Published in final edited form as:
Soc Sci Res. 2011 January 30; 40(1): 87–106. doi:10.1016/j.ssresearch.2010.04.013.

SPATIAL AND TEMPORAL DIMENSIONS OF NEIGHBORHOOD EFFECTS ON HIGH SCHOOL GRADUATION

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Abstract

Research into the effects of neighborhood characteristics on children's behavior has burgeoned in recent years, but these studies have generally adopted a limited conceptualization of the spatial and temporal dimensions of neighborhood effects. We use longitudinal data from the Panel Study of Income Dynamics and techniques of spatial data analysis to examine how both the socioeconomic characteristics of extralocal neighborhoods—neighborhoods surrounding the immediate neighborhood of residence—and the duration of exposure to disadvantaged neighborhoods throughout the childhood life course influence the likelihood of graduating from high school. Among blacks and whites, socioeconomic advantage in the immediate neighborhood increases the likelihood of completing high school, but among whites higher levels of socioeconomic advantage in extralocal neighborhoods decrease high school graduation rates. Extralocal neighborhood advantage suppresses the influence of advantage in the immediate neighborhood so that controlling for extralocal conditions provides stronger support for the neighborhood effects hypothesis than has previously been observed. Exposure to advantaged neighborhoods over the childhood life course exerts a stronger effect than point-in-time measures on high school graduation, and racial differences in exposure to advantaged neighbors over the childhood life course help to suppress a net black advantage in the likelihood of completing high school.

Over the past several decades scholars from across the social sciences have begun focusing extensively on how characteristics of neighborhoods influence child, adolescent, and young adult behavior, giving particular attention to the social and economic consequences of growing up in a poor neighborhood. Indeed, research on "neighborhood effects" has rapidly become a multidisciplinary growth industry (for summaries, see Ellen and Turner 1997; Galster 2002; Gephart 1997; Ginther, Haveman, and Wolfe 2000; Leventhal and Brooks-Gunn 2000; Sampson, Morenoff, and Gannon-Rowley 2002). But while significant progress has been made in documenting the existence and nature of these effects, and in identifying

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some of the mechanisms that transmit them, the theoretical and empirical treatment of neighborhood spatial and temporal dynamics remains underdeveloped in key ways.

In the typical nonexperimental research design used to examine neighborhood effects on individual behavior, some objective characteristic of an individual's neighborhood measured at a single point in their life is linked to a behavior measured either contemporaneously or at a later point in time. For example, in a pioneering paper on this topic, Brooks-Gunn et al. (1993) use measures of neighborhood socioeconomic status experienced at age 14 to predict whether youth have dropped out of high school or had a child by age 20. We argue that this research design—and the conceptualization of neighborhood effects from which it draws—is potentially underdeveloped in two ways.

First, almost all research in the neighborhood effects literature views neighborhoods as isolated islands, completely divorced from their broader socioeconomic and geographic context. Studies of neighborhood effects on child and adolescent development rarely consider the ecological embeddedness of neighborhoods within the larger urban mosaic (Dietz 2002). Yet, youth are likely to interact with peers and institutions in nearby neighborhoods, and thus to be influenced by socioeconomic conditions outside of, but proximate to, their immediate neighborhoods (Sampson et al. 2002). Much of the effect of neighborhood conditions on youth behavior may be transmitted through school-based peer groups (Ainsworth 2002), but because most school catchment areas usually extend beyond the confines of single neighborhoods (most often operationalized as census tracts), sources of peer influence likely extend beyond these boundaries as well (Saporito and Sohoni 2006). But we know little about the role played by conditions in adjacent, proximal, or otherwise nearby neighborhoods in shaping children's social development. Studies of neighborhood-based crime and violence have begun to emphasize the influence of contiguous neighborhoods (e.g., Mears and Bhati 2006; Morenoff, Sampson, and Raudenbush 2001), but this concern has not extended to other outcomes routinely explored in the neighborhood effects literature.

Second, by measuring neighborhood characteristics at a single point in time, prior studies ignore the possibility that the duration of exposure to disadvantaged neighborhood conditions may influence subsequent behaviors. At a general level, the life-course perspective directs attention to the cumulative impact of experiences during the childhood years on later-life behaviors (Elder 1985; 1999). By focusing exclusively on neighborhood conditions experienced at a single age, rather than throughout the entire childhood life course, prior studies may have mischaracterized how neighborhood characteristics affect behavior in late adolescence and young adulthood.

In this paper we use geographically-referenced, longitudinal data from the Panel Study of Income Dynamics (PSID) to explore the spatial and temporal dimensions of neighborhood effects on a key event in the transition to adulthood—graduating from high school. We explore the spatial dimension of neighborhood effects by using techniques of spatial data analysis to examine how the socioeconomic status of "extralocal" neighborhoods–-those areas surrounding an individual's neighborhood of residence—affect the likelihood that PSID respondents will graduate from high school. We explore the temporal dimension of neighborhood effects by considering how the duration of exposure to disadvantaged conditions in both local and extralocal neighborhoods throughout the entire childhood life course affects the likelihood of graduating from high school.

We focus on neighborhood effects on high school graduation for several reasons. High school graduation, of course, is a critical precondition for economic success in later life (Rumberger 1987). More importantly for our purposes, among the panoply of adolescent and young adult behaviors that have been thought to be influenced by neighborhood conditions, educational attainment (or academic performance more generally) is one of the most thoroughly investigated (e.g., Ainsworth 2002; Brooks-Gunn et al 1993; Crane 1991; Crowder and South 2003; Duncan 1994; Duncan, Connell, and Klebanov 1997; Ensminger, Lamkin, and Jacobson 1996; Garner and Raudenbush 1991; Harding 2003; Sanbonmatsu et al. 2006, South, Baumer, and Lutz 2003; Vartanian and Gleason 1999). Estimating models of high school graduation that incorporate the spatial and temporal dimensions of neighborhood effects allows us to compare our findings with those of studies that omit these characteristics. Moreover, an effect of neighborhood conditions on educational attainment—and particularly high school graduation—is observed in most studies that attempt to control rigorously for unobserved confounders that might influence both neighborhood choice and educational attainment; these methodological approaches include instrumental variable techniques (e.g., Duncan et al. 1997), sibling fixed-effect models (Aaronson 1997), counterfactual models (Harding 2003), extensive controls for observable individual and family attributes (Ginther et al. 2000), and at least for some groups, quasi-experimental designs (Kling, Liebman, and Katz 2007, Orr et al. 2003). In contrast, neighborhood effects on the likelihood of attending college are observed less consistently, perhaps because college attendance is influenced more strongly by family economic resources (Plotnick and Hoffman 1999; South et al. 2003). These studies suggest, albeit by no means prove, that if neighborhood effects exist at all, they are likely to be found for high school graduation.

Exploring the Spatial Dimension of Neighborhood Effects

Jencks and Mayer (1990) describe several reasons why neighborhood socioeconomic conditions might influence children's behavior. Three of these theoretical models imply that greater exposure to disadvantaged neighbors (or lesser exposure to advantaged neighbors) impairs children's social development. Epidemic or contagion models emphasize the influence of peers (Crane 1991). According to this model, growing up in a poor neighborhood diminishes children's educational attainment because their friends and peers devalue education and spread these attitudes throughout the neighborhood. Collective socialization models of neighborhood effects emphasize the influence of nonparental adults. Socioeconomically disadvantaged adults fail to provide successful role models for neighborhood children (Wilson 1987, 1996). The presence of advantaged neighbors, in contrast, reinforces "the perception that education is meaningful, that steady employment is a viable alternative to welfare, and that family stability is the norm, not the exception" (Wilson, 1987:56). Although research on the mechanisms linking neighborhood socioeconomic status to children's education outcomes is still developing, the attitudes and behaviors of peers are emerging as pivotal mediators of neighborhood effects, consistent with epidemic models (Ainsworth 2002; South and Baumer 2000; Turley 2003).

Institutional models emphasize the behaviors and attitudes of adults with whom young people come into contact in local institutions. With regard to educational outcomes, the characteristics of schools serving the neighborhood of residence might be especially important. An institutional model would anticipate that children in poor neighborhoods are more likely than children from wealthier neighborhoods to drop out of school because, among other reasons, lower-SES schools have fewer resources to meet students' diverse needs, are staffed by less motivated and poorly trained teachers, receive less support from parents, and are characterized by low collective educational expectations and school attachment (Jencks and Mayer 1990; Lee and Burkham 2002; Wilson 1996). While past research presents a mixed picture of the effects of teacher training, student-teacher ratio, and other factors related to school financing (Hanushek 1996; Hedges, Laine and Greenwald 1994), there is clearer evidence that the composition of the student population of schools affects educational outcomes. Krieg and Storer (2006), for example, find that the concentration of students from higher status families significantly increases school performance levels, exerting a more important influence than objective measures of school quality. Similarly, Perreira, Harris, and Lee (2006) find that characteristics of the student body, including the proportion of students who expect to earn middle-class incomes and the proportion involved in school activities, significantly influence the risk of dropping out, independent of the effects of family- and individual-level characteristics. Moreover, these school characteristics are a key mechanism through which neighborhood socioeconomic conditions influence educational outcomes (Ainsworth 2002; Perreira et al. 2006).

