has proceeded from the perspective that segregation is a bad thing. The findings from previous studies have consistently supported this supposition. However, there are certain contemporary trends in housing that may be running counter to this perspective. Over the past several decades a number of middle-class racially segregated African American communities have developed in and around such cities as Atlanta, Baltimore, Birmingham, Chicago, Nashville, and Washington (Cashin 2001; Darden and Kamel 2000). These suburban communities have avoided the social problems typically associated with segregated African American areas. In communities such as these, racial and class-based segregation come together in ways that may have different consequences. Upper-income racially segregated communities may have a more beneficial set of characteristics, and possibly better health outcomes.

Moreover, while most of the consequences of segregation are negative, there are some known benefits of segregation. For example, LaVeist (1992) found that African Americans develop more political empowerment in racially segregated cities, and Bobo and Gilliam (1990) found more community cohesion. Moreover, other ethnic groups have been able to develop a business class within their own ethnic enclaves (Portes, Haller, and Guarnizo 2002). The literature would benefit from further examination of the positive or protective effects of segregation. The segregation/health relationship has not yet been examined within the context of a race/class interaction. Such an analysis would be instructive in determining whether there are differences in health outcomes between segregated middle-class black and white neighborhoods.

Limitations of this study include a less than ideal measure of health status at baseline and an inability to distinguish cause of death. We are also lacking body mass index, a known predictor of health outcomes. Additionally, it would have been preferable to be able to ascertain data on the social environment of the communities (such as poverty rates or neighborhood quality). In spite of these limitations, this study uses a very different study design than prior ones of segregation and health, and successfully replicated those findings. This suggests that the segregation/health relationship is robust, and that a questionnaire-based measure of segregation can adequately assess this contextual variable.

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