

**THE PLACE OF RACE IN HEALTH DISPARITIES: HOW FAMILY BACKGROUND AND
NEIGHBORHOOD CONDITIONS IN CHILDHOOD IMPACT LATER-LIFE HEALTH**

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I. Introduction

Health is distributed unevenly, following a gradient that is a function of socioeconomic advantage and mirrors the pattern of neighborhood disadvantage. Among the steepest of such gradients is that of the US, where there are large differences between people on measures of neighborhood environments, early childhood experiences, education, income, and housing quality.

Persistent residential segregation of poor and minority populations has spurred a growing body of literature that investigates the effects of community background on a variety of socioeconomic outcomes. However, the role of the physical and socioeconomic neighborhood in contributing to health disparities has been relatively unexplored. Analyses of health disparities have instead focused largely on individual and family-level determinants of health outcomes. However, over the past decade, we have witnessed a renewed research and policy interest and recognition of the salience of non-medical determinants of health, especially the socioeconomic determinants of health that derive from differential neighborhood quality (Schoeni, House, Kaplan and Pollack, 2008). Previous research has shown health behaviors, such as cigarette smoking, alcohol use, diet and exercise, explain a relatively small amount of race and socioeconomic differences in health status (Lantz et al., 2001), leaving open the question of the importance of parental socioeconomic status via their effect on access to neighborhood amenities.

This chapter reports on recent research by the author on the influence of neighborhood conditions on health over the life course, with a particular focus on how childhood neighborhoods affect health later in life. This research takes the perspective

that disadvantaged neighborhood exposures may both accumulate and beget future exposures due to links between neighborhood characteristics and the socioeconomic mobility process. In the US, there are substantial racial differences in the incidence and persistence of exposure to high poverty neighborhoods (Johnson, 2008c). Moreover, in the US, blacks can expect to live six fewer years than whites, and can expect to live more years with chronic health problems (Hayward and Heron, 1999), with most of the black-white difference in life expectancy stemming from racial differences in mortality rates prior to age 65. Racial disparities in neighborhood exposures, in childhood and adulthood, and the relationship between these disparities and those in health provide an important backdrop and motivation for this inquiry.

Stressful neighborhood conditions due to high poverty rates, crime, violence, and weaker sources of social support, may lead to increased risk of high blood pressure and accelerated rates of health deterioration more generally. There are well-known differences across neighborhoods in the amount of perceived safety, availability and quality of public spaces and recreational facilities, tobacco advertising, liquor stores, availability and cost of nutritious foods. The empirical question is whether differences across neighborhoods in the prevalence of health conditions do in fact reflect causal processes operating over the life course. Given the known lengthy latency periods before most health effects manifest (e.g., hypertension), it is important to examine whether later-life racial health disparities are rooted in early-life childhood circumstances. Racial differences in adult health status are likely the result of a long-term cumulative process of socioeconomic environmental exposures over the life cycle. The selected studies highlighted in this chapter on this topic seek to identify causal influences of the life cycle

trajectory of health inequality using innovative research designs to separate causal impacts of neighborhoods from correlations arising from familial selection into neighborhoods.

The typical analytical approach used in neighborhood studies is to regress individual level outcomes such as health on neighborhood-level factors such as census tract mean income, poverty rates, or rates of single motherhood. But attempts to estimate causal effects of neighborhood context have faced well-documented challenges. The problem of endogeneity of residential location (in the form of "selection bias") has received perhaps the most attention in the literature (Manski, 1993) and is a paramount concern because families choose where to live in part based on the characteristics they value. Thus, families who care more about investing in health-promoting activities may be less likely to choose to reside in a community with a poor health care system or high pollution. The multi-dimensional aspects that influence residential location decisions are most often unmeasured, which makes it particularly difficult to disentangle the causal influences of a child's family, school, and neighborhood. Few studies have used convincing identification strategies to overcome this challenge, exceptions being experimental evaluations such as Katz, Kling, Liebman (2001) and Leventhal & Brooks-Gunn (2001). (See Gennetian et al in this volume.)

A second challenge is the difficulty of obtaining accurate measures of neighborhood characteristics. Another problematic characteristic of many neighborhood studies is that they examine the relationship between contemporaneous health and neighborhood conditions without regard to changing circumstances during the life cycle, or the persistence of exposure to neighborhood conditions. If exposure to neighborhood

conditions at an earlier stage of the life cycle influences current health, but is not accounted for, then the estimated relationship between contemporaneous neighborhoods and health may be misleading. Causality between economic and health status runs in both directions in adulthood and has proven notoriously difficult to sort out empirically (Adda et al., 2003). By focusing on childhood socioeconomic conditions, we can more easily identify causal impacts on subsequent health because reverse causality is a relatively minor concern (i.e, poor child health is not a significant factor in most cases that leads to low parental income or neighborhood disadvantage).

