The Dynamics of Income and Neighborhood Context on Health and Racial Health Disparities

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WORKING PAPER:

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Abstract

Socioeconomic status, though robust and strong predictors of health, has generally been unable to fully explain the health gap between Blacks and Whites in the United States. However, at both the individual and neighborhood levels, socioeconomic status is often treated as a static factor with only single-point-in-time measurements. These cross-sectional measures fail to account for possible heterogeneous histories within groups who may share similar characteristics at a given point in time. Ignoring the dynamic nature of these factors may lead to the underestimation of the importance of both in explaining health and racial health disparities. In this study, I use longitudinal data to investigate the relationship between neighborhood poverty and respondent-rated health, focusing on whether the addition of a temporal dimension reveals a stronger relationship between neighborhood poverty and health, and a greater explanatory power for the health gap between Blacks and Whites. Results indicate that long-term neighborhood measures are stronger predictors of health outcomes and explain a greater amount of the Black/White health gap than single-point measures.

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Introduction

Prior investigations have consistently shown that socioeconomic status and its differential distributions across race are key determinants of health and racial health disparity (Haan & Kaplan 1986; Adler et al. 1993, 1994). However, adjusting for demographic and socioeconomic characteristics has generally been unable to fully account for the health disparity between Blacks and Whites in the United States (Williams & Collins 1995, 2001). The persistence of this unexplained gap has led some to direct their attention towards differences in residential living conditions as a contributing factor to the health disparities between Blacks and Whites (House & Williams 2000).

Blacks, contrasted to other minority groups such as Asians and to a lesser extent Hispanics, are least likely to be able to translate socioeconomic success into residential mobility to more affluent neighborhoods (Alba & Logan 1993; Rosenbaum & Friedman 2001) As a consequence of discrimination, equitable access to residential neighborhoods has been denied to Blacks, restricting their choices of neighborhoods to those that are often less desirable and often divergent from their socioeconomic attainment (Alba et al. 1994; Logan & Alba). That is, Blacks are disproportionately exposed to areas of concentrated poverty characterized by diminished quality of the neighborhood's social and economic environments, high rates of neighborhood turnover and mobility, crime, and social disorder (Sampson, Raudenbush & Earls 1997). Residing in disadvantaged

socioeconomic neighborhoods, in turn, has been consistently shown to be associated with adverse health outcomes including mortality, low birthweight, and infant mortality (Morenoff and Lynch, 2004; Yen and Kaplan, 1999; Yen & Syme 1999; Kawachi & Bekrman 2003; Pickett & Pearl 2001; Robert 1999).

However, socioeconomic status, at both the individual and neighborhood levels, is often treated as a static factor with only single-point-in-time measurements. These cross-sectional measures fail to account for possible heterogeneous histories within groups who may share similar characteristics at a given point in time. Given that long exposures to poverty have been found to have more profound impacts than short exposures (Malat et al. 2005; McDonough et al. 2005) and that the duration of exposure greatly differs between Blacks and Whites (McDonough et al. 2005; Quillian 2003), ignoring the dynamic nature of these factors may lead to the underestimation of the importance of both in explaining health and racial health disparities. In this paper, I use longitudinal data to investigate the relationship between individual and neighborhood poverty on health, focusing on whether the addition of a temporal dimension reveals a stronger relationship between neighborhood poverty and health and whether it provides a greater explanatory power for the health gap between Blacks and Whites that has persisted even after adjustments of single-point measures of socioeconomic status.

The Dynamic Nature of Individual and Neighborhood Characteristics

The importance of the temporal dimension over a life-course is especially salient if one considers the dynamic nature of financial resources, both in terms of absolute monetary levels and poverty status. Although a person's real income is expected to rise as he

accumulates experience and expertise in the workforce, there may be considerable volatility over a lifetime (Duncan 1988; Solon 1992; & Zimmerman 1992). Rank and Hirschl (2001) estimate that half of Americans will experience either poverty or affluence at least one year between the ages of twenty-five & seventy-five while only 20 percent will experience neither ends of the economic spectrum. Temporary and short-term fluctuations may be a consequence of job loss or exit from the labor force for various reasons, such as returning to school. Similarly, income spikes may reflect a transition into a different field, re-entry into the labor force after a spell of unemployment, or initial employment upon completion of school. Cross-sectional data is ill equipped to adjust for these life-course changes.

Within a lifetime, drops in income may push some to fall into poverty. However, the condition of poverty is not an absorbing state. To the extent that income fluctuates, individuals may also cross the threshold into and out of the dichotomous classification of poverty multiple times over the life-course (Stevens 1994). For example, thirty-five percent of those who were poor in 1996 were not poor the next year and almost half climbed out of poverty after three years (Iceland 2003). Thus, a single-point-in-time measurement of even an extremely coarse category such as poverty status may not accurately reflect an individual's long-term condition.

As individual-level characteristics may change, so may the context of neighborhoods in which individuals reside. This may be due to a slow process of neighborhood gentrification or deterioration over time or a more abrupt change when individuals move residential locations. Evidence with respect to the stability of neighborhood environment an individual experiences over time is mixed. Kunz, Page, & Solon (2001) estimate that

