NEIGHBORHOOD CONDITIONS AND CHILDREN/adolescents’
MENTAL HEALTH AND EDUCATIONAL OUTCOMES:
TRAJECTORIES AND MECHANISMS

by

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ABSTRACT

Background: Mental health and education during childhood and adolescence are critical building blocks of lifelong health and well-being. Existing theories and empirical evidence have linked aspects of neighborhood conditions to children’s mental health and education. However, the timing and mechanisms of the potential neighborhood effects have not been well understood.

Objectives: The dissertation aims to examine long-term patterns of exposure to poor neighborhoods among poor children (aim 1), the timing and mechanisms of the effects of neighborhood exposure on children and adolescents’ trajectories of externalizing behaviors (aim 2) and educational attainment at the transition to adulthood (aim 3).

Methods: The dissertation used a United States national cohort of children participated in the Child Development Supplement (CDS) in the Panel Study of Income Dynamics. Neighborhood quality was rated by children’s primary caregivers, and neighborhood structural characteristics such as poverty and socioeconomic advantage were measured by census tract indicators reported in United States Census. The timing, persistence, and duration of poor children’s exposure to poor neighborhoods were described using cross-tabulations and predicted by a series of family conditions using regression analysis (aim 1). Children’s long-term trajectories of externalizing behaviors and their educational attainments were predicted by their cumulative neighborhood exposures using structural equation models, and the mediating effects of family context and intermediary developmental outcomes were also tested (aim 2 & 3).

Results: A substantial proportion of poor children experienced persistent exposure to neighborhood poverty, and the exposure were almost solely predicted by being minorities and by their family histories in such neighborhoods (aim 1). Cumulative exposure to poor neighborhood quality predicted increasing trajectories of externalizing behaviors, primarily
mediated by parental distress and family conflict, with early childhood being the most sensitive period (aim 2). Cumulative exposure to better neighborhood quality predicted higher chances of high school graduation, and the relationship was mediated by mental health and extra-curricular activities among children; cumulative exposure to neighborhood advantage predicted higher chances of college attendance, and the relationship was mediated by educational motivations, behaviors, and abilities.

**Conclusions:** Persistent exposure to neighborhood disadvantage may have important implications for children’s development. Residential mobility programs that promote racial- and income-integrated neighborhoods, major improvements in poor neighborhoods and family and school-based intervention to support healthy development may help improve children’s behavioral and educational outcomes in disadvantaged neighborhoods.

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CHAPTER I

Background and Significance
Introduction

Childhood and adolescence are periods of time when individuals develop basic physical, cognitive, and socioemotional functions and build the foundation of lifelong health (Halfon & Hochstein, 2002), and neighborhood is a key part of the ecological context that shapes such development. In the United States, neighborhoods are highly stratified by income and race (Sampson & Sharkey, 2008), and offer staggeringly different economic opportunities, amenities, and services consequential for child development (Chetty & Hendren, 2015b). As a result, neighborhood conditions may be important sources of inequality in child development and population health across the lifespan across income and racial groups.

Neighborhood environments have primarily been linked to children’s behavioral adjustment and educational attainment (Leventhal & Brooks-Gunn, 2000), both of which are important building blockings of lifelong health and well-being. One of the most common forms of behavioral maladjustment is externalizing behaviors (Campbell, 1995; Merikangas, Nakamura, & Kessler, 2009), which includes defiance, impulsivity, disruptiveness, aggression and antisocial behavior. Externalizing behaviors frequently lead to peer rejection (Patterson, 1986), academic under-performance (Hinshaw, 1992), and predict substance abuse and involvement with the criminal justice system in adulthood (Odgers et al., 2008). On the other hand, educational attainment is the culmination of human capital development throughout childhood and adolescence, and the gateway to economic opportunity and work fulfillment in adulthood. Education broadly shapes a person’s cognitive and non-cognitive skills, economic and social resources, and health behaviors (Ross & Wu, 1995), and is one of the strongest predictors of morbidity and mortality (Kaplan, Everson, & Lynch, 2000; National Center for Health Statistics, 2012).

Although neighborhood environments have been linked to children’s behavioral adjustment and educational attainment in the existing literature, the timing and mechanisms
of potential neighborhood effects are still largely unknown. Specifically, when and for how long are children exposed to deleterious neighborhood environments? How do the timing and duration of neighborhood exposures affect children’s outcomes? How do other aspects of the ecological context (e.g., family and peers) mediate and modify the neighborhood effects? What aspects of children’s resources, motivations and behaviors are associated with neighborhoods conditions that contribute to the longer term outcomes? Addressing these knowledge gaps could help informing policies and programs to reduce disparities in children’s development, and improving overall population health across the life span.