The studies highlighted in this chapter employ a different approach to address these challenges by exploiting a unique feature of the Panel Study of Income Dynamics (PSID). Specifically, the initial PSID sample in 1968 was highly clustered, with most original sample families having several other sample families living on the same block and who were subsequently followed over significant shares of the life course. This allows one to compare the similarity in adulthood health outcomes between siblings who grew up together, versus unrelated individuals who grew up in the same narrowly defined neighborhood. I use correlations between neighboring children's subsequent health in adulthood to bound the proportion of inequality in health outcomes that can be attributed to disparities in neighborhood background. Small neighbor correlations would indicate that community origins can explain only a minor portion of the variation in health outcomes. Large neighbor correlations would leave open the possibility that neighborhoods contribute significantly to inequality in health outcomes, and further analyses of the effects of particular neighborhood characteristics would be warranted.

Estimating the overall scope of any such causal links of neighborhood environments is of substantial policy importance because the residential locations of both the poor and affluent are influenced by public policies related to crime, subsidized housing, zoning, tax subsidies for home ownership, and school districting, among other things. Moreover, understanding how the effects of neighborhood conditions differ over the life cycle is critical to helping policy makers develop interventions (e.g., early childhood interventions or targeted policies for the geographic deconcentration of the poor) that build a bridge between childhood and early adulthood for impoverished families, so fewer individuals arrive at the doorstep of retirement with accumulated exposures that are irreversible.

The remainder of the chapter is organized in the following way. I begin with a discussion of how neighborhood and family background may affect an individual's health trajectory in adulthood. I provide an overview of the ways that neighborhoods, as well as families, may directly and indirectly affect health, and then summarize previous research on a number of topics relevant to my research, including the impacts of stress on long-term health, intergenerational mobility, the evolution of the socioeconomic gradient in health over the life course, and the health effects of residential segregation. Section III lays out the methodological hurdles in estimating causal effects of neighborhood conditions. Section IV summarizes recent research findings using innovative approaches that address these methodological challenges across a range of health outcomes over the life course. The final section discusses the policy implications and interventions that show the most promise to promote population health to build a more comprehensive and efficient health system.

II. WHY MIGHT NEIGHBORHOOD AND FAMILY BACKGROUND MATTER?

Family background can have direct effects on health status over the life course through several mechanisms. Transmission of genetic traits from parents to children clearly plays an important role. Parental socioeconomic and demographic characteristics most likely influence children's health status (Case, Lubotsky, and Paxson, 2002), which in turn carries through to health status in adulthood. The transmission of health lifestyle orientation – eating habits, exercise and smoking behaviors, for example – across generations may also translate into disparities in adult health.

Similarly, it has been hypothesized that neighborhood background can have direct effects on health. Childhood neighborhood factors such as water and air quality, sanitation, pollution and environmental toxins, crime, health care and social services, and public schools most likely have some influence on childhood health. Health lifestyle orientation may have a neighborhood component as well, with peer groups and role models within communities or neighborhoods influencing children's opportunities and preferences (Johnson, 2007).

Perhaps equally or more importantly for health dynamics, both neighborhood and family background may indirectly affect health over the life course through their effects on the socioeconomic mobility process. The degree of socioeconomic mobility has direct implications on the resemblance of an individual's childhood and adulthood family characteristics, such as income and education, which may in turn affect health. Since economic status is a major determinant of residential choice, persistence in economic status is likely to lead to persistence in neighborhood quality as well; that is, the lower

economic mobility is, the greater the correlation between childhood and adulthood neighborhood characteristics.

My recent research on the ways in which family and neighborhood background may affect health over the life course integrates a number of strands in the existing literature. Each of these strands is briefly discussed in the remainder of this section.

Previous Research. Research has shown that socioeconomic status and health status are highly correlated. This strong association holds for a variety of health status measures, is true in countries with varying levels of economic development and government-sponsored medical care, and has existed as far back in time as data are available. The association also holds across the entire life course, but the nature and pattern of the SES-health gradient differs over the life cycle, with a steepening gradient through mid-life that gradually lessens in later-life, particularly after 65 (Card et al., 2004; Smith, 2007; Johnson, 2007). Chronic health conditions, like hypertension, typically grow out of socioeconomic conditions over a lengthy life-cycle period rather than from circumstances at a single point in time. The life-course perspective of health emphasizes that health problems early in life could affect health later in life because the problem is chronic, because the health shock damaged health stock making it more susceptible to deterioration later in life, and because the health problem affects socioeconomic outcomes such as education which in turn influences health later in life (Kuh and Wadsworth, 1993). My recent research on this topic summarized in section IV seeks to uncover aspects of childhood neighborhood and family socioeconomic status that play a role in explaining the steepening of the gradient through mid-life and the lasting importance of childhood conditions.

Research draws on neuroscience. Emerging research has sought to identify whether and how early-life differences in exposures to stressful life conditions get under the skin. There are compelling theoretical reasons to expect chronic stress linked to neighborhood environments to influence health trajectories. Recent findings in neuroscience highlight prolonged exposure to stress hormones (e.g., cortisol) can suppress the body's immune response and cause greater vulnerability to chronic health conditions. Early-life experiences of toxic stress, even in the womb, may have profound implications for later-life health (Aizer et al., 2007; Johnson and Schoeni, 2007). Other research indicates that early-life risk factors compound over the life cycle—often-cited examples of the adaptive cost of stress-induced wear and tear (“weathering”) include pushing the endocrine system toward diabetes or the cardiovascular system toward coronary artery disease and hypertension (Halfon and Hochstein, 2002). Blacks appear to face more stress than comparable whites (Geronimus et al., 2006; Cohen et al., 2006), as evidenced in studies that document higher cortisol levels—a hormone that is a marker for stress—among blacks even after accounting for family income (DeSantis et al., 2007).