Although epidemic, collective socialization, and institutional models of neighborhood effects suggest that exposure to high levels of contextual advantage increase adolescents' likelihood of completing school, Jencks and Mayer (1990) also describe several theoretical models suggesting that exposure to more advantaged neighbors may have *negative* outcomes for children. Relative deprivation models posit that individuals, including children, assess their own social and economic standing in comparison to those around them. Lower SES children, who tend to do worse in school than higher SES children, may evaluate their own abilities and academic performance more favorably when they are surrounded by similarly low SES peers than when they are surrounded by, and presumably out-performed by, higher SES classmates and neighbors (Turley 2002). Competition for good grades, for example, will be fiercer in higher SES schools and neighborhoods than in their lower SES counterparts. In turn, children who assess their own abilities negatively may be more likely to drop out of school. Similarly, cultural conflict theories also suggest that disadvantaged neighbors may be a benefit, and advantaged neighbors a liability, for children's educational attainment. Jencks and Mayer (1990) suggest that deviant subcultures, including those that devalue education as a meaningful route to adult success, are likely to develop in settings where failure and success are distributed unevenly. Greater exposure to successful advantaged neighbors may induce the formation of a subculture that devalues normatively prescribed behaviors. In somewhat indirect support of these models, a few studies show that blacks' educational aspirations are lower in schools with proportionally more white students (Frost 2007; Goldsmith 2004).

These theoretical arguments focus on the socioeconomic characteristics of residents and institutions in the immediate neighborhood but, as Sampson et al. (2002: 469) have noted, "adolescents occupy many different neighborhood contexts outside the home, especially in the company of peers." Thus, it is instructive to consider the implications of these theoretical models for the possible impact of extralocal "neighbors" — peers, adults, and institutions outside of the focal neighborhood of residence but who nonetheless interact with children in that neighborhood. One possibility is that the effects of socioeconomic conditions in extralocal neighborhoods on children's educational attainment simply mimic and reinforce those of conditions in the immediate neighborhood. To the extent that patterns of social interaction extend outside of the neighborhood of residence, high levels of advantage in extralocal areas may provide adolescents with exposure to, and reinforcement of, pro-education norms that increase their likelihood of completing school. From an institutional perspective, extralocal effects may arise because school catchment areas often extend beyond the boundaries of a single neighborhood so that the social interactions and opportunity structures characterizing the school are affected by this broader geographic area. Following these arguments, advantaged conditions in extralocal neighborhoods might spill over into the immediate neighborhood, exerting parallel positive influences on children's educational attainment, even controlling for conditions in the immediate neighborhood. In this sense, past research may have simply focused on an inappropriately small geographic scale in delineating the social context relevant to young people's educational progress. Indirect support for this hypothesis comes from Cutler and Glaeser (1997) and Mayer (2002), who show that racial and economic segregation in metropolitan areas is inversely related to minorities' educational attainment. Moreover, given that geographically contiguous neighborhoods are generally similar in socioeconomic status (i.e., they exhibit positive spatial correlation), it is possible that some of the typically observed influence of socioeconomic conditions in the immediate neighborhood is instead attributable to the influence of socioeconomic characteristics of adjacent or otherwise proximate neighborhoods (e.g., Morenoff 2003; Sampson et al. 1999).

It is also possible, however, that local and extralocal areas represent separate social spheres in which different processes operate to affect adolescent outcomes. As noted above, prior studies of the impact of socioeconomic status in the immediate neighborhood on educational outcomes generally find that greater exposure to disadvantaged neighbors hinders educational attainment and greater exposure to affluent neighbors improves these outcomes. Thus, if processes of relative deprivation, competition, and cultural conflict operate at all, they would appear to be overwhelmed by the mechanisms identified by epidemic, collective socialization, and institutional models of neighborhood effects. However, processes of relative deprivation, resource competition, and cultural conflict may be more likely to emerge for extralocal neighbors. Peers and institutions in these proximate communities may not be close enough—socially or geographically—to transmit education-related values to children in the focal neighborhood, but they may be close enough to serve as comparison groups for perceptions of relative deprivation or to create competition for scarce educational resources. Similarly, given that school catchment areas typically encompass multiple neighborhoods, the characteristics of extralocal areas may affect the composition of children's schools and the nature of social interactions therein, while the local neighborhood more effectively circumscribes the patterns of interaction and socialization occurring outside of school. Under these conditions, population characteristics in local and extralocal areas may exhibit opposite effects on the likelihood of completing school. For example, relative deprivation theory suggests that children residing in poor areas but attending schools in which classmates are drawn from a broader set of more advantaged neighborhoods may assess their own neighborhoods and prospects for educational attainment as especially limited. The resource-competition perspective suggests that when poor neighborhoods and schools are surrounded by comparatively well-off neighborhoods and schools, these relatively affluent areas may siphon off resources—e.g., school funding, better teachers, instructional technologies, involved parents—that would otherwise have improved the educational experience of students in disadvantaged neighborhoods. Thus, rather than simply reinforcing the positive influence of advantaged immediate neighbors on children's educational attainment, socioeconomic advantage in extralocal communities may have the opposite effect, reducing children's educational attainment through processes of relative deprivation, competition, and cultural conflict. And, given the positive spatial autocorrelation of neighborhood SES, it is possible that socioeconomic advantage in proximate neighborhoods may suppress the influence of socioeconomic advantage in the immediate neighborhood. That is, controlling for socioeconomic conditions in extralocal neighborhoods could strengthen the positive effect of advantage in the immediate neighborhood on children's educational attainment. Our analysis offers a spatial perspective on the mechanisms linking exposure to advantaged neighbors to children's educational attainment by distinguishing the influence of the socioeconomic status of immediate neighbors from the socioeconomic status of extralocal neighbors. This is an endeavor for which some common sources of data are poorly suited. For example, while Sampson (2008) finds significant differences in the conditions of the immediate neighborhoods experienced by the treatment and control groups in the Moving to Opportunity experiment, he finds little variation in the conditions of surrounding neighborhoods, limiting any efforts to explore potentially important, and perhaps countervailing, influences of this broader geographic context.

Theories guiding research into the effects of neighborhood conditions imply not only additive effects of local and extralocal conditions; they also suggest interactive effects in which the impact of conditions in the immediate neighborhood may be modified by conditions in surrounding areas. Wilson (1987) argues that the geographic concentration of poverty alters the normative and social structure of a neighborhood, further reinforcing the problems endemic to poor neighborhoods and exacerbating the consequences of family poverty. A neglected implication of this argument is that the impact of neighborhood disadvantage on residents' behavior may be exacerbated by location near similarly distressed areas. Geographically concentrated disadvantage is implicated in the social isolation of ghetto residents from others who might facilitate their status attainment, perhaps through connections to employment and educational opportunities or, more perniciously, by isolating these residents from mainstream cultural values. The presence of affluent residents, more stable institutions, and stronger normative environments in proximal areas may help compensate for low levels of socioeconomic advantage in the immediate neighborhood. In contrast, youth living in distressed areas that are surrounded by similarly disadvantaged neighborhoods are less likely to gain access to these beneficial resources even if they do maintain social contacts and activities outside of their immediate neighborhood. Living near distressed areas may undermine social control and collective socialization processes that encourage conventional life course trajectories, thereby counteracting relative neighborhood advantage in the immediate neighborhood (Pattillo 1998). These arguments thus suggest that the level of economic advantage in the neighborhood of residence interacts positively with the level of advantage in adjacent areas to influence the risk of early school exits.

Incorporating the socioeconomic conditions of extralocal neighborhoods into models of neighborhood effects may also have implications for explaining the pronounced racial difference in youth educational attainment. The geographic concentration of poverty is more pronounced among African Americans than among whites (Massey and Denton 1993). Jargowsky (1997; 2003) shows that census tracts inhabited by poor blacks are not only more likely than those inhabited by poor whites to have high concentrations of poor residents, but they are also more likely to be surrounded by similarly disadvantaged neighborhoods. As described in ethnographic work by Mary Patillo (1998, 2000), even middle-class blacks tend to reside in areas in close proximity to poor neighborhoods. Thus, blacks are not only less likely than whites to encounter peers who value education, successful adult role models, and strong institutions within their immediate neighborhood, they are less likely than whites to experience such conditions as they venture into, or otherwise encounter residents of, adjacent areas. Consistent with this line of reasoning, Sampson et al. (2002) argue that studies focusing only conditions in the immediate story may underestimate the disadvantage faced by blacks by ignoring their proximity to disadvantaged areas.

Prior studies show that racial differences in background social, demographic, and economic characteristics explain much if not all of the racial difference in high school completion. Indeed, some studies find a net black advantage in high school graduation rates and other educational outcomes once other factors are controlled (Bennett and Xie 2003; LaVeist and McDonald 2002). We suggest that racial (black-white) differences in exposure to socioeconomic disadvantage in extralocal neighborhoods may further suppress this net black advantage, such that controlling for the socioeconomic conditions of extralocal neighborhoods will reveal an even larger black advantage in rates of high school graduation.

Exploring the Temporal Dimension of Neighborhood Effects

Another possible limitation to the typical research design used to examine neighborhood effects on individual behavior is its reliance on point-in-time measures of neighborhood characteristics. To be sure, some studies use as the key explanatory variables average values of neighborhood conditions over fairly short age ranges (e.g., Ginther et al 2000; Harding

2003), but few if any studies explore the effects of neighborhood advantage or disadvantage experienced over the entire childhood life course. We know that early childhood events and experiences can influence educational attainment even controlling for later-life circumstances (Haveman, Wolfe, and Spaulding 1991). All else equal, we would expect that prolonged exposure to disadvantaged neighborhoods would more strongly influence later-life conditions than fleeting exposures. At least implicitly, collective socialization and institutional theories of neighborhood effects presume that the longer the exposure to adverse socioeconomic conditions, the worse the outcome for children, while relative deprivation, resource competition, and cultural conflict theories presume better outcomes for those experiencing long-term exposure to neighborhood disadvantage. Some observers have suggested that one reason why only weak effects of neighborhood characteristics are occasionally observed in these studies is that the typical research design fails to consider the duration of exposure to neighborhood poverty over the entire childhood life course (Timberlake 2007; Turley 2003). Clampet-Lundquist and Massey (2008: 139) argue that because the influence of neighborhood context is likely to accrue over time, “when modeling neighborhood effects it is critically important to measure the cumulative time spent in different kinds of environments” (Clampet-Lundquist and Massey 2008: 139). While studies of the effects of family poverty have begun to examine the effects of cumulative exposure to disadvantaged conditions (Wagmiller, Lennon, Kuang, Alberti, and Aber 2006), studies of neighborhood effects have generally not kept pace in this regard.