Using a U.S. national prospective cohort with rich measures on children’s ecological context, this dissertation examines the role of neighborhood conditions in shaping children’s externalizing behaviors and educational attainment, focusing on elucidating the timing and mechanisms of potential influences. The dissertation has the following aims:

**Aim 1**: Understand the timing, persistence and duration of poor children’s exposure to neighborhood poverty throughout childhood and adolescence.

**Aim 1.1** Demonstrate the timing of poor children’s exposure to poor neighborhoods across age.

**Aim 1.2** Demonstrate the persistence of poor children’s exposure to poor neighborhoods across age.

**Aim 1.3** Demonstrate the duration of poor children’s exposure to poor neighborhoods across age.

**Aim 1.4** Identify the family conditions that predict cumulative exposure to poor neighborhoods among poor children during childhood and adolescence.
**Aim 2:** Examine the longitudinal relationships between neighborhood quality and child externalizing behaviors throughout childhood and adolescence.

**Aim 2.1** Examine the relationships between neighborhood quality at various stages of development and trajectories of child externalizing behaviors throughout childhood and adolescence.

**Aim 2.2** Examine family and peer processes as potential mediators of the relationships between neighborhood quality and child externalizing behaviors.

**Aim 3:** Examine the longitudinal relationships of neighborhood quality and neighborhood advantage with children’s educational attainments in the transition to adulthood.

**Aim 3.1** Examine the independent associations of neighborhood quality and neighborhood advantage with educational attainment in the transition to adulthood.

**Aim 3.2** Examine mental health, and educational motivations, behaviors and achievement as potential mediators of the relationship between neighborhood conditions and children’s educational attainment.

**Background**

**Residential Sorting and Neighborhood Inequality in the United States**

Families decide where to live based on their residential preferences and resources, and these decisions collectively shape the neighborhood landscape in which they live. Several classic theories explain the processes by which families sort into neighborhoods.
The *residential satisfaction model* posits that families evaluate their housing and neighborhood conditions against family members’ life cycle needs, such as getting married and raising children, and they consider moving when these needs are not satisfied (Speare, 1974). As families’ neighborhood choices have to be supported by their ability to afford housing in the given location, the *human capital model* posits that families usually end up in neighborhoods that “match” their socioeconomic status (SES) (South & Crowder, 1997). In addition, black families, and to a lesser extent other racial/ethnic minority families, usually reside in much more disadvantaged neighborhoods than white families of similar SES (Alba & Logan, 1993; Logan & Alba, 1993). This is mostly due to racial segregation and steeper neighborhood stratification by SES within these minority groups (South, Crowder, & Chavez, 2005). The phenomenon is referred to as *place stratification*, because neighborhood is considered to constitute another level of social stratification beyond family SES. The sorting of families according to their SES and race yields a structural pattern of population flows between neighborhoods, which serves to reproduce the landscape of neighborhood inequality (Sampson & Sharkey, 2008).

Besides the general forces underlying residential sorting, families with children have special residential preferences and constraints related to child-rearing. For example, some middle-class white families may seek neighborhoods with prestigious schools (Holme, 2002) or segregated white populations (Goyette, Iceland, & Weininger, 2014) for the perceived benefits to their children’s education. In contrast, low-income families may need to trade off neighborhood quality for additional space in the housing unit for their children (Rosenblatt & DeLuca, 2012).

In addition, decisions to move to and stay in poor neighborhoods may also be affected by families’ residential history. Families who have long histories living in poor neighborhoods have developed strategies to cope with dangerous environments. They are more likely to fall back on these neighborhoods when they face financial pressures
(Rosenblatt & DeLuca, 2012). Further, adults’ current neighborhood conditions are predicted by their childhood neighborhood conditions, and the predictive power is stronger than any other aspect of family background or adults’ own educational attainment (Sharkey, 2008).

In the past two decades in the United States, neighborhood income inequality has intensified, and the poorest and most affluent neighborhoods have become worlds apart both physically and economically (Pendall & Hedman, 2015). Poverty has become more concentrated spatially, and poor neighborhoods have spread beyond the traditional urban confines, emerging rapidly in smaller metropolitan areas and suburbs, influencing dramatically more people (Jargowsky, 2014). Thus, the impact of neighborhood inequality and concentration of poverty on residents urgently needs to be understood.