childhood neighborhood characteristics exhibit high consistency over their observed five year time-frame. The sample correlation between the five-year average of log mean neighborhood income and single-year value is between 0.83 and 0.96, depending on the restriction of the sample to only movers versus all children, respectively. The high correlations suggest that a snap shot of an individual's neighborhood context may not be such an inaccurate reflection of his long-term neighborhood environment. In contrast, several other investigations into neighborhood stability, using longer time frames and various operationalization of neighborhood context, suggest a different conclusion (Quillian 2003; Timberlake 2003; Massey et al. 1994; Gramlich et al. 1992). Gramlich et al. (1992) find a great deal of neighborhood heterogeneity even in poor adults, with a quarter of them entering and leaving extremely poor urban neighborhoods (defined as Census tracts with poverty rate greater than 30%) in a year. However, using a dichotomous measure of neighborhood poverty may give a misleading picture if individuals who cross over the neighborhood poverty threshold into or out of poor neighborhoods experience only a marginal change in neighborhood circumstance. This does not seem to be the case. Quillian (2003) estimates that among individuals who move into or out of poor neighborhoods (defined as Census tracts with poverty rate greater than 20%), the difference in neighborhood poverty rates is substantial. For those moving into or out of poor neighborhoods, the average change in neighborhood poverty rate is approximately 18 percent; changes among non-movers were smaller, from 0.6 to 2 percent. However, Quillian (2003) notes that these minor single year changes usually represented a progression towards neighborhood gentrification or deterioration that took several years to complete.

The Temporal Dimension of Individual and Neighborhood Poverty and Its Association with Health

The dynamic nature of both individual and neighborhood socioeconomic levels may be a crucial component to understanding health, neighborhood context, and their intersection. An extensive line of research has documented a strong association between individual-level socioeconomic status and health outcomes (Haan & Kaplan 1986, Adler et al. 1993, 1994; Pappas et al. 1993). Those with less education and financial resources exhibit disproportionately worse health outcomes across all levels of the socioeconomic gradient, not just at the left end of the distribution (Adler et al. 1993). However, relatively few studies have distinguished between chronic and transient spells of poverty and their association with health. The handful of studies that have investigated the impact of varying durations of income level or poverty on individuals' well-being consistently find that longer term spells of financial hardship have a greater negative impact on health than shorter term spells (Malat et al. 2005; McDonough et al. 2005; McDonough & Berglund 2003; Duncan et al. 1994; Korenman et al. 1994). Equally important, current economic circumstances did not erase the impact of earlier poverty experiences on health (Malat et al. 2005; McDonough & Berglund 2003) and estimates based on long-term poverty were greater than those based on single-year measures (Korenman et al. 1995). These findings suggest that long-term measures of financial resources may be better predictors of health than single-year measures (Benzeval & Judge 2001; Korenman et al. 1995; but see McDonough et al. 1997).

Though there has been less work on whether varying durations of neighborhood poverty exposure differentially affect health, findings from the few studies that have done so suggest that the impact of neighborhood context increases with duration of exposure (Turley 2003; Ross, Reynolds, & Geiss 2000). For example, Ross et al. (2000) find that the length of time an individual resides in a poor neighborhood is positively related with increased depression and anxiety of residents. Their findings support the view of conventional wisdom that suggests there are cumulative effects of risk exposure, whether they exist at the individual or neighborhood level, on health. That is, a limited exposure to poor neighborhood environments (e.g. driving through a poor neighborhood) would exert minimal effects on health while a persistent, life-long exposure may exert detrimental health effects (e.g. higher stress levels) that have been compounded over time. Cross-sectional measures that fail to partition short-term exposure to neighborhood poverty from long-term exposure may be noisy proxies for long-term neighborhood conditions, consequently leading to attenuated estimates of neighborhood effects.

Race, Duration of Exposure to Poverty, and Racial Health Disparity

The temporal dimension of individual and neighborhood poverty is closely intertwined with race and by extension, racial health disparity. Research consistently finds that Blacks are more likely to experience chronic poverty, with significantly longer spells, lower exit rates, and higher re-entry rates than Whites (Iceland 2003; Stevens 1999; McDonough et al. 2005). The longitudinal pattern of neighborhood poverty exposure across racial groups parallels that for individual-level poverty duration. That is to say, not

only do Blacks have longer durations of poverty spells, they also spend a disproportionate time in poorer neighborhoods than comparable Whites (Quillian 2003; Timberlake 2003).

Using the PSID, Quillian (2003) estimates the average tenure for those who enter poor neighborhoods (defined as Census tracts with poverty rate greater than 20%) is 8.5 years for Whites and 11.8 years for Blacks. The exit rate after one year is 30 percent for Whites and only 18 percent for Blacks. South and Crowder (1997), using a shorter time frame of the PSID, also find a differential entry and exit rate between Blacks and Whites. The rate of entry into poor neighborhoods for Blacks residing in non-poor tracts in any given year is 11 percent, compared to 1.4 percent for Whites. Exit rates are 6.7 percent and 16.7 percent for Blacks and Whites, respectively.

Since life trajectories may be shaped early in life, the importance of childhood environment should not be discounted. As in the case with adulthood, there is great racial inequality in childhood exposure to neighborhood poverty and affluence. Timberlake (2003) finds that Black children spend 60 percent of their childhood in poor neighborhoods (defined as Census tracts with poverty rate greater than 20%), compared to 14 percent for White children. On the other side of the economic spectrum, White children spend almost five times longer in affluent neighborhoods (defined as Census tracts with poverty rate of 3% or less) than Black children. Even more disturbing is that gap seems to be increasing over time (Timberlake 2003).

The notion that both individual and neighborhood poverty may exert their effects on health through duration of exposure and that there are differences in length of exposure across race, suggest a potential explanation for why a significant portion of Black/White health disparities, net of single-point measures of socioeconomic differences, remains

unexplained. If we interpret the race residual as the racial disparity in health that cannot be accounted for by differences in socioeoconomic status, then we can view the point estimate for race as a potentially biased estimation of the disparity. This potential bias can be illustrated with an example of a multivariate regression model that estimates the magnitude of the Black/White health gap that cannot be explained by differences in socioeconomic and demographic characteristics across race.