Two studies, primarily of a methodological nature, have addressed this possible “window” problem (Wolfe, Haveman, Ginther, and An 1996) in the measurement of neighborhood socioeconomic conditions. Kunz, Page, and Solon (2003) examine year-to-year correlations between measures of neighborhood income and find that point-in-time measures are reasonable proxies for measures of children’s long-run neighborhood environments. Jackson and Mare (2007) reach a generally similar conclusion, finding that averaged measures of neighborhood poverty over a five-year span yield similar effects on children’s problem behavior and mathematics achievement scores as point-in-time measures. Both studies, however, focus on relatively short time frames for measuring neighborhood characteristics. Over the entire childhood life course, there is likely to be greater intra-individual variation in neighborhood conditions both because individuals will have had more time to move to a different neighborhood with a different socioeconomic status and because neighborhoods themselves will have had a longer time to experience a change in their socioeconomic conditions. Moreover, by comparing the effects of temporal averages with single year estimates of neighborhood conditions, neither study addresses directly whether longer durations of exposure are more detrimental (or more beneficial) than shorter durations to children’s development.

Similar to our arguments involving the spatial dimension of neighborhood effects, incorporating the temporal dimension may have implications for explaining racial differences in high school completion. Like black adults (Quillian 2003), black children spend a much greater portion of their childhood in poor neighborhoods compared to their white counterparts (Timberlake 2007). And, racial differences in the cumulative exposure to poor neighborhoods over the childhood life course are greater than racial differences at any single point in time (Timberlake 2007). Thus, incorporating racial differences in the cumulative exposure to disadvantaged neighborhoods throughout the childhood life course may alter the observed net racial difference in high school graduation rates. Specifically, we anticipate that controlling for the duration of exposure to disadvantaged neighborhoods will reveal or increase blacks’ net advantage over whites in the likelihood of graduating from high school.

Finally, it is likely that the effects on high school completion of neighborhood advantage and the duration of exposure to disadvantaged neighborhoods differ between blacks and whites and between females and males. Absent compensating resources, especially from families, blacks may be more vulnerable than whites to even short-term exposures to low-advantage neighborhoods. In contrast, whites may be influenced by disadvantaged neighborhood conditions only when they have been exposed to them for a fairly lengthy portion of their lives. Prior research on racial differences in the effects of neighborhood socioeconomic status on educational outcomes has yielded inconsistent findings. For example, Dornbusch et al. (1991) and Crowder and South (2003) find stronger effects of neighborhood characteristics on educational outcomes for blacks than for whites, but Brooks-Gunn et al. (1993) and Halpern-Felsher et al. (1997) find the opposite pattern. Existing research also highlights potentially important gender differences in the effects of contextual conditions. Some evaluations of the Moving to Opportunity experiment find significant effects of neighborhood context on educational outcomes only for young women (Kling, Liebman, and Katz 2007; Sampson 2008). Similarly, Crowder and South (2003) find that neighborhood distress exerts a significantly stronger effect on the risk of dropping out for young women than for young men, a finding attributed to possible gender differences in the scope, content, and utility of social networks. None of these studies, however, considers characteristics of extralocal areas or how the duration of exposure to neighborhoods with low levels of socioeconomic advantage throughout childhood and adolescence might differentially shape educational outcomes for different racial and gender groups.

In sum, prior studies of neighborhood effects on youth outcomes have adopted rather limited conceptualizations of the spatial and temporal dimensions of these effects. We expand on these conceptualizations by examining the influence of the socioeconomic status of extralocal neighborhoods and by considering the duration of exposure to disadvantaged neighborhoods throughout the entire childhood life course. We pay special attention to how the socioeconomic characteristics of extralocal neighbors influence the likelihood of graduating from high school, and how these characteristics moderate the influence of the socioeconomic characteristics of the immediate neighborhood. We also examine how incorporating spatial and temporal dimensions of exposure to disadvantaged neighborhoods alters the observed racial (black-white) difference in the likelihood of graduating from high school. And, we explore possible racial and gender differences in the effects of exposure to disadvantaged neighbors over the childhood life course.

DATA AND METHODS

Our primary source of data for this analysis is the Panel Study of Income Dynamics (PSID), a well-known longitudinal survey of U.S. residents and their families (Hill 1992). Starting in 1968, members of the initial panel of approximately 5,000 families were interviewed annually until 1997 and biennially thereafter. New families have been added to the panel as children and other members of original panel families form their own households. Sample attrition has been modest, especially in more recent years, and has not compromised the representativeness of the sample (Duncan and Hill 1989). The PSID was one of the first sources of data used to study contextual effects on socioeconomic attainment (Corcoran et al. 1992; Dachter 1982) and remains one of the most widely used in studies of neighborhood effects on adolescent and young adult behavior, including educational outcomes (e.g., Brooks-Gunn et al. 1993; Crowder and South 2003; Harding 2003). As described below, we append data from four decennial U.S. censuses (1970 to 2000) to the PSID sample members' individual records to capture the socioeconomic conditions of the immediate and proximate neighborhoods that they experienced throughout their childhoods.

Sample selection

We select all black and white PSID participants who were born between 1968 and 1980.[1] This strategy allows us to follow even the youngest members of our sample through the last available wave of PSID data in 2005—a full 25 years. When we last observe these respondents in 2005, they are between the ages of 25 and 37. Following Wagmiller et al. (2006), we further select individuals for whom valid information was collected for at least nine of the years between ages 0 and 18 and for whom educational attainment at age 25 was known. These selections results in an effective sample of 2,254 individuals, 953 of whom are black and 1,301 of whom are white.

Dependent Variable

Our dependent variable is a binary indicator of whether the PSID participant had ***graduated from high school*** or received a GED by age 25 (1 = yes; 0 = no).

Measuring Local Neighborhood Advantage

Following most prior research in this area, we use census tracts as our approximation of neighborhoods. Adopting a geographic standard similar to that in past neighborhood-effects research enhances the comparability of our study and allows us to more effectively assess the effects of incorporating information about the temporal and spatial dynamics of these neighborhood effects. Moreover, census tract data are readily available for the entire country and for multiple points in time which is crucial given our use of longitudinal data collected from a national sample of individuals. However, it is important to note that the reliance on tract data has potentially important drawbacks. As Lee and his colleagues (2008) point out, census tracts vary in geographic size both within and between metropolitan areas and may not correspond well with either individual definitions of neighborhoods or the geographic scope of actual neighborly interactions. As a result, our results may reflect fairly rough estimates of the effects of local and extralocal context on individual behavior. Although national data on socially-defined neighborhoods are not available, the use of such data might reveal stronger linkages between contextual characteristics and individual outcomes (Hipp 2007).

Tract-level census data are drawn from the Neighborhood Change Data Base (NCDB), in which data from earlier censuses (1970, 1980, and 1990) have been normalized to 2000 tract boundaries, allowing us to produce consistent, time-varying measures of neighborhood context (GeoLytics 2008).[2] Studies in this genre acknowledge that no single indicator can capture fully the concept of neighborhood socioeconomic status (Duncan et al. 1997). Accordingly, our measure of socioeconomic conditions in the neighborhood is a standardized, multi-item index consisting of the following variables: the percentage of families in the tract with high incomes (more than $15,000 in 1970, more than $30,000 in 1980, more than $50,000 in 1990, and more than $75,000 in 2000), the percentage of residents age 25 and over with a college education, the percentage of workers employed in managerial or professional occupations; the percentage of the tract population made up of individuals residing in families with incomes above the federal poverty threshold; the percentage of families not receiving public assistance; and the percentage of working-age men who are in the labor force and employed. Each item is standardized in order to equalize

[1]Members of other racial and ethnic groups are either represented in too few numbers or not followed long enough by the PSID to warrant inclusion in this analysis.

[2]The use of data smoothing procedures to match data from earlier censuses to 2000 geography could produce variation in the correspondence between local and extralocal conditions for cases with contextual information based on different sets of census data. Results of sensitivity tests indicate a fairly consistent statistical link between local and extralocal conditions, and similar effects of these variables on school completion, for members of the birth cohorts represented in our analysis.

their weight in the creation of the additive index. This measure has high internal reliability and parallels those used in prior studies of neighborhood effects (e.g., South and Crowder 1999).[3]

Scores on the index for each tract are computed separately for each year. We use piecewise linear interpolation, fitting a straight line between data values from consecutive censuses to estimate scores on the index for non-census years. We then attach the (estimated) value of this ***Local Neighborhood Advantage Index (LNAI)*** to the records of the PSID respondents according to their tract of residence at each age from 0 to 18. In order to ease interpretation, the final index for each age is standardized so that a score of zero on the index indicates a level of advantage equal to the average across all tracts experienced by the members of the sample during the given age, and a one-unit change refers to a difference of one standard deviation from that average level of advantage.