Recent findings in neuroscience also indicate that developmental health trajectories can be altered more readily during sensitive periods of rapid developmental change than during other periods. Heckman (2007) emphasizes that, “common developmental processes are at work where some cognitive and non-cognitive skills and health capabilities at one stage in childhood cross-fertilize the productivity of investment at later stages”. Research evidence from this field increasingly supports the notion that the greatest opportunities to invest in health occur during the first 20 years of life. This suggests a need to shift some of the emphasis on treatment in later stages of disease

toward the promotion of earlier, more effective prevention and an investment-oriented approach to health spending targeted to its most productive uses.

Metropolitan form: Segregation and fragmentation. No consensus among researchers has been reached on the assessment of the role of neighborhood quality vs. overall residential segregation patterns in contributing to racial health disparities. Prior work has uncovered puzzling issues about the role of race in explaining spatial differences in morbidity and mortality that have yet to be resolved. In particular, people die younger in cities and states that are more segregated and have a higher fraction of African Americans in their populations, not only because blacks die younger than whites, but because *both* blacks and whites die younger in places where the population is more heavily black and segregated (Deaton and Lubotsky, 2002).

Hart et al. (1998) showed that metropolitan areas characterized by metropolitan governance had lower black mortality rates than areas characterized by municipal fragmentation and that housing segregation mediated the effect of metropolitan governance on black male mortality. Previous research has shown that fragmented local governance structures lead to greater black-white residential segregation within US metropolitan areas. We are left with the puzzle of why the fraction black and extent of residential segregation should increase morbidity and mortality.

Intergenerational Mobility. Research indicates that socioeconomic mobility tends to be lower among blacks than whites. Poor black children are less likely to escape poverty than poor white children (Bhattacharya and Mazumder, 2007). In particular, Hertz (2005) finds 17 percent of whites in the bottom decile of family income remain there as adults, compared to 42 percent of black children.

With a few exceptions, the role of neighborhood factors in contributing to this difference has received little attention in the literature. Intergenerational mobility literature has focused almost exclusively on cognitive skills and investments in education in understanding the process behind intergeneration persistence in economic status. Even in this work, however, the mechanisms through which mobility is enhanced or impeded have not been identified. Inequalities in economic status tend to be correlated across generations in part because of intergenerational correlations in health and education (Eriksson et al., 2005).

One paper that *does* consider the role of segregation in contributing to black-white achievement gaps is that of Card and Rothstein (2006); they find that achievement gaps are consistently higher in more segregated cities and that this effect operates primarily through neighborhood segregation as opposed to school segregation. Their evidence supports the hypothesis that differences in childhood neighborhood conditions and school quality contribute to lower rates of socioeconomic mobility observed among blacks. More recently, Johnson (2008c) has examined the relationship between residential and socioeconomic mobility. Johnson documents significantly higher rates of persistent exposures to poor neighborhoods from childhood through mid-life among blacks. In particular, my previous work using nationally-representative data shows that among cohorts born between 1951-1970, the average black child spent about $\frac{1}{4}$ of their childhood years in high poverty neighborhoods (i.e., neighborhood poverty rates in excess of thirty percent), and about one-third of their early-to-mid adulthood years (ages 30-50) in high poverty neighborhoods, while only roughly 15 percent of these adulthood years were lived in low poverty neighborhoods (i.e., less than ten percent of households

in poverty). In contrast, the comparable estimates for the average white child is only three percent of childhood and adulthood years spent in high poverty neighborhoods, while spending 80 percent of childhood years in low poverty neighborhoods and more than half of early-to-mid adulthood years in low poverty neighborhoods. Furthermore, black-white differences in adulthood exposure to neighborhood poverty are largely accounted for by differences in the likelihood of being born into a poor neighborhood, and to a lesser extent by differences in rates of upward and downward socioeconomic mobility over the life course.

This means that blacks are trapped in high poverty neighborhoods for a significant share of the life course to a far greater extent than whites. Johnson (2008b) demonstrates childhood neighborhood poverty and related dimensions of childhood neighborhood disadvantage such as high crime, low county per-pupil school spending, residential segregation, parental and neighborhood-level average expectations for child achievement, and neighborhood connectedness to informal sources of support, also significantly influence mobility prospects, and explain part of black-white differences in rates of upward mobility from poor families.

Higher income appears to have a significantly more beneficial effect on the ability of white families, relative to black families, to convert their residential mobility expectations into a move (Crowder, 2001). Broker discrimination has been shown to play a role in some differences in neighborhood quality when residential moves are attempted (Massey and Lundy, 2001; Ondrich et al., 1999; Reibel, 2000). Newburger (1995) found using survey data of recent black and white homeowners that brokers were a more important source of information for blacks than whites, because of a dearth of

other information on housing opportunities in black and integrated neighborhoods; she speculates that this dearth of information may lower the quality of housing choices made by households searching in these neighborhoods.