**Neighborhood Conditions and Residents’ Health and Behavior**

A neighborhood consists of a set of physical elements, people and social processes in space and time. Each of these elements may have effects on the health and behaviors of residents. Following a long tradition of urban ecological approach, research in sociology has demonstrated that neighborhoods with structural disadvantage, including concentrated poverty, residential instability and dilapidated housing, suffer disproportionately high rates of outcomes such as infant mortality, delinquency, crime, low birth weight, tuberculosis, and physical abuse; the poor outcomes tend to persist in the same neighborhoods despite changes in the resident population over time (see a summary in (Sampson & Morenoff, 2000).

An intuitive explanation of the links between neighborhood structural disadvantage and residents’ poor health and behaviors is *social contagion*, in the sense that residents tend to copy the behaviors of others around them when such behaviors reach a critical threshold. The idea is supported by the evidence that neighborhoods poverty seem to discourage positive behaviors (i.e., working) and encourage negative behaviors (i.e., crime,
school dropout) starting around 15-20%, and with increasingly larger effects until it reaches around 30-40% (Galster, 2002).

Neighborhood structural disadvantage may also be linked to residents’ poor outcomes through social disorganization, which is characterized by weak social networks, a lack of organizational participation, and inadequate informal social control (i.e., willingness to intervene on behalf of the common good). Neighborhoods that are socially disorganized lack the ability to achieve collective goals, such as controlling drugs and crimes, maintaining infrastructure and obtaining public resources (Groves & Sampson, 1989; Sampson, 1997). Such neighborhoods are also consistently associated with residents’ poorer mental health outcomes, independent of their individual characteristics (Aneshensel & Sucoff, 1996; Truong & Ma, 2006; Weden, Carpiano, & Robert, 2008; Wen, Hawkley, & Cacioppo, 2006).

Theories on Neighborhood and Child Development

Compared to its effects on adult residents, neighborhood effects on child development may be more complex and long lasting. Several theoretical perspectives on neighborhood and child development have flourished in the past few decades. In the early 1990s, the now classic review of Jencks and Mayer (Jencks & Mayer, 1990) presented several theoretical models to understand neighborhood influences on child development. The epidemic/contagion model posits that children learn behaviors from peers in the community. The collective socialization model posits that indigenous affluent adults in advantaged neighborhoods serve as role models for children, shaping children’s expectations of hard work and education in exchange for economic success; these adults also serve to maintain positive norms and supervise children in the public life. Both the epidemic/contagion model and the collective socialization model emphasize indigenous neighborhood influences. A third model, the institutional resources model, posits that adults from outside the neighborhood who work in the schools, the police force, and other
institutions affect children’s development. Since schools in affluent neighborhoods are more likely to attract qualified teachers, and police may treat delinquents in affluent neighborhoods better than those in poor neighborhoods, the outside adults’ influences are likely still related to a neighborhood’s SES. All three models discussed above suggest that neighborhood advantage improves children’s outcomes. On the other hand, neighborhood advantage may also contribute to poorer developmental outcomes among children. The *relative deprivation model* posits that children are more likely to feel inadequate in the presence of wealthier and abler neighbors. The *resource competition model* posits that affluent neighborhoods have stronger competition for limited resources. Importantly, Jencks and Mayer have pointed out that these neighborhood-related theories do not have to be mutually exclusive, and each child outcome likely involves different theories and mechanisms (Jencks & Mayer, 1990).

A decade after the Jencks and Mayer study, Leventhal and Brooks-Gunn published another seminal literature review on neighborhood and child development (Leventhal & Brooks-Gunn, 2000), where in addition to expanding the collective socialization and institutional resources models, they proposed the *relationship model*. The model posits that poor, dangerous and deteriorated neighborhoods can affect children’s outcomes by compromising parental mental health and family relations, contributing to harsh parenting practices and family environments that are less safe and stimulating, more violent and chaotic. All three models received considerable support from the empirical literature.

Another stream of neighborhood theories originated from the *social disorganization theory*, which was initially proposed to explain the geographic concentration of juvenile delinquency (Shaw & McKay, 1942). Instead of focusing on neighborhood structural characteristics, these theories consider the role of social processes – social cohesion and informal social control – in enforcing collective control of youths’ deviant behaviors, and in supporting parents to monitor and supervise their children (Groves & Sampson, 1989;
Sampson, 1992). These theories have also received considerable empirical support (Sampson, Morenoff, & Gannon-Rowley, 2002).