Suppose the true relationship is:

$$poorhealth = \beta_0 + \beta_1(black) + \beta_2(poor) + \beta_3(durationpoor) + \sum_{i=4} \beta_i(x_i) + u$$

where *poorhealth* is the health outcome of interest, with increasing value reflecting poorer health, and *poor* is dichotomous measures of poverty status; *durationpoor* is the percent of time an individual is poor up to the time of measurement; x_i are conventional socioeconomic and demographic controls including education, marital status, gender, and age; and u is the error term. All measures, except for *durationpoor*, are contemporaneous, single-point-in-time measures.

However, only cross-sectional data is available and we can only model:

$$poorhealth = \tilde{\beta}_0 + \tilde{\beta}_1(black) + \tilde{\beta}_2(poor) + \sum_{i=3} \tilde{\beta}_i(x_i) + v$$

Because all the regressors may be pairwise correlated, it is difficult to obtain the direction of bias for $\tilde{\beta}_1$ without making further assumptions. However, if we simplify the model by ignoring all the other explanatory variables, then the direction of bias is the sign of β_3 multiplied with corr(*black,durationpoor*). Given that β_3 has been found consistently to be positive and that there is evidence to suggest that the

corr(*black,durationpoor*) is strongly positive, the proportion of racial health disparity that cannot be accounted for by socioeconomic status may be overestimated.

To the extent that neighborhood poverty negatively affects health, the direction of bias due to the omission of duration in poor neighborhoods is likely to be the same. The strength of the bias depends on the strength of the association between race and duration in poor neighborhoods, net of the set of controls included in the regression model. It is probable that after accounting for socioeconomic status, the net correlation between race and duration in poor neighborhood is negligible. However, Quillian (2003) found that only a modest fraction of racial differences in duration of residing in a poor neighborhood is attributable to differences in poverty status or family structure. He observed that Blacks above the poverty line and in male-headed household were more likely to be exposed to poor neighborhoods than Whites below the poverty line and in female-headed households. Consequently, accounting for the temporal dimension in both individual and neighborhood factors may provide additional explanation to the Black/White health disparity that has been thus far largely ignored.

RESEARCH OBJECTIVES

This paper has several objectives:

1. To examine whether multiple-year measures of neighborhood context are stronger predictors of health than single-year measures.
2. To examine whether longer durations of neighborhood poverty exposure have a larger association with health than shorter exposures.

3. To examine whether the Black/White health gap, net of single-point-in-time measures of SES, is further explained with the inclusion of multiple-year measures of individual income and neighborhood context

Analytical Strategy

Using longitudinal data, I being with a simple descriptive analysis that examines whether single-point measures of income and neighborhood poverty are suitable proxies for long-term conditions, paying particular attention to whether the pattern between single-point and multiple-year measures differs by race. I then estimate a series of multivariate regression models that explore the associations between income, neighborhood poverty, and health. The base model adjusts for only single-point measures of individual-level SES. Subsequent models add on multiple-year measures of income, then single-point measures of neighborhood poverty, then multiple-year measures of neighborhood poverty. The race residuals and point estimates of neighborhood poverty, when applicable, are compared across the models.

DATA AND MEASURES

Analyses are based on data from the 1980-1996 years of the Panel Study of Income Dynamics (PSID). Begun in 1968, the PSID is a longitudinal study of a nationally representative sample of the non-immigrant U.S. population, annually collecting an extensive list of socioeconomic information as well as some health measures. [1]

[1]In 1997, the sample was reduced and the interview schedule was changed from annually to bi-annually. interviews (Accessed March 1, 2007: http://psidonline.isr.umich.edu/)

I use a restricted version of the PSID (available only through special contract from the Institute for Social Research at the University of Michigan) that includes respondents' census tracts of residence, employed as rough proxies of neighborhoods in this study, during the time of interview. Census tract poverty measures were extracted from the Geolytics' Neighborhood Change Database (NCDB) which contains decennial census tract level measures for years 1970, 1980, 1990, and 2000 and linked to each respondent-year observation via 2000 tract identifiers. A unique feature of the NCDB is that it offers tract level information for all four decades normalized to 2000 tract boundaries. Because tract boundaries change across decennial census, variations in tract demographics due to boundary adjustments may be spuriously attributed to compositional changes. Consequently, normalization of tract boundaries is a critical adjustment to increase the measurement accuracy of neighborhood trends by minimizing the noise produced by boundary changes. I estimate neighborhood conditions between decennial census years by linearly interpolating across decennial tract measures.[2]

Health Measure

I use respondent-rated health, as measured in 1996, as the health outcome. Respondent-rated health, collected only for heads and wives of heads in the PSID, was measured in a five-point scale: fair, poor, good, very good, and excellent. I dichotomize the measure to poor health (fair/poor=1) and good health (good/very good/excellent=0). Although not an objective measure, respondent-rated health has been shown to be strong predictors of mortality, net of adjustments for clinical measures of health status (Benyamini and Idler,

[2] Using decennial tract measurements as support points, I assume a constant rate of change between each decennial census and linearly interpolate between each pair of decennial census (e.g. 1980/1990 & 1990/2000).

1999; Idler and Benyamini, 1997). Moreover, this association is similar for Blacks and Whites (McGee et al. 1999).

Socio-economic Measures

Individual-level socioeconomic and demographics adjustments, as measured in 1996, include marital status, education, labor force status, race, gender, and age. Marital status is divided into three categories: single, married, and other (divorced, separated, widowed). Educational attainment represents the years of schooling attended (fewer than 12, 12, 13-15, 16, and 17+). Labor force categories include the employed, the unemployed, and the labor force non-participants. Age is measured continuously. Family poverty income ratio and neighborhood poverty levels are derived from 1996 single-point observations and 1980-1996 multiple-year observations.[3] The family poverty income measure is grouped into four categories: family poverty income ratio less than or equal to 1, family poverty income ratio between 1 and 2, family poverty income ratio between 2 and 3, and family poverty income ratio 3 or higher. Neighborhood poverty levels are classified into three categories representing affluent, mixed, and poor neighborhoods. These neighborhood categories are defined as less than 10 percent poor, 10 to 20 percent poor, and 20 percent or more poor, respectively. For multiple-year measures of family poverty income and neighborhood poverty levels, annual measures are averaged across the years and then classified into the appropriate levels. I also include wealth quintiles, as measured in 1994, as an additional adjustment for economic level.