DiPasquale and Kahn (1999) found that while black, white, and Hispanic families spend about the same amount on housing (controlling for household size and income), black and Hispanic families spend considerably less than white families on community attributes (such as low crime rates, neighbors' human capital, school quality, and environmental quality). Despite the fact that minority families choose higher-quality communities as their income rises, there is a racial gap in expenditures on community attributes at all income levels. The evidence shows that black families tend to live in lower-quality neighborhoods, even after controlling for their socioeconomic characteristics.

III. METHODOLOGICAL CHALLENGES IN ESTIMATING NEIGHBORHOOD EFFECTS

The primary methodological challenge in estimating the causal effects of neighborhoods on health status is that unobserved factors that affect health may also be correlated with neighborhood factors, leading to biased estimates of neighborhood effects. This can arise from the self-selection associated with residential location. Namely, individuals and families choose where they live based on the characteristics they value (Tiebout, 1956), although constraints such as racial discrimination and exclusionary zoning may be placed on that decision. In this context, families and individuals who care more about their health will be less likely to choose to live in an area with high crime, pollution, or a poor health care system; i.e, they will tend to self-select into neighborhoods with "health-promoting" characteristics. In turn, if we observe that

children who live in areas that score highly on “health-promoting characteristics” have better health than children who do not, it is difficult to determine the extent to which this is due to neighborhood characteristics and the extent to which it reflects their parents putting a high value on good health and taking a range of actions to foster it. This task is made particularly difficult because we do not actually observe the value that different households put on good health. Oakes (2004) argues that the lack of attention to the issue of self-selection in neighborhood choice implies the resulting estimates of neighborhood effects “will always be wrong” (p.1941).

The most powerful way to address self-selection is through a randomized trial of the type used in the MTO Demonstration, where an experimental design is used to estimate the effects of offering housing assistance that allows individuals to move out of low-income, poor neighborhoods. (See Gennetian et al in this volume for more discussion of MTO). Evidence from two sites – Boston and New York – demonstrates that MTO had beneficial effects on the health of children and adults (Katz, Kling, Liebman, 2002; Leventhal and Brooks-Gunn, 2002).

But research that can draw on an experimental design is rare. In turn, most studies have attempted to address self-selection using non-experimental methods. The most common approach is the use of instrumental variable techniques (e.g., Evans et al., 1992; Case and Katz, 1991), where the exclusion restrictions are tenuous. An alternative non-experimental approach is comparing siblings who have been raised in different neighborhoods at different ages because their parents have moved (Aaronson, 1998; Plotnick and Hoffman, 1996). But this approach is not satisfying either, because the key assumption is that the family effect is fixed, not time-varying. If, for example, families’

preferences change as their children get older, and they become more interested in living in neighborhoods that are less risky for their children's health, then they might move to neighborhoods with less crime or pollution, which may in turn lead to better health outcomes for their kids. But if the underlying change in their preferences towards health outcomes not only caused them to change neighborhoods, but also to spend more time encouraging their children to practice good health behaviors, then the neighborhood "effect" might actually be representing all of these other factors and not the true causal effects of neighborhoods *per se*.

Typical neighborhood studies also face the challenge of identifying and measuring relevant factors. The neighborhood qualities that may in fact matter may be hard to measure, or they may not be measured in enough spatial detail. This issue is analogous to the finding in the family background literature that sibling correlations in socioeconomic status far exceed what has been explained by any particular measured aspects of the siblings' shared background (Corcoran, Jencks, and Olneck, 1976), suggesting that all of the family background measures that affect socioeconomic status have not been identified and/or measured.

The typical methods by which economists solve endogeneity problems are particularly ill-suited for examining the question of whether and how neighborhood socioeconomic features influence long-run health trajectories. Difficulties in measuring neighborhood characteristics also become especially problematic when addressing this question. If health outcomes are a product of cumulative exposures to advantaged/disadvantaged environments spanning decades or exhibit long latent periods before problems manifest, as is hypothesized here, the connection between current

neighborhood and current health may say little about the overall influence of neighborhoods factors over the life cycle. As well, it may be important to conceptualize neighborhood effects as cumulative and variable over the life course as opposed to isolated and unchanging. Because most methods for overcoming endogenous neighborhood choice are based on small, short-run changes in the neighborhood environment, these approaches might be limited to uncovering effects only for rapidly-responding intermediate outcomes such as health behaviors (e.g., smoking/drinking, exercise/diet). An additional issue is that neighborhood variables of the underlying neighborhood feature of interest are notoriously measured with a great deal of error. The neighborhood attributes of interest change slowly over time, so most year-to-year variations in the characteristic is comprised of measurement error.

IV. SUMMARY OF NEW EVIDENCE

I have recently conducted a series of studies that employ an empirical strategy that largely side-steps the pitfalls of neighborhood studies in confronting the endogeneity of residential location by exploiting unique features of the Panel Study of Income Dynamics (PSID). The PSID is the longest-running US longitudinal study spanning 1968-2005. These studies are among the first to use nationally-representative data from the US to analyze the persistence in neighborhood quality over the life course and investigate its health consequences later in life. The analysis utilizes the PSID, spanning nearly four decades, and follows two study samples: 1) a cohort born between 1951 and 1970 from childhood through mid-life, and 2) older cohorts born between 1920 and 1949 followed from young adulthood through late-life. I examine several different health outcomes, including self-assessed health status, risky health behaviors and risk preference

formation in childhood, the onset of health-limiting conditions, the onset of hypertension, and mortality.