Measuring Extralocal Neighborhood Advantage

To measure the level of socioeconomic advantage in extralocal neighborhoods, we compute a spatially weighted average version of the neighborhood advantage index for the tracts surrounding the tract of residence. Following Downey's (2006: 570) argument that spatial dependence tends to decline with distance, we employ a spatial-weighting strategy in which the influence of conditions in an extralocal tract on high school graduation is assumed to be inversely related to the distance of the extralocal tract from the individual's tract of residence. Specifically, this distance-decay strategy utilizes a spatial weights matrix with elements defined as $w_{ij} = 1/d_{ij}$ where d_{ij} is the geographic distance between the centroid of the tract of residence (i) and the centroid of the extralocal tract, j. [4] Given the implausibility that the socioeconomic characteristics of every tract in the nation directly affect the decisions of residents in all other tracts, we constrain to zero the influence of tracts that are more than 100 miles away from the focal tract.[5] The spatial weight relating a tract to itself (w_{ii}) is set to 0 so that the characteristics of the tract of residence are not included in the calculation of extralocal conditions. By convention, the weights matrix is row standardized so that the elements of each row sum to one and the extralocal characteristics can be easily interpreted as the weighted average of values of key characteristics in potentially influential extralocal tracts (Anselin 1988; 2001). The spatial weights are applied to the values of each of the six indicators of tract socioeconomic conditions for each year and these annual weighted components are combined to create the ***Extralocal Neighborhood Advantage Index (ENAI)*** for each observation year. Values of the ENAI are attached to the records of the PSID respondents at each age from 0 to 18 and standardized so that a score of zero indicates a level of advantage in spatially weighted surrounding areas equal to the average

[3]As reviewed above, some theoretical arguments stress the importance of exposure to poor neighbors while others emphasize exposure to more advantaged populations. The Neighborhood Advantage Index includes components related to both. Analyses utilizing individual components, including local poverty, joblessness, and neighborhood median income, all produce results that are generally similar to those obtained from the index.

[4]We compared the inverse-distance weighting strategy to results using several alternatives, including: 1) a strategy in which spatial weights were defined as the inverse of squared distance between census tracts so that more distant extralocal tracts are presumed to be even less influential relative to nearby tracts; 2) a strategy in which spatial weights are an inverse function of logged distance so that distant tracts exert more influence on extralocal measures; and 3) an adjacent-tracts approach in which w_{ij}=1 when tracts i and j share a common border and w_{ij}=0 otherwise. The first two strategies generated very similar results to the inverse-distance scheme reported in the text, but the adjacent-tracts approach yielded weaker findings. These differences suggest that characteristics of tracts beyond adjacent tracts impact high school graduation rates in the focal tract. In addition, we tested models in which all tracts within the metropolitan area (or county for non-metropolitan residents) received a weight of 1, and models in which measures of extralocal conditions were replaced with comparable metropolitan-area characteristics. Both strategies produced results that are substantially weaker than those described in the text, confirming that the observed effects of extralocal neighborhood characteristics do not simply reflect the influence of the broader metropolitan context.

[5]Even without this constraint, spatial weights determined by inverse distance are quite small beyond distances of about 10 miles. Consequently, conditions in nearer tracts, where extralocal social interactions are likely to be most common, dominate the measures of extralocal conditions.

extralocal socioeconomic advantage experienced by sample members at a given age. A key advantage of this approach to constructing measures of extralocal conditions is that we are able to specify separate effects of local and extralocal neighborhood socioeconomic conditions; the spatially-weighted ENAI is treated as a separate contextual characteristic with possible additive and interactive effects on the likelihood of graduating from high school.

Measuring Exposure to Advantaged Neighborhoods over the Childhood Life Course

We compute several measures of the PSID respondents' cumulative exposure to (dis)advantage in their immediate neighborhood and to (dis)advantage in their extralocal neighborhoods over the childhood life course. First, extending the work of others (Jackson and Mare 2007; Kunz et al. 2003), we compute the average level of the LNAI that the respondents experienced from ages 0 to 18. Values on this variable are determined both by the *level* of neighborhood advantage experienced in each year and by the *duration* of exposure to advantaged areas over the childhood years. We compare the effect of this variable to the more common strategy of measuring the LNAI experienced at age 14. Second, and analogously, we compute the average level of the Extralocal Neighborhood Advantage Index (ENAI) experienced between ages 0 and 18. Third, we compute the proportion of years from ages 0 to 18 that a respondent lived in a neighborhood with a high level of *disadvantage* (a LNAI score more than one standard deviation below the mean for all tracts in that year) and the proportion of years spent in a neighborhood with an extreme level of *disadvantage* (a LNAI score more than two standard deviations below the mean). Applying these standardized thresholds for the level of disadvantage in each year provides purer duration measures with which to determine whether and, if so, how high school graduation responds to *prolonged* exposure to disadvantaged neighborhoods.

Control variables

Following much prior work on neighborhood effects (e.g., Brooks-Gunn et al. 1993), we control for several individual and family characteristics that might be related to both neighborhood socioeconomic status and the likelihood of graduating from high school. ***Race*** is a dummy variable scored 0 for whites and 1 for blacks. ***Sex*** is a dummy variable scored 0 for males and 1 for females. Secular trends in high school graduation are captured by a continuous variable for ***year of birth***. Younger individuals thus receive higher scores than older individuals on this measure of birth cohort. ***Family income*** is the average family-to-needs ratio computed over ages 0 to 18. ***Parental educational attainment*** is measured by a dummy variable scored 1 for sample members whose family head (most often the father) had completed college by the time the sample member was age 14. ***Childhood family structure*** is measured by the proportion of childhood years in which the individual's family was headed by a female (most often the mother). Because frequent ***residential mobility*** has been shown to hinder educational attainment (Hagan, MacMillan, and Wheaton 1996), we also include as a control the proportion of childhood years in which the respondent moved between census tracts.[6]

These individual- and family-level controls are included to help isolate the effects of contextual conditions on the likelihood of completing high school. The assumption here is that these controls not only represent important potential sources of spuriousness in their

[6]For those respondents born before 1970, the estimates of residential mobility are biased downward by the absence of geocoded addresses for the 1969 interview year. Similarly, it is possible to detect inter-tract mobility only across two-year intervals after 1996 because the PSID moved to a biennial interview schedule in these years. Thus, the inter-tract mobility figures for the relatively few individuals who turned 18 after 1997 are likely to underestimate the actual frequency of moves. These biases are largely corrected by controlling for the individuals' year of birth. Sensitivity checks using two-year intervals to measure the frequency of inter-tract mobility across the entire period of the data produce results that are virtually identical to those reported here.

own right but also help to account for the effects of other correlated factors, including parental behavior and emotional conditions, that may be associated with both neighborhood selection and adolescent development, but that remain unobserved in the PSID and most other sources of data. Our basic strategy for accounting for possible endogeneity of neighborhood effects is supported by recent research showing that direct controls for typically uncontrolled psychosocial factors contribute little to the explanation of neighborhood selection over and above the effects of race, parental education, and family income (Sampson and Sharkey 2008). Thus, following Sampson and Sharkey's (2008) recommendation and Sampson's (2008) warning about included-variable bias, we have opted to include only the most conceptually and statistically important controls in the models reported below.[7]

Analytical Strategy

We use logistic regression to examine the impact of socioeconomic disadvantage in the immediate and extralocal neighborhoods experienced during the childhood life course on the likelihood of graduating from high school. We estimate models with various point-in-time and cumulative measures of exposure to neighborhood advantage to determine the sensitivity of findings to the life course time frame captured by these measures. We add spatially lagged measures of neighborhood advantage to determine whether the likelihood of graduating from high school responds to extralocal socioeconomic conditions, net of any response to socioeconomic conditions in the immediate neighborhood. We estimate models with and without the spatially-lagged and duration-of-exposure measures to determine if they suppress racial differences in the likelihood of graduating from high school. And we incorporate the relevant product terms in these models to determine whether the impact of advantage in the immediate neighborhood is moderated by conditions in surrounding areas.

RESULTS

Table 1 presents descriptive statistics for all variables used in the analysis for the pooled sample and separately for the black and white PSID respondents. Immediately apparent is the pronounced racial difference in the likelihood of having graduated from high school. Among PSID whites born between 1968 and 1980, 91% graduated from high school by age 25; in contrast, only 82% of the PSID African Americans in this cohort are high school graduates ($p < .001$).[8]

Sharp racial differences also exist in exposure to advantaged neighbors in both local and extralocal neighborhoods. At age 14, the mean of the Neighborhood Advantage Index in the immediate neighborhood (LNAI) for blacks is -.628, indicating a level of neighborhood advantage almost two-thirds of a standard deviation below the average for the entire sample. In contrast, the comparable figure for whites is .460, nearly one-half of a standard deviation

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[7]We also assessed potential omitted-variable bias in two other ways. First, we experimented with models that included other potential sources of spuriousness, including welfare receipt, the employment history of the household head, and the number of children in the family. None of these variables proved to be significant predictors of school completion net of the effects of other variables already in the model and their inclusion tended to increase the risk of multicollinearity. More importantly, the inclusion of these additional controls did not change the pattern of local and extralocal neighborhood effects noted in the analysis below. Second, as in other recent studies (e.g., Clampet-Lundquist and Massey 2008; Ludwig et al. 2008) we also employed an instrumental-variable approach, using an instrument originally proposed by Gottschalk (1995) and used by Duncan et al. (1997) measuring the residential context of the household head after all children had left the household. We found that, despite the reliance on a smaller and non-random sub-sample for whom the instrument is available and the possible introduction of multicollinearity in the two-stage procedure (Maddala 1983), the results of the instrumental-variable models are consistent with the results reported below. Thus, it does not appear that the effects of contextual conditions reported in our analysis reflect the impact of omitted variables.

[8]These figures are comparable to the figures from the U.S. Census, although the census data do not include those who completed a GED. About 88% of whites and 81% of blacks age 25–34 at the time of the 2000 census had attained a high school diploma (U.S. Census Bureau, 2008).

above the overall mean. A slightly larger racial difference is observed for the average LNAI over the childhood life course. The mean LNAI averaged over ages 0 to 18 is −.723 for blacks and .530 for whites.