[3] I use only include family poverty income values for survey years when the respondent is either the head or wife and at least 18 years of age at the time of interview.

The analysis sample is restricted to Black and White respondents (sample sizes for other racial/minority groups were insufficient for analysis) who are either the household head or wife and at least 18 years of age in 1996 and have at least one year of nonmissing family poverty income ratio and tract-level poverty rate between 1980 and 1995. The resulting sample size is comprised of 10,490 individuals, with information on personal income and neighborhood context[4] as far back as 1980. Table 1 provides descriptive statistics of the total sample and by race.

<Table 1 here>

ANALYSIS

Descriptive Analyses

I begin with exploratory descriptive analyses investigating the relationship between race, duration of poverty, and duration of residing in poor neighborhoods. Simple bivariate analyses reveal that single-point adjustments for family income do not account for the very different economic histories between Blacks and Whites. Blacks who fell under the poverty threshold in 1996 had experienced durations of poverty that were twice as long as those experienced by comparable Whites (Figure 1). Similarly, only 19 percent of Whites who were poor in 1996 had an average income below the poverty threshold during the previous sixteen years, compared to over 50 percent of Blacks (Figure 2). These statistics suggest that single-point measures of poverty status may be more accurate proxies for

[4] Neighborhood is defined as the census tract. Because tracts were not demarcated for portions of the U.S. before 1990, any computations using 1980-1989 tract information are restricted to respondents residing in areas that have at least 75 percent tract coverage.

long-term conditions for Blacks than for Whites. Parallel analyses for neighborhood poverty rate show a similar pattern. On average, Black individuals who resided in a poor neighborhood in 1996 had spent over 80 percent of the years between 1980 and 1995 in poor neighborhoods (Figure 3). Comparable Whites had spent approximately 62 percent of those years in poor neighborhoods. There is a similar divergence when comparing 1980-1995 average residential neighborhood poverty rates across race (Figure 4). Eighty-five percent of Blacks who lived in a poor neighborhood in 1996 lived in neighborhoods between 1980 and 1995 that were, on average, poor. In comparison, only 60 percent of Whites residing in a poor neighborhood in 1996 had experienced the same conditions.

<Figure 1 here>

<Figure 2 here>

<Figure 3 here>

<Figure 4 here>

These descriptive analyses suggest that: 1) the accuracy of single-point measures in capturing long-term poverty differs by racial group, with a larger proportion of transient poor Whites being classified as chronically poor and 2) the accuracy of single-point measures in capturing long-term neighborhood conditions differs by racial group, with a larger proportion of Whites residing in a poor neighborhood in a given year experiencing better neighborhood environments in the long run. This pattern, consistent with studies that found that Blacks were more likely to experience chronic poverty and long-term exposure to high neighborhood poverty than Whites, supports the hypothesis that racial

health disparities may be overestimated when only single-point in time measures for individual and neighborhood economic conditions are used to account for the differences in socioeconomic characteristics between Blacks and Whites. However, these are only bivariate statistics and do not adjust for other socioeconomic characteristics (e.g. education, marital status, employment status) between Blacks and Whites that are associated with income and neighborhood socioeconomic level. The magnitude in the heterogeneity of the socioeconomic histories between Blacks and Whites may be attenuated once other single-point measures are included.

Multivariate Analysis

In the following sections, I estimate a series of multivariate regression models to empirically examine whether the inclusion of a temporal dimension further accounts for the racial health gap, net of single-point measures of socioeconomic factors. For each of my analysis, I conduct a logistic regression model with a binary outcome measure of respondent reported poor health. Controls for gender, age, education, employment, and marital status, as previously defined, are included throughout. For models that include multiple-point measures of income or neighborhood poverty, I include a series of binary indicators that account for the number of years in which family income and neighborhood poverty is observed.[5]

[5] Although the data has a hierarchal structure (individuals nested within neighborhoods), I do not use multi-level modeling techniques because there is nominal clustering at the neighborhood level; over 80% of tracts contain only one or two respondents. All analyses adjust for clustering at the family level.

Single-Point versus Long-Term Measures of Individual Income

To test whether adjusting for long-term economic measures account for a larger portion of the racial health disparity than single-point-in-time measures, I begin with a base model (Model 1) with only year 1996 measures of socioeconomic and demographic conditions. In the next model (Model 2), I account for past economic conditions by adjusting for the 1980-1995 average family poverty income ratios while still retaining the 1996 family poverty income control in the model. Including both past and current family income measures allows me to gauge the relative strengths of association between historic and current economic levels to health. In Model 3, I use 1980-1996 average family poverty income as a long-term measure of economic means and compare estimates of single-point versus long-term measures of income on health. Finally, I add wealth levels in Model 4 as an additional control for economic means.

<Table 2 here>

Single-point versus Long-Term Measures of Neighborhood Context

The modeling sequence to determine the impact of adjusting for long-term measures of neighborhood context versus single-point measures follows the same strategy used in the family income models. The base model accounts for only current family income and current neighborhood poverty level (Model 5A) which I then augment by adding an adjustment for long-term measures of past neighborhood poverty level (1980-1995 average neighborhood poverty) in Model 6A. To test the hypothesis that a multiple-year

measure of neighborhood context is a stronger predictor of health than a single-year measure, I compare estimates of the impact of single-point measures of neighborhood poverty categories (Model 5A) to 1980-1996 average measures (Model 7A). Each primary model (e.g. Model 5A), is followed by a secondary model (e.g. Model 5B) that uses a longer-term measure for economic sufficiency. In the secondary models, single-point measures of family income are replaced with 1980-1996 averages and wealth is added as an additional control. Accounting for long-term economic conditions may reduces the likelihood that the observed association between health and neighborhood context is due to poorly measured levels of economic sufficiency.