The research findings that emerge from this array of health outcomes at different stages of the life cycle provide corroborating evidence on the role of neighborhood environments over the life course on health. The consistency of findings across the study samples and health outcomes at different stages of the life course paints a cohesive portrait of the influence of neighborhood disadvantage earlier in the life cycle on health later in life.

Outline of Key Features of Empirical Approach.

Instead of performing another typical regression analysis focused on particular neighborhood characteristics, the first goal of the analysis is focused on an overall assessment of the relative contributions of individual, childhood family and neighborhood effects on health in childhood and early-to-mid adulthood. A key to the empirical strategy and research design employed is that the initial PSID sample in 1968 was highly clustered with most PSID families having several other sample families living on the same block. This survey design allows a comparison of the similarity in health from childhood through mid-life between siblings versus unrelated individuals who grew up in the same neighborhood (using the younger cohort sample), and also allows us to compare the similarity in late-life health between spouses, versus unrelated individuals who were living in the same narrowly defined neighborhood during their young adulthood years (using the older cohort sample). This approach avoids the difficulty of defining neighborhood quality and instead compares sibling correlations with neighbor

correlations, placing an upper bound on the neighborhood influence and allowing a comparison of the relative magnitudes of child neighborhood versus family effects.

The intuition behind this strategy is that if family background and residential community are important determinants of health outcomes, there will be a strong correlation between siblings in their health outcomes, as compared to two arbitrarily chosen individuals. Sibling correlations in health outcomes reflect the influence of all family and neighborhood background factors shared by siblings—measured and unmeasured—that may have an impact on health outcomes, such as the socioeconomic status of parents, genetic traits, family structure, as well as neighborhood quality. And, if the neighborhood where the child grew up is important, it will show up as a strong correlation between neighboring children's subsequent health outcomes. The resemblance of adult health outcomes among childhood neighbors reflects the lasting and composite influence of factors shared by individuals from the same neighborhood—this represents an omnibus measure of the overall scope of child neighborhood effects, but is an upper bound because some of the raw child neighbor correlation in health may emanate from child neighbors having similar family background characteristics. Thus, augmenting the sibling correlation estimates with child neighbor correlation estimates of health outcomes (net of the similarity arising from similar observable family characteristics), enables us to disentangle family from neighborhood effects.

The overarching logic of the analytic approach is that if the neighbor correlations prove to be substantial, then that provides greater rationale for the further investigation of which neighborhood features matter and explain the lasting importance of childhood conditions. Upon discovering substantial child neighbor correlations in adult health

outcomes, I analyze the relative contribution of a rich array of measured individual, family, and neighborhood covariates to the total variation from each component, and test hypotheses about the effects of specific characteristics of families and neighborhoods.

The comparison of sibling and child neighbor correlations in adult health, as well as comparisons between spousal and adult neighbor correlations in late-life health allows an assessment of the relative magnitudes of the effects of the childhood neighborhood and family environments, and neighborhood environment in adulthood versus family characteristics in adulthood. The findings are based on the estimation of four-level hierarchical random effects models of various dimensions of health.

There are four primary reasons why the approach taken in this work may be able to detect neighborhood effects in ways previous studies have been unable. First, in contrast to the experimental evidence and previous observational studies, the analysis examines effects over a much longer time horizon using data over the life course spanning nearly four decades. This is particularly important for most health outcomes, as there is likely a longer lag between poor neighborhood quality and the manifestation of health effects. Second, instead of focusing on contemporaneous neighborhood effects, I analyze the lasting effects of neighborhood environments earlier in the life cycle, which include cumulative exposure to neighborhood conditions that may vary over the life cycle. Third, I use the census block as the definition of neighborhood, which comprises a much smaller geographic area than previous studies utilize. Finally, I use estimates of neighbor correlations as an omnibus measure of the potential effects of neighborhood quality (including unmeasured characteristics), rather than initially focusing the analysis on particular observable neighborhood attributes.

Two unique aspects of the project findings include: (1) the relationship between cumulative neighborhood exposures over the life course and later-life health; and (2) the role of neighborhood environments in contributing to socioeconomic and racial health disparities. The innovative research design and unique measures collected on aspects of neighborhood physical, service and social environments—including neighborhood poverty and crime, income and education, county per-pupil school expenditures, birth weight and health insurance, race and residential segregation, health behaviors, housing quality, connectedness to informal sources of support—help illuminate what lies along the “chain of causation” from poverty to health outcomes over the life course.

Below, I summarize key findings that emerge from these studies by life cycle stage. First, the overall scope of childhood family and neighborhood influences on health implied by the estimated sibling and child neighbor correlations in health outcomes over the life course is substantial. The results show sibling correlations in general health status is roughly 0.6 through at least the first 50 years of life—suggesting that three-fifths of adult health disparities may be attributable to family and neighborhood background. I also find childhood neighbor correlations in adult health that are substantial (net of the similarity arising from similar observable family characteristics). The results suggest that disparities in neighborhood background account for between one-third and 40 percent of the variation in health status in mid life. The estimates indicate that a child who grows up in a neighborhood at the 10th percentile of the neighborhood quality distribution has roughly a 0.3 chance of falling in the bottom decile of the adult health distribution and has only a 0.15 chance of rising above the median.