Given these differences, it is not surprising that racial differences also exist in the proportion of the childhood years spent in a disadvantaged neighborhood (i.e., a neighborhood with a LNAI more than one standard deviation below the mean for that year). Only 12% percent (1 − .878 = .122) of whites spent any of their childhood years in a disadvantaged neighborhood using this criterion, and only 6% spent more than one-quarter of their childhood in a disadvantaged neighborhood. Among blacks, in contrast, about 80% (1 − .209 = .791) spent at least some portion of their childhood in a disadvantaged neighborhood and over half spent more than one-quarter of their childhood in such a neighborhood. Perhaps most telling, almost 17% of blacks in this cohort spent their entire childhood in a socioeconomically disadvantaged neighborhood. Racial differences in exposure to *extremely* disadvantaged neighborhoods are even more pronounced. Almost 40% of blacks, but only 1.3% of whites, spent some of their childhood years in neighborhoods with socioeconomic advantage scores at least two standard deviations below the mean. And, while a full 6% (.046 +.018=.064) of blacks lived in areas with extremely low socioeconomic advantage for more than three-fourths of their childhood years, we observe no whites who experienced this duration of exposure to extreme local neighborhood disadvantage.

Pronounced racial differences appear for the levels of socioeconomic advantage in extralocal neighborhoods as well. At age 14, the mean Extralocal Neighborhood Advantage Index (ENAI) is −.438 for blacks and .321 for whites. The average of the ENAI experienced over the childhood years is −.495 for blacks and .363 for whites.[9] Thus, in comparison to whites, black sample members not only tend to reside in neighborhoods with substantially lower levels of socioeconomic advantage and experience longer spells in disadvantaged neighborhoods, they are also typically surrounded by neighborhoods with much lower levels of advantage.

Racial differences also emerge in the family background variables. The average family income-to-needs ratio over the childhood years for the white respondents (2.78) is almost double that of the black respondents (1.44). Over a quarter of the white family heads had completed college, compared to only 5% of the black family heads. Blacks spent on average 41% of their childhood years in a family headed by a female; whites spent only slightly more than 10% of their childhood years in a female-headed family. The black respondents experienced slightly greater inter-neighborhood residential mobility than the white respondents.

Table 2 presents the results of a series of logistic regression models examining how exposure to advantaged neighbors in both the immediate neighborhood and extralocal neighborhoods influences the likelihood of graduating from high school. Model 1 is a baseline model that includes as predictors only the individual demographic and family background variables. For the most part these potential determinants of high school graduation operate as anticipated. Females are significantly more likely than males to graduate from high school. The family income-to-needs ratio (averaged over the childhood years) and the family head’s educational attainment are both positively and significantly related to high school graduation. More frequent residential mobility is inversely associated with high school graduation. Once the other determinants are controlled, neither the respondent’s race nor the proportion of childhood years spent in a female-headed family is

[9]At age 14, the mean poverty rates for extralocal areas are 18.00 for blacks and 13.02 for whites. The corresponding extralocal poverty rates averaged over ages 0 to 18 are 17.29 and 12.42.

significantly associated with the odds of completing high school, and there is no evidence of a net trend in high school completion as indicated by the non-significant coefficient for year of birth.

Model 2 of Table 2 adds as a predictor variable the Local Neighborhood Advantage Index measured for respondents when they were age 14. This model is thus typical of the conventional nonexperimental strategy for examining the impact of neighborhood socioeconomic status on children's outcomes. Consistent with much prior research in this area, the coefficient for the Neighborhood Advantage Index is positive and statistically significant ($b = .245$, $p < .01$) indicating that exposure to higher levels of socioeconomic advantage in the immediate neighborhood are associated with greater odds of graduating from high school. Moreover, controlling for the Local Neighborhood Advantage Index causes the coefficient for Black race, which had been positive but non-significant in Model 1, to become statistically significant. Racial differences in neighborhood socioeconomic conditions, then, tend to suppress the net black advantage in high school graduation.

Model 3 substitutes for the Local Neighborhood Advantage Index measured at age 14 the average Local Neighborhood Advantage Index experienced during the childhood years. The coefficient for this variable is also positive and statistically significant, and it is about 25% larger than the coefficient for the Local Neighborhood Advantage Index measured at age 14. A one-standard deviation increase in the average level of socioeconomic advantage experienced during childhood increases the odds of completing school by about 36% ($e^{.307} = 1.359$), whereas a one standard-deviation increase in the LNAI at age 14 increases these odds by 28% ($e^{.245} = 1.278$).[10] Thus, although exposure to advantaged neighbors at age 14 is a reasonable proxy for exposure to advantaged neighbors over the childhood life course, moderately stronger effects of neighborhood socioeconomic conditions on high school graduation are observed when exposure to advantaged neighbors over the entire childhood life course is considered. Exposure to advantaged neighbors over the entire childhood life course is also a stronger suppressor of the net black advantage in high school graduation. The net black advantage in the odds of high school graduation is about one-fifth larger ($b = .506$ in Model 3) when exposure to advantaged neighbors over the entire childhood life course is controlled, compared to controlling for only the LNAI at age 14 ($b = .414$ in Model 2).

Model 4 of Table 2 adds to Model 3 the spatially-lagged measure of the Neighborhood Advantage Index (ENAI). As described above, this measure captures the spatially weighted average of socioeconomic advantage in the neighborhoods surrounding the respondents' immediate neighborhood of residence. This measure is also averaged over the ages 0 to 18, although similar findings are observed for a measure of extralocal neighborhood advantage experienced at age 14 (results not shown). The coefficient for the ENAI is negative but not statistically significant, indicating that, for the sample as a whole, the socioeconomic characteristics of extralocal neighborhoods appear to be largely irrelevant to high school graduation prospects net of the characteristics of the immediate neighborhood of residence.[11] Nor, contrary to expectations, does controlling for the ENAI affect the net racial difference in the odds of graduating from high school (relative to Model 3); the coefficient

[10]The correlation between the Local Neighborhood Advantage Index experienced art age 14 and the average LNAI over ages 0 to 18 is .906. Not surprisingly, then, when both variables are included in the same model, neither has a significant effect, although the coefficient for the average LNAI is substantially larger than for the age 14 LNAI.

[11]The correlation between the local and extralocal NAI is .65 for variables measured at age 14 and .67 for variables averaged across the childhood years. Variance inflation factor scores for these sets of variables are 1.72 and 1.80, respectively, well below the threshold often considered indicative of problematic levels of collinearity (Menard 1995). The conclusion that collinearity does not significantly influence our inferences is also supported by the modest changes in standard errors occurring with the addition of extralocal conditions to the models.

for the dummy variable for black respondents barely changes between Models 3 and 4. Controlling for the ENAI does strengthen modestly the negative effect of socioeconomic advantage in the immediate neighborhood; the coefficient for the Local Neighborhood Advantage Index (LNAI) increases from .307 to .383 when the ENAI is controlled.

Model 5 of Table 2 adds the product term representing the interaction between the level of advantage in the immediate neighborhood (averaged over the childhood years) and the level of advantage in extralocal neighborhoods (also averaged over the childhood years). The coefficient for this interaction is negative and statistically significant at a borderline level ($p < .10$).[12] Thus, there is some evidence that higher levels of neighborhood advantage in surrounding neighborhoods temper the positive effect of advantage in the local neighborhood. In other words, partly consistent with the hypothesis derived from Wilson's (1987) theory of spatially concentrated advantage, the detrimental effect on high school graduation of socioeconomic *disadvantage* (i.e., low advantage) among immediate neighbors is exacerbated when the surrounding neighborhoods are also disadvantaged. Note also, however, that in Model 5 the main effect of the spatially-lagged ENAI is now negative and statistically significant. That is, when the level of advantage in the immediate neighborhood of residence is at zero, the level of advantage in extralocal neighborhoods is negatively associated with the odds of graduating from high school, as theories of relative deprivation, competition, and cultural conflict anticipate.

As noted above, prior studies suggest that there are racial differences in the effect of neighborhood characteristics on educational attainment. To explore this possibility, we re-estimated Models 3, 4 and 5 of Table 2 separately for blacks and whites. Table 3 presents the results for blacks and Table 4 presents the results for whites. To explore possible gender differences in these contextual effects, these tables also present separate models for female and male respondents within each race.

Models 1 and 2 of Table 3, which include black sample members of both genders, show that, while blacks' odds of graduating from high school respond positively and significantly to socioeconomic advantage in the immediate neighborhood, the level of advantage in extralocal neighborhoods is unrelated to high school graduation. And Model 3 shows that the impact of local socioeconomic advantage is not moderated by the level of advantage in proximal neighborhoods; the coefficient for the product term representing the interaction between the local level of neighborhood advantage (LNAI) averaged over the childhood years and the level of advantage in extralocal areas (ENAI) averaged over the childhood years is not statistically significant.[13] There is, however, some evidence of a gender difference in the effect of local socioeconomic advantage among blacks. Specifically, the positive coefficient for the LNAI is over twice as large for black males than for black females and is only statistically significant for the former. However, the difference between these coefficients is far from statistically significant ($p = .305$). Overall, these results imply that, net of the influence of other factors, blacks' likelihood of completing high school is positively affected by socioeconomic advantage in the immediate neighborhood of residence but unresponsive to socioeconomic conditions in surrounding neighborhoods.[14]

Among whites, however, a different pattern emerges. As with blacks, socioeconomic advantage in the immediate neighborhood is positively and significantly related to high

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[12]When age 14 measures local and extralocal neighborhood disadvantage are substituted for the measures averaged over the childhood years, this interaction becomes significant at a conventional level ($p < .01$).

[13]The interaction is also statistically non-significant when measures of the LNAI and ENAI at age 14 are substituted for the measures averaged over the childhood years.