<Table 3 here>

Transient versus Persistent Exposure to Neighborhood Poverty

Although long-term averages may better capture long-term conditions than single-point measures, averages may mask large variances in neighborhood context. For example, averaging may mask exposure to poor neighborhoods if residents also resided in middle-income neighborhoods for some time. Hence, averaging may not be the most appropriate strategy to summarize an individual's exposure to neighborhood poverty. Consequently, I also employ two alternative specifications for neighborhood poverty: a continuous and discrete measurement for length of exposure to poor neighborhoods. The continuous measure is defined as the proportion of years the respondent resided in a poor neighborhood during the timeframe of observation and is entered into the model as a

linear specification. The discrete measure is divided into three categories: never exposed transient exposure, and persistent exposure. The "never exposed" category is the reference category and is defined as never been observed to reside in a poor neighborhood during the timeframe of observation. Transient exposure to neighborhood poverty is defined as residing in a poor neighborhood for less than 50 percent of the time; conversely, residing in a poor neighborhood for over half of the time is considered to be a persistent exposure.

For both the continuous and discrete measures of exposure to poor neighborhoods, I estimate a logistic model that adjusts for the amount of exposure to poor neighborhoods between 1980 and 1996 while adjusting for single-point measures of family income (Model 8A & 9A). As in the previous section, each primary model is followed by a secondary model that replaces 1996 single-point measures of family income with 1980-1996 averages and adds wealth to the list of covariates.

<Table 4 here>

RESULTS

Model results for family income reveal the expected negative association between income and poor health (Table 2). Family income estimates from the simultaneous inclusion of both current and past economic measures (Model 2) show that, even with adjustments for current income levels, past economic conditions are strong and significant indicators of current health. Moreover, long-term measures of income reveal a

stronger association with health than single year measures. These patterns are consistent with results from previous studies (Benzeval & Judge 2001; Korenman et al. 1995).

Accounting for the economic history of individuals substantially reduced the unexplained racial health disparity observed in Model 1. The inclusion of both current and average past income in Model 2 and long-term 1980-1996 average income measures in Model 3 yielded virtually identical reductions in the Black/White disparity estimates, from OR=1.59 to 1.46 and 1.47, respectively.[6] The additional adjustment for wealth reduced the health gap further to OR=1.33. In the logit metric, this represents a 39 percent reduction in the unexplained disparity (from 0.46 to 0.29). The remaining racial health gap is still highly statistically significant, indicating that adjustments for long-term measures of individual socioeconomic factors still do not fully account for why Blacks disproportionately experience poor health.

Results from the neighborhood poverty models yielded a similar pattern to the results from family income models. The cross-sectional specification (Model 5A) showed a significant positive association between neighborhood poverty level and poor health; individuals residing in poor neighborhoods have a 22 percent greater odds of reporting poor health, compared to individuals residing in affluent neighborhoods. Comparing results from Model 1, the additional adjustment for neighborhood poverty does not provide any additional account for the Black/White health gap. However, single-point measures of neighborhood context may be poor proxies for long-term neighborhood environment. With the addition of past neighborhood context is included (Model 6A), current measures of neighborhood context are no longer significant and the impact of

[6] The differences in the racial disparity coefficients (compared to the coefficient for the base model) are statistically different at the 1% level.

long-term neighborhood poverty measures is not only significant but larger (OR=1.56 vs OR=1.22). With measures of only long-term neighborhood conditions, the estimate for the impact of mixed neighborhood becomes significant. Replacing single-point measures of family income with multiple-year averages and adding wealth eliminates the significant association for the single-point measure of poor neighborhood (Model 5B), suggesting that the significant neighborhood estimates based on cross-sectional data may be due to imperfect measures of individual-level attributes. However, the multiple-point measures of neighborhood poverty levels show a strong association with health that are larger in magnitude than the single-point measures and were robust to the inclusion of long-term measures of personal income (Models 6 & 7).

Model results for duration in poor neighborhoods show a positive association to duration in poor neighborhoods and likelihood of reporting poor health (Model 8A). A persistent residence in poor neighborhoods was also associated with poor health while a transient residence showed no significant association (Model 9A). However, both estimates became non-significant once long-term measures of personal income were controlled for (Models 8A & 9A).

With respect to racial disparity, accounting for longer-term conditions of both family income and neighborhood poverty reduced the unexplained racial health gap from OR=1.59 to OR=1.24. In the logit metric, this represents a 54 percent reduction in the unexplained disparity (from 0.46 to 0.22). The duration in neighborhood poverty specifications, though also explaining some more of the health gap compared to single point measurements of neighborhood poverty, was not as strong an explanatory factor.