The overall scope of both childhood family and neighborhood factors on health through mid-life (implied by the sibling and child neighbor correlations in health) provided the impetus for further investigation of what aspects of childhood family and neighborhood features influence subsequent health trajectories and explain their lasting impacts. The full set of findings from this inquiry are reported in Johnson (2007), and summarized below.

What aspects of childhood neighborhood and family socioeconomic status matter?

The results indicate that the composite neighborhood effects reflected in the significant child neighbor correlations in adult health appear to emanate from the direct effects of neighborhood quality during childhood on child health that may carry over into adulthood, as well as indirect effects via the economic mobility process. Differences in developmental health trajectories explain much of variance in nature and rate of later declines in health.

The socioeconomic gradients in health are not fully accounted for by differentials in education, access to health care, or health behaviors; and childhood neighborhood conditions play a role in explaining the steepening of the gradient through mid-life and lasting importance of childhood conditions. Significant child health and adult health status differences are associated with parental income and education, child neighborhood poverty and crime, race and childhood residential segregation, school district per-pupil spending, parental expectations for child achievement, neighborhood housing quality, and child health insurance coverage, birth weight, and parental health status. Child neighborhood poverty was found to be the single most salient neighborhood characteristic that influenced the subsequent health trajectory. The results reveal several

patterns: 1) children growing up in poverty experience significantly higher rates of problematic health throughout life; 2) the socioeconomic gradient in health appears to widen over the life course, as the health deterioration rate is more rapid in adulthood among those who grew up in more disadvantaged child neighborhood and family environments; and 3) exposure to concentrated neighborhood poverty during childhood and cumulative exposure through mid-life is highly predictive of adult health status problems at mid-life. The results reveal substantial persistence in health status across generations that are linked in part to low intergenerational economic mobility.

The results indicate that exposure to concentrated neighborhood poverty over the life course has significant deleterious impacts on later-life health, with the largest neighborhood effects identified during childhood and to some degree in young adulthood, with a far lesser role for contemporaneous neighborhood exposures on contemporaneous health outcomes. The widely discussed correlation between contemporaneous neighborhood conditions in adulthood and adult health status arises mostly because it is *lifetime neighborhood exposures* that have cumulative effects on health and mortality risk, and lifetime neighborhood quality and family resources are strongly positively related to contemporaneous neighborhood environments in adulthood. Most health outcomes are a product of cumulative exposures to advantaged/disadvantaged environments spanning decades or exhibit long latent periods before problems manifest. Therefore, the connection between current neighborhood and current health say relatively little about the overall influence of neighborhoods factors over the life cycle. As well, the research findings point to the importance of conceptualizing neighborhood effects as cumulative and variable over the life course as opposed to isolated and unchanging.

Health during Childhood through Mid-life

Conditions of persistent exposures to disadvantaged neighborhoods, particularly high poverty neighborhoods, appear to be responsible to a significant degree for the patterns of accelerated health deterioration and the socioeconomic gradient. To probe the robustness of a causal inference, the analysis employs a novel empirical approach, recently proposed by Altonji et al. (2005), to gauge how sensitive estimates of the effects of neighborhood poverty are to selection on unobserved variables. The results reveal that even a large amount of selection on unobservable factors does not eliminate the significant effect of neighborhood poverty on health status later in life. While there is no single perfect solution to address the endogeneity of residential location, there are additional ways to determine if selection bias is driving the results. The fact that the effect of concentrated neighborhood poverty is weaker when the duration of exposure is brief and parents know few of their neighbors suggests that selection bias is not driving these results. If effects simply represented unmeasured family factors, then the number of years in the neighborhood and the number of neighbors known by name should not be associated with the strength of these effects. But that is not the case here.

Toward understanding sources of adult racial health disparities.

Another important contribution of this work is that I conduct a systematic analysis of the evolution of socioeconomic and racial health disparities over the life course, and attempt to explain the level and age-profile of sibling and neighbor correlations. In the results reported in Johnson (2007), general health status in childhood and adulthood through mid-life are the key outcomes analyzed, while the likelihood of onset of hypertension in adulthood is the health condition analyzed in Johnson (2008a). Both

studies find that racial differences in adult health can be accounted for by childhood family and neighborhood factors, while contemporaneous adult economic factors account for relatively little of this gap. Blacks' higher prevalence of cardiovascular disease-related risk factors account for more than half of the racial disparity in longevity (Barghaus, Cutler, Fryer, and Glaeser, 2007), with hypertension the leading culprit. Hypertension is a major risk factor for heart disease and stroke, the leading causes of death in the US. I find childhood neighborhood poverty and its attendant stressors play an influential role in shaping risks of onset of hypertension in middle-age. Other notable neighborhood factors that were shown to influence risks of onset of hypertension in adulthood include childhood neighborhood crime exposure and county per-pupil school expenditures; and notable family background factors include birth weight, parental health status, and parental socioeconomic status. These effects appear linked, in part, to low intergenerational economic mobility, particularly among blacks. The results indicate that racial differences in these early-life neighborhood conditions and family background characteristics play a significant role in explaining racial disparities in hypertension through at least age 50, while contemporaneous economic factors account for relatively little of the racial disparities in this health condition in adulthood. The findings of the importance of family background and neighborhood origins facilitates the identification of the antecedents of health at mid-life and provides us with a better understanding of the early risk factors for health decline among older adults.