[14]Additional models indicate that the interaction between local and extralocal advantage is statistically non-significant among both black females and black males.

school completion (Table 4, Model 1). But net of this effect and the effects of the other predictors, socioeconomic advantage in extralocal neighborhoods is negatively and significantly related to whites' likelihood of graduating from high school, consistent with theories of relative deprivation, competition, and conflict (Table 4, Model 2). Among whites, the positive effect of a one standard deviation increase in the concentration of advantaged neighbors (b = 1.211) is moderately stronger than the negative effect of a similar difference in the level of advantage in extralocal neighborhoods (b = −.720). A one standard deviation increase in the Local Neighborhood Advantage Index more than doubles the odds of high school graduation ($e^{1.211} = 3.36$), while a one standard deviation increase in the Extralocal Neighborhood Advantage Index reduces those odds by about half ($e^{-.720} = .49$). The effects of both local and extralocal contextual advantage appear to be substantially stronger for whites than for blacks (compare Model 2 in Table 4 to Model 2 in Table 3).[15]

Also worth noting is that the estimated effect of *local* neighborhood disadvantage grows dramatically when the level of advantage in extralocal neighborhoods is controlled. Indeed, the coefficient for the LNAI more than doubles from Model 1 (b = .503) to Model 2 (b = 1.211). Consequently, prior studies of the effect of neighborhood socioeconomic conditions on high school graduation (and perhaps other outcomes as well) may have seriously underestimated this effect by failing to consider the countervailing impact of the socioeconomic characteristics of areas surrounding the neighborhood of immediate residence.

Model 3 of Table 4 adds the product term representing the interaction between the local level of neighborhood advantage and the level of advantage in extralocal areas, with both variables measured as averages across ages 0 to 18. The coefficient for this interaction term is once again negative and substantially larger than the parallel coefficient among blacks (see Table 3, Model 3), indicating that the significant interaction revealed in the racially pooled sample (Table 2, Model 5) is driven primarily by the interactive effect among whites. However, with the smaller sample size in racially disaggregated models this interaction coefficient fails to attain statistical significance even among whites ($p = .226$). However, in results not presented in Table 4, the interaction is statistically significant (b = −.380, $p = .017$) when local and extralocal advantage are measured at age 14 rather than across all childhood years.

Table 4 provides no evidence of a consistent gender difference in the effects of either local or extralocal socioeconomic conditions among whites. Among both white females (Model 4) and white males (Model 5), exposure to larger concentrations of advantaged neighbors in the immediate area of residence tends to increase the likelihood of completing school while the concentration of advantaged groups in surrounding areas tends to reduce the likelihood of graduating, net of the influence of other factors. While the coefficients are slightly larger for white females than for white males, these differences are not statistically significant.[16]

Duration of exposure to disadvantaged neighborhoods

Although a comparison of Models 2 and 3 of Table 2 suggests that models employing point-in-time measures of neighborhood characteristics, rather than averaged childhood-lifetime measures, do not severely mischaracterize the impact of neighborhood disadvantage on high school graduation, these analyses cannot reveal how the likelihood of graduating from high school responds to varying amounts of time spent in more advantaged versus less advantaged neighborhoods. The models presented in Table 5 address this issue directly,

[15]The racial differences in the effect of both the LNAI and the ENAI are statistically significant ($p < .01$).

[16]Additional models indicate that the interaction between the LNAI and the ENAI is slightly stronger for white males than for white females but is statistically non-significant for both groups.

utilizing the set of dummy variables for the proportion of observed childhood years spent in neighborhoods with a low level of advantage (one or more standard deviations below the mean for all neighborhoods) and the proportion of years spent in neighborhoods with an extremely low level of advantage (two or more standard deviations below the mean neighborhood advantage). These measures provide purer indicators of the duration of exposure to neighborhoods with low levels of socioeconomic advantage than does the average LNAI for ages 0 to 18 because the latter is a function of both the level of advantage in each year *and* the length of exposure to such advantage during childhood.

Table 5 presents the results from these regression models separately for blacks (Models 1 and 2) and whites (Models 3 and 4).[17] For whites, the pattern of coefficients for the dummy variables representing varying durations of exposure to low levels of neighborhood advantage (Model 3) reveals a clear monotonic pattern, with each subsequent duration category exerting a stronger negative influence on the likelihood of graduating from high school. Whites who spent over one-quarter of their childhood in a disadvantaged neighborhood are significantly less likely than whites who spent none of their childhood in a low-advantage neighborhood (the reference category) to complete high school. Even whites who spent some time but no more than a quarter of their childhood in a low-advantage neighborhood are, at a borderline significance level, less likely to graduate than are whites who never lived in a disadvantaged area ($b = -.687$, $p = .061$).

Among blacks, in contrast, the length of time spent in neighborhoods with socioeconomic advantage levels at least one standard deviation below the mean for all tracts has very modest effects on the likelihood of completing high school; the pattern of coefficients for the duration dummies in Model 1 of Table 5 is non-monotonic and all of the coefficients fall far from statistical significance. This pattern of non-effects among blacks likely reflects the fact that the vast majority of blacks spend significant parts of their childhood exposed to relatively low levels of neighborhood advantage (see Table 1).

Given the concentration of most African Americans in these distressed neighborhoods, blacks who completed high school and those who did not are not clearly differentiated in terms of their length of exposure to distressed areas. It is not until the focus is shifted to the duration of exposure to *extremely* disadvantaged neighborhoods – those with socioeconomic advantage levels at least two standard deviations below the mean for all tracts – that such distinctions become clear. The coefficients in Model 2 show a nearly monotonic pattern in which black youth who spent more than three-quarters of their childhood in an extremely disadvantaged neighborhood are significantly less likely than youth who never spent time in such a neighborhood to graduate from high school, although the coefficient for durations of 75% to 99% is significant only at a borderline level ($p = .093$). In comparison to exposure to merely low-disadvantage areas, long-term exposure to *extremely* disadvantaged areas is relatively rare even among blacks (see Table 1), but such exposure is apparently more important in determining the likelihood of completing high school.

These findings reinforce Clampet-Lundquist and Massey's (2008) suggestion that studies of neighborhood effects attend seriously to individuals' cumulative exposure to disadvantaged neighborhoods. Indeed, among blacks, we do not observe even a borderline significant effect of exposure to extremely disadvantaged neighborhoods until youth have spent at least three-quarters of their childhood (over 13 years) in such highly distressed communities (Table 5, Model 2). Evaluations of the Moving to Opportunity experiment have been able to follow

[17]Interactive and disaggregated models show no significant differences in the effects of duration of exposure between females and males within the same race category.

participants for at most seven years; this may be too short a time for the effects of residing in extremely disadvantaged neighborhoods to emerge.

As noted in the discussion of Table 1, our sample contains no whites who were exposed to extremely disadvantaged neighborhood conditions for more than three-quarters of their childhood, so a full racial comparison is not possible. However, Model 4 of Table 5 indicates that the likelihood of completing school is significantly lower for those white youth who were ever exposed to extremely disadvantaged areas than for those who never experienced such conditions. Thus, for both white and black youth, the duration of exposure to neighborhood disadvantage clearly influences the likelihood of graduating from high school, but these effects are only apparent within the context of dramatically different distributions of white and black youth across highly and extremely disadvantaged areas. At the same time, however, it does not appear that the graduation probabilities of black youth are more sensitive than those of white youth to short-term exposure to socioeconomically disadvantaged neighborhoods. [18]

DISCUSSION AND CONCLUSION

Studies of the effects of neighborhood characteristics on the behavior of children, adolescents, and young adults have grown dramatically in recent years, but for the most part these studies have adopted rather simplistic conceptualizations of the spatial and temporal dimensions of neighborhood effects. We use longitudinal data from the Panel Study of Income Dynamics to examine how both the socioeconomic characteristics of “extralocal” neighborhoods and the proportion of the entire childhood life course spent in a disadvantaged neighborhood influence the likelihood of graduating from high school. Three main conclusions emerge from our study.

First, while among both blacks and whites the level of socioeconomic advantage in the immediate neighbor of residence is positively associated with the likelihood of graduating from high school—a finding consistent with much prior work in this area (e.g., Crane 1991; Brooks-Gunn et al. 1993; Harding 2003)—among whites exposure to advantaged *extralocal* neighborhoods tends to *decrease* the odds of completing high school. The positive influence of advantaged *local* neighbors is consistent with epidemic, collective socialization, and institutional models of neighborhood effects, which stress the importance of access to positive role models and strong institutions for adolescent development. The generally detrimental impact of advantaged extralocal neighbors, in contrast, is more consistent with theories of relative deprivation, resource competition, and cultural conflict (Jencks and Mayer 1990). More generally, the countervailing influences exerted by local and extralocal neighborhoods on youths’ likelihood of completing high school are consistent with the assumption that these discrete geographic scales capture distinct social contexts, most likely with local neighborhoods encompassing regular interactions with neighbors and extralocal conditions characterizing processes outside the local school and neighborhood. These results also suggest that these separate social contexts play very different roles in shaping educational aspirations and attainment. Advantaged immediate neighbors may bolster the likelihood of completing high school by transmitting values conducive to academic achievement and by providing positive role models for educational attainment. In contrast, at least for whites, *advantaged* populations in the larger social setting of surrounding neighborhoods may not provide a source of pro-education models strong enough to

[18]Separate models (not shown) reveal no consistent effects of various durations of exposure to high and extremely high levels of neighborhood *advantage* (one and two standard deviations *above* the mean level of neighborhood advantage respectively), indicating that it is length of exposure to neighborhoods with low levels of advantage, rather than high levels of advantage, that affects the likelihood of completing high school.

overcome the countervailing models provided by more geographically proximate neighbors, but successful extralocal neighbors may engender feelings of relative deprivation that reduce the motivation to complete high school. Perhaps more importantly, geographically proximate advantaged neighborhoods, especially those extending beyond the catchment zone of the local school, may siphon off school resources (e.g., funding, better teachers, instructional technologies, parental and school social capital) that would otherwise have gone to schools in less advantaged neighborhoods. In comparison, local neighborhoods and schools surrounded by competing areas with relatively low levels of advantage may face less competition for neighborhood- and school-based resources that facilitate educational attainment, including high school graduation (Mayer 2002). Paradoxically, white youth living in a poor neighborhood appear better off if their neighborhood is surrounded by other poor neighborhoods than if their neighborhood is surrounded by more affluent neighborhoods.