DISSCUSSION AND CONCLUSION

The results of the analyses using multiple-point measures of family income and neighborhood poverty suggest that cross-sectional analyses of neighborhood-effects are subject to two sources of bias that work in opposing directions. First, estimates of neighborhood-effects are inflated when single-point measures of income are used to adjust for financial viability. When long-term (multiple-point) measures and wealth are controlled for, the neighborhood estimates are significantly attenuated and the single-point estimates of neighborhood poverty become non-significant. The sensitivity of the neighborhood poverty estimates to the inclusion of better measures of personal attributes reflects the most often voiced concern regarding cross-sectional studies of neighborhood-effects. That is, neighborhood-level estimates may be reflections of omitted variable bias or measurement error at the individual-level rather than contextual influences. The inability of the single-point neighborhood poverty estimates to retain their statistical significance when wealth and longer-term measures of family income are included as additional adjustments for compositional heterogeneity across neighborhoods suggest that much of the so-called neighborhood effects found in previous cross-sectional studies that relied on only single-point measures of income may be more of an artifact of variable omission and measurement error at the individual level. At the same time, the consistent increase in the magnitude of neighborhood estimates when multiple-measures of neighborhood poverty are used reveal that single-point measures of neighborhood poverty level are also noisy proxies for long-term neighborhood context that have led to downwardly biased estimates of neighborhood effects. For the general case, the net bias due to these two sources based on theoretical grounds may be impossible to determine.

However, at least in this study, the association between long-term measures of neighborhood poverty and poor health were robust to the inclusion of wealth and long-term measures of income.

As opposed to single-point measures, long-term neighborhood measures of neighborhood poverty may better capture the cumulative wear and tear and "weathering" effects (Geronimus 1992) experienced by residents chronically exposed to disadvantaged environments. These influences on health may be more independent of personal level of socioeconomic status. Less likely to reflect long-term conditions, single-point measures of neighborhood poverty, may be only able to capture the influences of neighborhood context that are quickly mutable, such as health behaviors (e.g. smoking, exercising, diet). The health impact of these may also take some time to manifest and may not be readily discernable in cross-sectional analyses.

The ambiguity regarding the net direction of bias of cross-sectional neighborhood estimates from these two sources reflect the enormous and possibly insurmountable complexity in recovering causal estimates of neighborhood context. In addition to issues regarding measurement error and omission of individual factors, analysts need to be concerned about the possible bias induced by adjusting for individual-level attributes routinely treated as confounders, such as income and education, that may have been influenced by past neighborhood conditions. These factors may arguably be also considered intermediate variables in the pathway between neighborhood context and health. Adjusting for such variables may lead to severely overly conservative estimates of neighborhood influences on health while omitting them would certainly lead to criticisms of under-adjustment of individual-level heterogeneity.

Adjusting for long-term measures of neighborhood poverty further explained a little less than a quarter of the remaining Black/White health gap that remained unexplained after wealth and long-term measures of income were controlled for. In comparison, adjusting for single-point neighborhood poverty provided no further explanation. This suggests that there existed a great deal of heterogeneity in neighborhood poverty histories between Blacks and Whites that were not adequately captured by single-point measures. Though not entirely explained, in totality, the race residual was reduced by over fifty percent after accounting for both long-term measures of income and neighborhood poverty. Consequently, studies on racial health disparities that base their analysis based on only cross-sectional data may be missing a critical component that may undermine their ability to explain a sizable portion of the Black/White health gap.

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Table 1 Descriptive Sample Statistics

Characteristics	Full Sample		White		Black	
	N	%	N	%	N	%
Sample Size	10,490	100	7,100	67.68	3,390	32.32
Gender						
Female	5,801	55.30	3,763	53.00	2,038	60.12
Male	4,689	44.70	3,337	47.00	1,352	39.88
Mean Age	46.15 (14.42)		46.64 (14.71)		45.134 (13.74)	
Race						
White	7,100	67.68				
Black	3,390	32.32				
Family Poverty Income Ratio						
100% Or Less	1,111	10.59	343	4.83	768	22.65
100% to 200%	1,702	16.22	880	12.39	822	24.25
200% to 300%	1,750	16.68	1,141	16.07	609	17.96
Over 300%	5,927	56.50	4,736	66.70	1,191	35.13
Marital Status						
Married	7,397	70.51	5,588	78.70	1,809	53.36
Single	929	8.86	352	4.96	577	17.02
Other	2,164	20.63	1,160	16.34	1,004	29.62
Education Level						
<12 Years	2,359	22.49	1,225	17.25	1,134	33.45
12 Years	3,730	35.56	2,507	35.31	1,223	36.08
13 to 15 Years	2,328	22.19	1,576	22.20	752	22.18
16 Years	1,234	11.76	1,055	14.86	179	5.28
17+ Years	839	8.00	737	10.38	102	3.01
Labor Force Status						
Employed	7,125	67.92	4,989	70.27	2,136	63.01
Unemployed	407	3.88	166	2.34	241	7.11
Not In The Labor Force	2,958	28.20	1,945	27.39	1,013	29.88
Tract Poverty						
1996 Tract <10% Poor	4,793	45.69	4,148	58.42	645	19.03
1996 Tract 10%to20% Poor	3,231	30.80	2,246	31.63	985	29.06
1996 Tract 20%+ Poor	2,466	23.51	706	9.94	1,760	51.92
Mean 1980-1996 Ave Tract Poverty Rate	14.75(10.77)		10.30 (6.69)		24.07 (11.71)	
Mean 1980-1996 Percent Time in Poor Tract	25.44 (36.78)		10.78 (24.83)		56.12 (38.79)	
Average Wealth	140,254 (421,900)		188,697 (502,090)		38,858 (88,000)	
Health Status						
Poor Health	1,766	16.84	901	12.69	865	25.52
Good Health	8,724	83.16	6,199	87.31	2,525	74.48

Note: Standard deviation in parenthesis

Table 2. Logistic Regression Results of Poor Health on Individual-level Poverty ±