Mid-to-late-life health

Johnson, Schoeni, and Rogowski (2008) and Johnson (2008d) seek to identify origins of health disparities at older ages, again with emphasis on the influence of the

neighborhood environment and residential segregation. In these studies the health experiences of older cohorts born between 1920 and 1949 are analyzed from young adulthood through late-life. General health status and the onset of health-limiting conditions are the key outcomes analyzed in Johnson et al. (2008), while men's mortality is analyzed in Johnson (2008d). These studies build directly on the aforementioned findings of Johnson (2007, 2008a), which illuminated the importance of family background and neighborhood origins on child health and adult health through mid-life.

One aim of the comparison of the childhood neighbor correlations in adult health with the adult neighbor correlations in health among the elderly (after accounting for cohort and age differences across the samples) is to contribute to our understanding of how neighborhood effects may vary over the life cycle. A key to uncovering this issue is analyzing the persistence in neighborhood quality over the life course; the results of which are summarized below.

While the adult neighbor correlations in late-life health are important and substantively significant (0.27), they are smaller than the child neighbor correlations in mid-life health (0.4), suggesting a potentially more prominent role of childhood neighborhood factors than neighborhood environments in adulthood. The smaller but significant scope of young adult family and neighborhood factors on later-life health (implied by the spousal and young-adult neighbor correlations in late-life general health status), provided the impetus for further investigation of aspects of neighborhood and family background characteristics experienced earlier in the life course, including childhood socioeconomic conditions¹, the type of community the individual grew up in,

¹ The measures used for childhood socioeconomic conditions of the older birth cohorts are obtained from retrospective reports of childhood circumstances asked in the early survey years of the PSID.

parental education, young adult health insurance coverage and health behaviors, young adult neighborhood poverty, crime and residential segregation, and housing quality.

The results show that black men have a 79 percent higher mortality hazard in mid-to-late-life, relative to white men. The black-white gap in mortality risk is cut by about half after inclusion of controls for childhood and young adult family socioeconomic factors, including income, educational attainment, health insurance coverage, and to a lesser extent health behaviors. Furthermore, the study finds that racial differences in longevity can be fully accounted for by childhood and young adult family and neighborhood socioeconomic factors, particularly neighborhood poverty and crime. The results highlight the significant role of neighborhood poverty in shaping adult mortality risks. I find that living in a high poverty neighborhood during young adulthood increases subsequent mortality risks by 56 percent, relative to living in a low poverty neighborhood (independent of individual and family-level characteristics).

About ¼ of health disparities in mid-to-late life may be related to differences in young adult neighborhood environments. The study finds that more than half of racial differences in later-life health are associated with these young adult family and neighborhood factors (including young adulthood income and education, young adult neighborhood poverty and crime, residential segregation, young adult smoking and alcohol use, young adult neighborhood connectedness to informal sources of help and housing quality), while contemporaneous neighborhood factors account for relatively little of this gap. These factors in young adulthood also explain two-thirds of the young adult neighbor correlation in health at ages 55 and over.

The results demonstrate that the average health status of a fifty-five year old who lived in a high poverty neighborhood during young adulthood is roughly at the same level of health as a seventy year old who lived in a low poverty neighborhood during young adulthood. The implied difference in the rates of health deterioration by neighborhood poverty status is on par with the effect size of the well-known college-high school education gradient in health status.

The study highlights substantial race differences in the incidence and duration of exposure to concentrated poverty over the life course with grave health consequences. The work reveals high rates of immobility from poor neighborhoods over the life course, especially among African-Americans.

V. POLICY IMPLICATIONS & DIRECTIONS FOR FUTURE RESEARCH

The US leads the world as the most technologically advanced in clinical research and medical practice. We spend more on medical care than any other nation (now more than 16% of GDP), but our health system produces inferior health outcomes relative to many other developed countries. The performance gaps in our current system include: 1) the more than 45 million uninsured; 2) escalating medical costs, 3) health care quality is highly variable, and 4) no entity ensures investments needed to promote long-term health are undertaken.

As emphasized by Chernichovsky and Liebowitz (2008), the singular focus on expanding health insurance ignores the necessity to design a health system that integrates preventive care and population-wide health initiatives over the life course. There remains a significant imbalance between resources devoted to public and population health with those spent on personal medical care. For example, 95% of the trillion dollars we spend

on health goes to direct medical care services, while just 5% is allocated to population-wide health improvement (McGinnis et al., 2002). It has been estimated that roughly 10-15% of preventable mortality could be averted by better availability of and higher quality medical care. This suggests that a more substantial share of deaths are caused by exposures (and behaviors formed) earlier in the life course that could be modified by preventive interventions.

If we want to expand our investments in promoting health, thereby reducing the demand for spending to restore health, what types of public policy interventions show the most promise, and at what stage of the life cycle? The findings point to childhood as the most important stage of the life course, where policy initiatives to improve neighborhood conditions would be most effective for ameliorating health disparities and overall health in late life.