A second key conclusion to emerge from our study is that, among whites, taking into account the socioeconomic conditions in extralocal neighborhoods substantially increases the estimated positive effect of local socioeconomic advantage on high school graduation rates. Although the effect remains modest in comparison to the influence of many individual-level predictors, the magnitude of our estimate of the beneficial impact of exposure to advantaged neighbors in the immediate neighborhood more than doubles when the socioeconomic characteristics of extralocal neighbors are controlled. Statistically, this suppression results from the positive spatial correlation between socioeconomic characteristics of proximate neighborhoods combined with the net negative effect of exposure to disadvantaged extralocal neighbors on high school graduation. Many observers have noted that, even when significant effects of neighborhood characteristics are observed, these effects are often quite weak (e.g., Brooks-Gunn et al. 1993). Our findings suggest that, by failing to consider the impact of the socioeconomic status of *extralocal* neighbors, prior studies may have substantially underestimated the effect of the socioeconomic status of *immediate* neighbors on high school graduation.

Unlike some past research that finds effects of neighborhood socioeconomic conditions only for young women, attention to characteristics of the broader social context reveal fairly modest gender disparities in the effects of local and extralocal neighborhood conditions on high school completion. Although females are slightly more likely than their male counterparts to complete school, the effects of both local and extralocal conditions are of similar magnitude for males and females within the same racial group – similarly weak for black males and females and similarly stronger for both white females and males. Thus, at least with regard to the likelihood of completing school by early adulthood, racial differences in the effects of local and extralocal neighborhood socioeconomic context are far more important than differences between young men and women.

It is not immediately clear why the effects on high school graduation of the socioeconomic characteristics of extralocal neighbors should emerge for whites but not for blacks. One possibility is that, more so than among whites, blacks' routine activities are geographically restricted to their local neighborhoods, perhaps partly a result of residential segregation (Massey and Denton 1993). As such, blacks may be less likely to encounter neighbors—either advantaged or disadvantaged—from outside their immediate residential areas. This relative absence of social interaction with extralocal neighbors would render the characteristics of these neighbors largely irrelevant for black youth's social development. Clearly, understanding such dynamics requires much more research into racial differences in the content and geographic scope of social networks maintained by young people. More generally, investigating variations in the effects of local and extralocal neighborhood conditions across other micro-level characteristics, including family composition and socioeconomic status, will provide important clues about the mechanisms through which these contextual characteristics operate to influence adolescent development.

A third central conclusion from our analysis concerns the temporal dimension of neighborhood effects. Consistent with prior studies in this area (Jackson and Mare 2007; Kunz et al. 2003), we find a very strong correlation between the socioeconomic status of the immediate neighborhood measured at a single point in time (here, age 14) and the average neighborhood socioeconomic status experienced during the entire childhood life course (ages 0 to 18). Largely as a result of rather limited migration between neighborhoods of varying socioeconomic status (Crowder and South 2005), point-in-time measures of neighborhood SES serve as reasonable proxies for exposure to disadvantaged neighbors over the childhood life course. Yet, we also find somewhat stronger effects on high school graduation of neighborhood SES when it is measured for all childhood years. Moreover, the racial difference in exposure to disadvantaged neighbors, particularly when this exposure is measured over the entire childhood life course, suppresses a net black advantage in the likelihood of graduating from high school. That is, blacks' high school graduation rate would be higher than that of whites if blacks were not exposed to higher levels of neighborhood disadvantage during their childhood years. From a policy perspective, this finding highlights the importance of moving beyond family- and school-level dynamics to assess the role of broader neighborhood structures in the effort to close the racial gap in academic achievement.

Future research on neighborhood effects might profit from pursuing several related lines of inquiry. We have suggested that the disparate effects of local and extralocal conditions likely reflect countervailing dynamics within separate social spheres, with extralocal areas reflecting the conditions in neighboring schools and the broader environment. A rigorous test of this interpretation would obviously benefit from incorporating school-level data. Indeed, research on the effects of neighborhood characteristics on youth outcomes has been criticized for its failure to explicitly consider school characteristics (Arum 2000). Measuring the quality of the school attended by youth and the geographic scope and socioeconomic characteristics of the school catchment area, as well as the quality of schools in proximate neighborhoods, may help to isolate the mechanisms through which the socioeconomic characteristics of both local and extralocal neighborhoods affect high school graduation. Research along these lines would complement parallel efforts to distinguish the effects of neighborhoods from the effects of schools on other outcomes (e.g., Tietler and Weiss 2000).

Research into the spatial dimension of neighborhood effects should also recognize that the social interactions ostensibly captured in the effects of extralocal neighborhoods may not correspond well with simple Euclidean distance (as we assume here). Distance between neighborhoods—the basis of our distance-decay function—is likely to capture only crudely youths' exposure to advantaged or disadvantaged extralocal neighbors. Rather, physical barriers and the configuration of streets and highways are likely to shape youths' exposure to disadvantaged or advantaged extralocal neighborhoods, just as they shape the potential for social interactions *within* neighborhoods (Grannis 1998). Simple distances between neighborhoods are also not likely to correspond perfectly with the distance between schools. Future research would do well to adopt spatial weighting schemes that take these factors into consideration and that utilize more precise geographic data on the location of individuals within neighborhoods, as well as relative to extralocal areas.

Research into the temporal dimension of neighborhood effects might profit by attending to possible age or life-course variation in the effect of neighborhood characteristics on youth behavior. It might be expected, for example, that exposure to disadvantaged neighborhoods (or disadvantaged schools) during the early high school years would be more consequential for high school graduation prospects than similar exposure during early childhood. Research on the influence of *family* poverty on high school graduation suggests that the timing (albeit not the duration) of exposure to disadvantaged circumstances is largely immaterial (Wagmiller et al. 2006). Nonetheless, we cannot dismiss the possibility that the impact of exposure to disadvantaged neighbors varies across developmental stages of the childhood life course.

Finally, future research might profit by examining the effects of local and extralocal neighborhood characteristics on other youth and young adult outcomes that have been examined in the neighborhood effects literature. Minimally, these behaviors and states include sexual activity (e.g., Brewster 1994; Browning, Leventhal and Brooks-Gunn 2004; 2005), mental health (e.g., Aneshensel and Sucoff 1996; Wheaton and Clarke 2003), employment (e.g., Massey and Shibuya 1995), and violence and delinquency (e.g., Baumer, Horney, Felson, and Lauritsen 2003; Sampson, Raudenbush, and Earls 1997). The analysis presented here suggests that research into the influence of neighborhood characteristics on each of these outcomes would likely benefit from greater attention to both the spatial and the temporal dimensions of these effects.

Acknowledgments

This research was supported by a grant from the National Institute of Child Health and Human Development (R03 HD052542).

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Table 1

Descriptive Statistics for Variables Used in Analysis of High School Graduation: Panel Study of Income Dynamics, Blacks and Whites born between 1968 and 1980.

		Pooled		Blacks		Whites	
Variable	***Definition***	***Mean***	***S.D.***	***Mean***	***S.D.***	***Mean***	***S.D.***
Dependent Variable							
Completed high school	Whether R graduated from high school or received a GED by age 25 (1=yes)	.874	.332	.821	.384	.912	.283
Independent Variables							
Local Neighborhood Conditions							
Local neighborhood advantage at age 14 (LNAI)	Neighborhood Advantage Index[a] in R's tract of residence at age 14	.000	1.000	−.628	.974	.460	.734
Average local neighborhood advantage between ages 0 and 18 (average LNAI)	Neighborhood Advantage Index[a] in R's tract of residence, averaged across ages 0 to 18	.000	1.000	−.723	.882	.530	.707
Duration of exposure to low neighborhood advantage	Percentage of years between ages 0 and 18 R lived in a tract with Neighborhood Advantage Index[a] at least one standard deviation below the mean for all tracts						
	Duration 0 percent (1=yes)	.595	.491	.209	.407	.878	.328
	Duration 1 to 25 percent (1=yes)	.084	.278	.119	.323	.059	.236
	Duration 26 to 75 percent (1=yes)	.166	.372	.325	.469	.049	.216
	Duration 76 to 99 percent (1=yes)	.079	.270	.179	.384	.005	.073
	Duration 100 percent (1=yes)	.076	.265	.168	.374	.009	.092
Duration of exposure to extremely low neighborhood advantage	Percentage of years between ages 0 and 18 R lived in a tract with Neighborhood Advantage Index[a] at least two standard deviations below the mean for all tracts						
	Duration 0 percent (1=yes)	.825	.380	.604	.489	.987	.114
	Duration 1 to 25 percent (1=yes)	.072	.258	.158	.364	.009	.095
	Duration 26 to 75 percent (1=yes)	.076	.265	.174	.379	.004	.062
	Duration 76 to 99 percent (1=yes)	.019	.138	.046	.210	.000	.000
	Duration 100 percent (1=yes)	.008	.087	.018	.132	.000	.000
Extralocal Neighborhood Conditions							
Extralocal neighborhood advantage at age 14 (ENAI)	Distance-weighted Average Neighborhood Advantage Index[a] in tracts surrounding R's tract of residence at age 14	.000	1.000	−.438	.990	.321	.879
Average extralocal neighborhood advantage between ages 0 and 18 (average ENAI)	Distance-weighted average Neighborhood Advantage Index[a] in tracts surrounding R's tract of residence, averaged across ages 0 to 18	.000	1.000	−.495	.961	.363	.864
Micro-level characteristics							