Characteristics	Model 1	Model 2	Model 3	Model 4
	OR	OR	OR	OR
Race [Reference: White]				
Black	1.59**	1.46**	1.47**	1.33**
1996 Family Income/Poverty [Reference: Over 300%]				
100% Or Less	2.58**	1.68**		
100%to200%	2.28**	1.62**		
200%to300%	1.40**	1.20		
1980-1995 Ave Family Income/Poverty Ratio [Reference: Over 300%]				
100% Or Less		1.93**		
100%to200%		2.01**		
200%to300%		1.27*		
1980-1996 Ave Family Income/Poverty Ratio [Reference: Over 300%]				
100% Or Less			2.96**	2.30**
100%to200%			2.85**	2.27**
200%to300%			1.63**	1.39**
Wealth Quintiles [Reference: Quintile 5]				
Quintile 1				2.31**
Quintile 2				1.96**
Quintile 3				1.56**
Quintile 4				1.36**

± **Statistically Significant at the 1% Level, *Statistically Significant at the 5% Level

Table 3. Logistic Regression Results of Poor Health on Neighborhood Poverty ±

Characteristics	Model 5A	Model 5B	Model 6A	Model 6B	Model 7A	Model 7B
	OR	OR	OR	OR	OR	OR
Race [Reference: White]						
Black	1.51**	1.32**	1.39**	1.25**	1.38**	1.24**
1996 Family Income/Poverty Ratio [Reference: Over 300%]						
100% Or Less	2.41**		2.29**		2.29**	
100%to200%	2.18**		2.12**		2.13**	
200%to300%	1.35**		1.32**		1.33**	
1980-1996 Ave Family Income/Poverty Ratio [Reference: Over 300%]						
100% Or Less		2.26**		2.14**		2.14**
100%to200%		2.22**		2.18**		2.17**
200%to300%		1.36**		1.35**		1.36**
Wealth Quintiles [Reference: Quintile 5]						
Quintile 1		2.28**		2.27**		2.26**
Quintile 2		1.92**		1.89**		1.90**
Quintile 3		1.53**		1.54**		1.53**
Quintile 4		1.34*		1.35*		1.34*
1996 Tract Poverty Level [Reference: 10% Or Less]						
10%to20%	1.25**	1.13	1.11	1.06		
20% Or More	1.22*	1.07	0.93	0.89		
1980-1995 Ave Tract Poverty Level [Reference: 10% Or Less]						
10%to20%			1.19	1.08		
20% Or More			1.56**	1.37**		
1980-1996 Ave Tract Poverty Level [Reference: 10% Or Less]						
10%to20%					1.28**	1.12
20% Or More					1.50**	1.26*

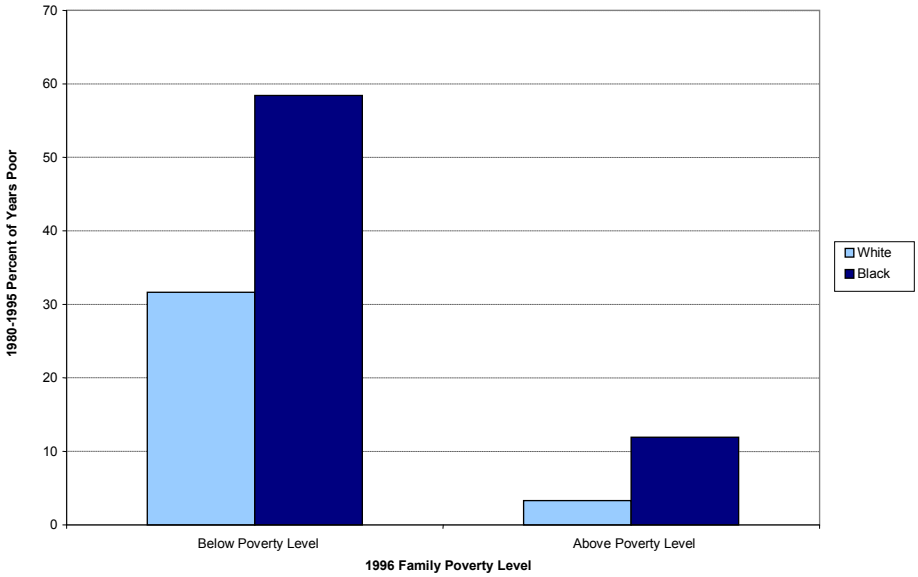
± **Statistically Significant at the 1% Level, *Statistically Significant at the 5% Level

Table 4. Logistic Regression Results of Poor Health on Neighborhood Poverty: Controlling for Duration in Poor Neighborhoods ±

Characteristics	Model 8A OR	Model 8B OR	Model 9A OR	Model 9B OR
Race [Reference: White]				
Black	1.48**	1.31**	1.49**	1.32**
1996 Family Income/Poverty Ratio [Reference: Over 300%]				
100% Or Less	2.39**		2.39**	
100%to200%	2.21**		2.21**	
200%to300%	1.37**		1.37**	
1980-1996 Ave Family Income/Poverty Ratio [Reference: Over 300%]				
100% Or Less		2.20**		2.21**
100%to200%		2.23**		2.23**
200%to300%		1.38**		1.38**
Wealth Quintiles [Reference: Quintile 5]				
Quintile 1		2.32**		2.32**
Quintile 2		1.94**		1.94**
Quintile 3		1.56**		1.56**
Quintile 4		1.36**		1.36**
1980-1996 Duration in Poor Tract [Reference: Never]				
Transient			1.10	1.02
Persistent			1.21*	1.08
1980-1996 Proportion Years In Poor Tract	1.02*	1.01		