From a public policy perspective, we have allowed a mismatch to develop between the opportunity for positively influencing an individual's healthy development during childhood when they are most malleable and the other public investments we make in health services in later-stage adulthood. US health policy has traditionally been more rehabilitative in its approach to health promotion as opposed to preventative with targeted programs that address the socioeconomic neighborhood environments within which individual health differences over the life course may be better understood and more efficiently targeted. There may be critical periods early in life that represent windows of opportunity to affect neighborhood conditions that can have a profound impact on economic mobility patterns and health later in life. The research discussed here tests for differential effects of socioeconomic neighborhood conditions by life cycle

stage, and the results highlight childhood as a critical period in part because it sets the stage of the socioeconomic mobility process that has far-reaching impacts on later-life health.

Most current US health policies focus on individuals and families as the locus of intervention to improve population health, with a traditional emphasis on programs aimed at increasing access to health insurance and provision of medical care services. In the US we have traditionally appealed to medical care access to remedy what disadvantaged neighborhood and family environments produce.

The research findings underscore the potential for targeting neighborhood conditions as a means of improving population health and confronting health inequality. A shift in resources from expanding health care delivery expenditures at later ages into targeted disadvantaged neighborhoods at earlier stages of the life course may be a promising avenue to increase population health and reduce racial/ethnic health disparities.

Future research findings must help advance our understanding of the optimal ways to allocate resources between family-focused (access to medical care) and housing policy programs that improve population health and reduce health disparities. It is critical to examine whether society allocates resources in an optimal way across these two important health-improving policy levers. Unless the government spends in such a way that the marginal benefit (health improvement achieved from the last dollar spent) is the same for each activity, society will not be promoting population health in the most cost-effective manner. Neighborhoods research has promise to yield new insights that

may point to reallocating resources toward higher payoff approaches, which may increase health for a given level of expenditure.

Economic Policy & Housing Policy is Health Policy

Promoting good health cannot be the sole purview of the health care system. Many prevention initiatives depend upon policy changes that are outside the traditional health policy domain. Moreover, there is a targeting efficiency need to understand the geography of health, and a need to assess health impacts of policies outside of the health care sector (e.g., road building, the built environment, environmental toxins). Evaluation of housing policy on health has focused on factors related to the built physical environment (such as exposure to lead and air pollution), which has been widely recognized as tools to protect public health. However, housing mobility programs (e.g., Moving To Opportunity evaluation and Yonkers evaluation of scattered-site public housing), implemented as racial and economic desegregation policies, have been evaluated to a far lesser extent for their potential longer-run (unintended) beneficial health effects.

Federal, state, and local governments intervene in the housing market by providing, subsidizing, or constraining the purchase, location, or rental of housing in a variety of ways, including tax policy, zoning laws, and the provision of housing for low-income families. Mixed-income housing policies have been shown to help alleviate the geographic concentration of urban poverty. The verdict is still out on the potential for mixed-income housing development as a means of helping lift families in US inner cities out of poverty and improve their future health trajectories. We are particularly interested in trying to better articulate the possible health impacts of mixed-income developments

on low-income families. Why do we expect mixed-income neighborhood development to promote health, a higher quality of life and upward mobility for low-income families? How might specifying our expectations for the benefits of this strategy more clearly inform current policy debates on how best to invest in health for disadvantaged families?

Future research should work toward providing an empirical assessment of whether our current policy of increased reliance on medical interventions at later ages and declining use of social welfare and housing program spending at earlier stages of the life cycle is the best way to spend our health-promoting dollars. Targeted housing and income-support policy for the poor (to reduce high concentration neighborhood poverty) may be more cost-effective (at prevailing levels of expenditure) for improving population health than spending the same amount of funds on a (weak) health care delivery system.

How big are the health effects of income-support and housing policy targeted toward childhood conditions compared with effects of explicit health interventions? Future work should evaluate the cost and health-improving potential of housing and income-support programs, and attempt to set forth conditions under which a shift in resources from expanding health care delivery expenditures at later ages into targeted disadvantaged families and neighborhoods at earlier stages of the life course would lead to an increase in population health and reduction in racial/ethnic health disparities.

A policy based on evidence from research on the social determinants of health and that integrates housing and income-support policies at various stages of the life cycle would not just strengthen overall health status and the stock of human capital, but may also improve educational attainments, reduce income inequality, and promote economic growth. If we really want to reduce the economic and social costs of health disparities,

then we must confront its early roots—this chapter has summarized the accumulating recent research evidence that underscore the role of childhood family and neighborhood conditions.

In order to provide more specific policy prescriptions, we need a better understanding of the pathways through which neighborhoods and families affect health. If we are to design policies to reduce health inequalities, policies that operate through access to medical care—health insurance coverage—would be different than one that operated primarily through family income—income taxes, Earned Income Tax Credits, minimum wages—and would be quite different from a policy that works at the neighborhood level—through improving the quality of neighborhoods, housing, local hospitals schools in inner cities. Peer group effects, role model effects, and contextual-complementarity effects each represent distinct influences under the umbrella of neighborhood effects, and each has different policy implications. Disentangling the causal sources of neighborhood effects is extremely difficult (Manski, 1993; Moffitt, 1998), but the decomposition and investigation into the mechanisms of why neighborhoods matter are an important area for future research.

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