Variable	Definition	Pooled Mean	Pooled S.D.	Blacks Mean	Blacks S.D.	Whites Mean	Whites S.D.
Black	Whether R lived in a household with a Black household head (1=yes)	.423	.494	1.000	.000	.000	.000
Female	Whether R is female (1=yes)	.512	.500	.539	.499	.493	.500
Year of birth	Year R was born	1974.329	3.844	1974.232	3.937	1974.401	3.774
Family income-to-needs ratio	Average income-to-needs ratio for R's family from age 0 to age 18	2.216	1.511	1.443	.910	2.783	1.610
Head completed college	Whether head of R's household at age 14 completed college	.174	.379	.046	.210	.267	.442
Time in female-headed family	Proportion of years between age 0 and 18 in which R lived in a family headed by a single woman	.237	.336	.414	.384	.108	.220
Residential mobility	Proportion of consecutive years between ages 0 and 18 in which R's family moved to a different tract	.156	.149	.182	.163	.137	.135
Number of observations		2,254		953		1,301	

[a]The Neighborhood Advantage Index is an standardized additive scale of percent of the tract population in families with incomes above the federal poverty line, percent of families not receiving public assistance, percent of males in the labor force and employed, percent of families with high incomes, percent of adults with at least a college education, and percent of adult workers employed in professional or managerial occupations.

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Table 2

Coefficients for Logistic Regression Analysis of High School Graduation, Panel Study of Income Dynamics, Blacks and Whites Born between 1968 and 1980.

	Model 1	Model 2	Model 3	Model 4	Model 5
Local Neighborhood Conditions					
Local neighborhood advantage at age 14		.245 ** (.087)			
Average local neighborhood advantage between ages 0 and 18			.307 *** (.095)	.383 *** (.109)	.319 ** (.114)
Extralocal Neighborhood Conditions					
Average extralocal neighborhood advantage between ages 0 and 18				−.133 (.090)	−.184 * (.093)
Local-Extralocal Interaction					
Local neighborhood advantage between ages 0 and 18 X extralocal neighborhood advantage between age 0 and 18					−.119 † (.063)
Micro-level characteristics					
Black	.254 (.162)	.414 * (.174)	.506 ** (.183)	.502 ** (.183)	.474 ** (.185)
Female	.298 * (.135)	.299 * (.136)	.295 * (.136)	.292 * (.136)	.305 * (.136)
Year of birth	.011 (.017)	.009 (.017)	.010 (.017)	.009 (.018)	.009 (.018)
Family income-to-needs ratio	.975 *** (.114)	.901 *** (.116)	.885 *** (.117)	.904 *** (.118)	.934 *** (.119)
Head completed college	1.672 *** (.521)	1.629 ** (.522)	1.606 ** (.522)	1.608 ** (.522)	1.669 *** (.523)
Time in female-headed family	.245 (.220)	.308 (.222)	.318 (.222)	.344 (.223)	.371 † (.225)
Residential mobility	−1.952 *** (.404)	−2.065 *** (.409)	−2.101 *** (.409)	−2.084 *** (.409)	−2.077 *** (.410)
Model chi-square	1459.506	1451.431	1449.063	1446.877	1443.484

Notes: Numbers in parentheses are standard errors. Number of observations = 2,254

† $p \le .10$

* $p \le .05$

** $p \le .01$

*** $p \le .001$

Table 3

Coefficients for Logistic Regression Analysis of High School Graduation, Panel Study of Income Dynamics, Blacks Born between 1968 and 1980.

	All Blacks			Females	Males
	Model 1	Model 2	Model 3	Model 4	Model 5
Local Neighborhood Conditions					
Average local neighborhood advantage between ages 0 and 18	.264 * (.108)	.254 * (.119)	.190 (.140)	.147 (.160)	.444 * (.183)
Extralocal Neighborhood Conditions					
Average extralocal neighborhood advantage between ages 0 and 18		.022 (.108)	−.059 (.143)	−.077 (.150)	.149 (.161)
Local-Extralocal Interaction					
Local neighborhood advantage between ages 0 and 18 X Extralocal neighborhood advantage between age 0 and 18			−.088 (.103)		
Micro-level characteristics					
Female	.093 (.178)	.094 (.178)	.101 (.179)		
Year of birth	−.005 (.023)	−.004 (.023)	−.005 (.023)	.020 (.031)	−.040 (.034)
Family income-to-needs ratio	1.023 *** (.181)	1.019 *** (.182)	1.035 *** (.184)	1.013 *** (.238)	.994 *** (.286)
Head completed college	.464 (.760)	.473 (.761)	.472 (.761)	.138 (1.084)	.649 (1.094)
Time in female-headed family	.513 † (.271)	.508 † (.272)	.518 † (.273)	.373 (.354)	.668 (.433)
Residential mobility	−1.802 *** (.531)	−1.807 *** (.532)	−1.794 *** (.533)	−1.002 (.711)	−3.010 *** (.820)
Model chi-square	812.119	812.077	811.369	453.516	349.618
Number of observations		953		514	439

Notes: Numbers in parentheses are standard errors.

† p ≤ .10

* p ≤ .05

** p ≤ .01

*** p ≤ .001

Table 4

Coefficients for Logistic Regression Analysis of High School Graduation, Panel Study of Income Dynamics, Whites Born between 1968 and 1980.

	All Whites			Females	Males
	Model 1	Model 2	Model 3	Model 4	Model 5
Local Neighborhood Conditions					
Average local neighborhood advantage between ages 0 and 18	.503 * (.208)	1.211 *** (.283)	1.218 *** (.284)	1.287 * (.529)	1.187 *** (.338)
Extralocal Neighborhood Conditions					
Average extralocal neighborhood advantage between ages 0 and 18		−.720 *** (.186)	−.641 *** (.196)	−.874 ** (.316)	−.653 ** (.231)
Local-Extralocal Interaction					
Local neighborhood advantage between ages 0 and 18 X Extralocal neighborhood advantage between age 0 and 18			−.202 (.167)		
Micro-level characteristics					
Female	.589 ** (.216)	.582 ** (.219)	.580 ** (.219)		
Year of birth	.030 (.028)	.026 (.029)	.025 (.029)	.045 (.047)	.010 (.036)
Family income-to-needs ratio	.713 *** (.160)	.718 *** (.161)	.721 *** (.161)	1.010 *** (.270)	.524 ** (.199)
Head completed college	2.133 ** (.731)	2.161 ** (.732)	2.180 ** (.732)	3.465 (4.324)	1.823 * (.744)
Time in female-headed family	−.299 (.402)	−.267 (.408)	−.273 (.409)	−.791 (.613)	.267 (.580)
Residential mobility	−2.624 *** (.656)	−2.753 *** (.668)	−2.774 *** (.671)	−3.075 ** (1.039)	−2.727 ** (.890)
Model chi-square	625.536	609.825	608.438	227.680	373.584
Number of observations		1,301		641	660

Notes: Numbers in parentheses are standard errors.

† $p \leq .10$

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$

Table 5

Coefficients for Logistic Regression Analysis of High School Graduation, Panel Study of Income Dynamics, Whites and Blacks Born between 1968 and 1980, by Race

	Blacks		Whites	
	Model 1	**Model 2**	**Model 3**	**Model 4**
Local Neighborhood Conditions				
Duration of exposure to low neighborhood advantage[a]				
Duration 0 percent	*reference*		*reference*	
Duration 1 to 25 percent	.009 (.370)		−.687 † (.367)	
Duration 26 to 75 percent	.092 (.294)		−.767 * (.375)	
Duration 76 to 99 percent	−.430 (.313)		−2.104 * (.872)	
Duration 100 percent	−.108 (.325)		−2.136 ** (.761)	
Duration of exposure to extremely low neighborhood advantage[b]				
Duration 0 percent		*reference*		*reference*
Duration 1 to 25 percent		.012 (.262)		−2.137 *** (.676)
Duration 26 to 75 percent		−.056 (.250)		−2.273 * (.969)
Duration 76 to 99 percent		−.629 † (.374)		
Duration 100 percent		−1.128 * (.532)		
Extralocal Neighborhood Conditions				
Average extralocal neighborhood advantage between ages 0 and 18	.076 (.106)	.064 (.104)	−.411 ** (.146)	−.267 † (.137)
Micro-level characteristics				
Female	.082 (.178)	.094 (.179)	.569 ** (.219)	.609 ** (.220)
Year of birth	−.003 (.023)	−.006 (.023)	.022 (.028)	.018 (.028)
Family income-to-needs ratio	1.035 *** (.182)	1.032 *** (.182)	.907 *** (.158)	.911 *** (.158)
Head completed college	.532 (.760)	.509 (.761)	2.262 ** (.731)	2.262 ** (.731)
Time in female-headed family	.464 (.275)	.490 (.274)	−.189 (.413)	−.299 (.407)
Residential mobility	−1.714 ** (.569)	−1.987 *** (.571)	−2.064 ** (.677)	−2.126 *** (.661)
Model chi-square	811.851	810.213	613.621	614.230
Number of observations	953		1,301	

Notes: Numbers in parentheses are standard errors.

[a] Low neighborhood advantage refers to residence in a tract with a score on the Local Neighborhood Advantage Index (LNAI) more than one standard deviation below the mean for all tracts.

[b] Extremely low neighborhood advantage refers to residence in a tract with a LNAI score more than two standard deviations below the mean for all tracts.

† $p \leq .10$

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$