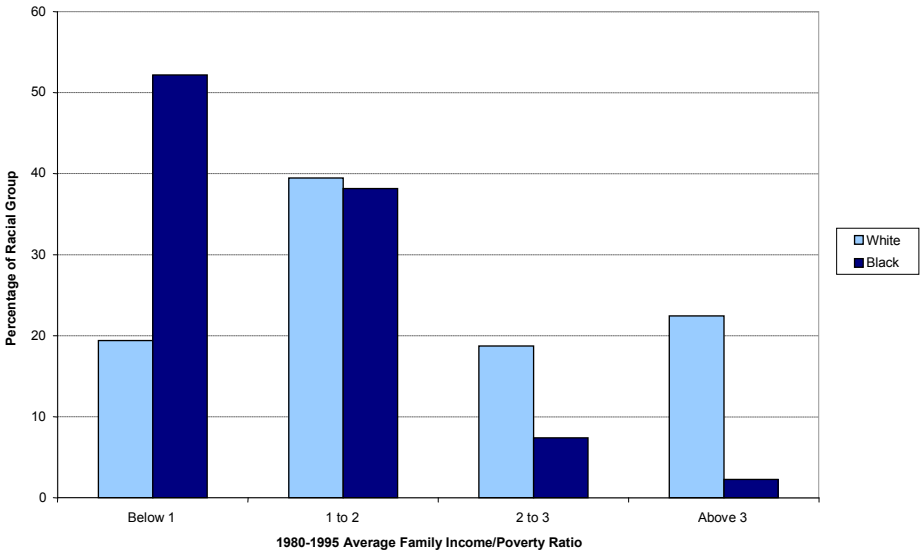
± **Statistically Significant at the 1% Level, *Statistically Significant at the 5% Level,
Odds Ratios for Proportion Years in Poor Tract represent a hypothetical 10% point change.

Figure 1. 1980-1995 Percent of Years Poor by 1996 Family Poverty Status



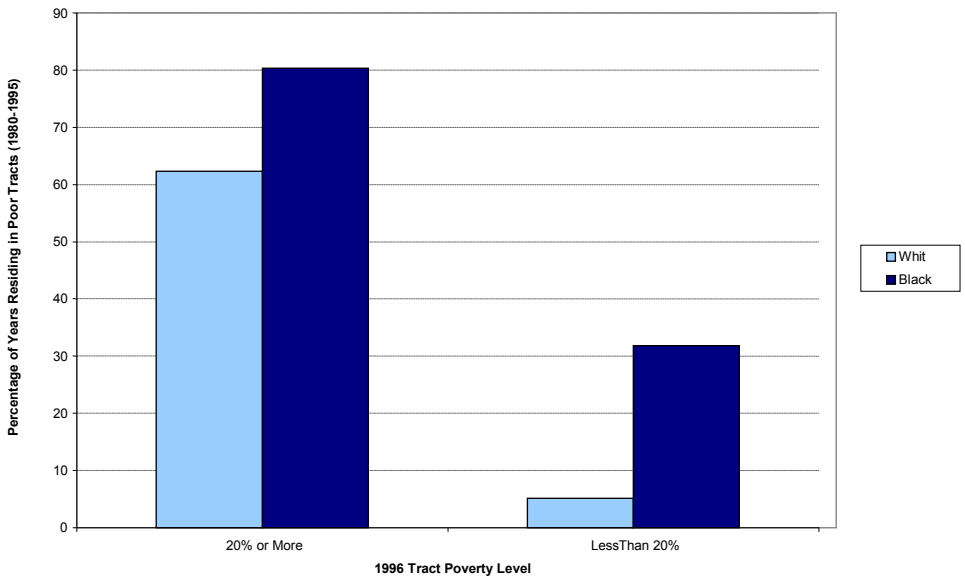
Note: Analysis restricted to respondents with at least six years of nonmissing family income values between 1980-1995.

Figure 2. 1980-1995 Average Family Income/Poverty Ratio Category for Individuals Who Were Poor in 1996



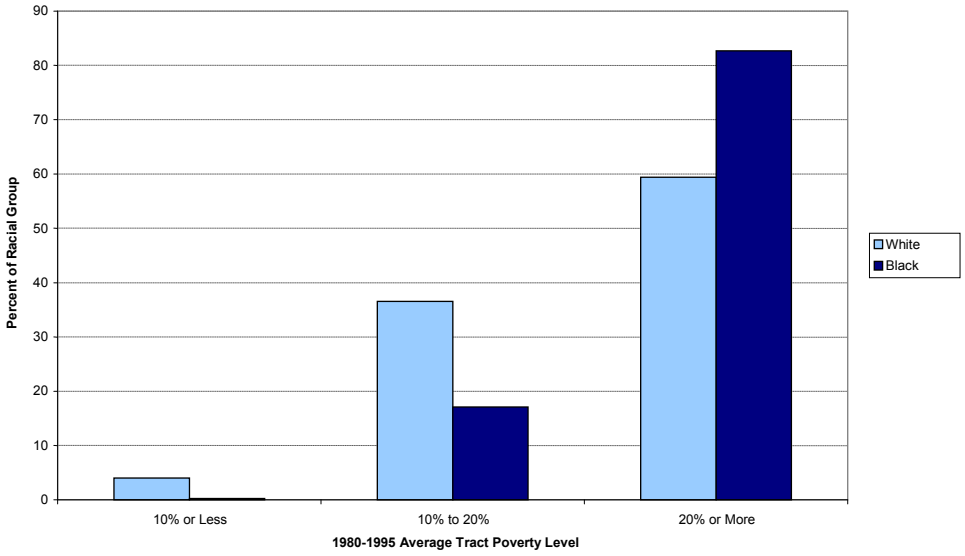
Note: Analysis restricted to respondents with at least six years of nonmissing family income values between 1980-1995.

Figure 3. 1980-1995 Proportions of Years Resided In a Poor Neighborhood



Note: Analysis restricted to respondents with at least six years of nonmissing tract poverty values between 1980-1995.

Figure 4. Average 1980-1995 Neighborhood Poverty Category Among Individuals Who Resided In a Poor Neighborhood in 1996



Note: Analysis restricted to respondents with at least six years of nonmissing tract poverty values between 1980-1995.