In summary, this section reviews theories on neighborhood and child development, which guide the development of the hypotheses in this dissertation. In the following sections, I review how neighborhood conditions may affect children’s externalizing behaviors and educational attainments – outcomes of interest in the dissertation.

Externalizing Behaviors: Epidemiology and Developmental Trajectories

Externalizing behaviors refer to a cluster of problem behaviors marked by defiance, impulsivity, disruptiveness, aggression and antisocial behaviors (Achenbach & Edelbrock, 1978). A common form of childhood maladaptation (Achenbach & Edelbrock, 1981; Campbell, 1995), externalizing behavior problems affect 10-15% of preschool children (Campbell, 1995) and around 6% of adolescents (Merikangas et al., 2009). These problems are even more prevalent among children from lower SES backgrounds (Qi & Kaiser, 2003).

Externalizing behaviors have powerful and long-lasting influences on individuals and society. During childhood and adolescence, they compromise individuals’ academic performance (Hinshaw, 1992; Masten et al., 2005; McLeod & Kaiser, 2004), peer-relations (Patterson, 1986) and the functioning and well-being of their families (Baker & Heller, 1996; Donenberg & Baker, 1993). Over the long term, externalizing behaviors predict mental health problems such as depression and substance abuse (King, Iacono, & McGue, 2004; Moffitt, Caspi, Harrington, & Milne, 2002; Odgers et al., 2008; Reinherz, Giaconia, Hauf, Wasserman, & Paradis, 2000). The most severe and persistent form of externalizing behaviors found in a very small group of people also predicts criminality in adulthood, placing enormous burden on the society (Moffitt et al., 2002).

According to Patterson’s social interaction model (Patterson, 1986), persistent problem behaviors initially arise when parents use rewards and punishments non-
contingently, so children fail to develop self-regulatory mechanisms necessary to control their own behaviors. Parents’ coercive and inconsistent discipline is met by children’s hostile and aggressive responses, creating cycles of negative exchanges that escalate over time. At the same time, there may also be a lack of training in pro-social skills. Children’s “training” in noncompliant and coercive behaviors subsequently leads to peer rejection and academic failure. These factors, together with lax parental supervision, set the stage for children to seek out deviant peer groups, which are major training grounds for delinquency and drug use.

Families characterized by these inept family management practices often have social disadvantage or poor parenting skills, or are experiencing high levels of stress, such as from daily hassles, unemployment or medical problems (Patterson, 1986). For example, Conger’s family stress model documents how economic stress causes parental depression, family conflicts and harsh parenting practices, eventually contributing to child behavioral problems (Conger et al., 1992; Conger, Ge, Elder, Lorenz, & Simons, 1994). Likewise, neighborhood problems, such as danger, dilapidation and inadequate services, are found to have similar effects on these family management practices (Kohen, Leventhal, Dahinten, & McIntosh, 2008; Kotchick, Dorsey, & Heller, 2005). Moreover, the accumulation of risk factors across multiple domains of lives put children at higher risk for behavioral problems, above and beyond the contribution of any single risk factor (Deater-Deckard, Dodge, Bates, & Pettit, 1998; Sameroff, 2000).

At the same time, not all children have the same level of susceptibility to contextual risks for externalizing behaviors. Children with poor cognitive abilities and difficult temperament – such as those prone to negative emotionality, hyperactivity and low effortful control – are more likely to interpret social cues negatively and to have more difficulties modulating their emotional experiences and behaviors. As a result, they may experience more negative reactions from adults and peers. The persistence of such negative patterns of
social interactions put the children at risk for behavioral problems (Caspi, Henry, McGee, Moffitt, & Silva, 1995; Eisenberg, Spinrad, & Eggum, 2010; Olson, Sameroff, Kerr, Lopez, & Wellman, 2005).

Children can demonstrate externalizing behavior problems as early as the preschool years. Roughly half of those affected early in life continues to have these problems throughout the primary school years and adolescence (Broidy et al., 2003; Campbell, 1995). Overall, individuals’ rank order position of externalizing behaviors within a cohort is highly stable across time (Campbell, 1995). However, environmental influences across childhood and adolescence are important to the initiation, continuation and desistance of externalizing behaviors (Campbell, 1995).

Externalizing Behaviors and Neighborhood Environments

An extensive literature has established the link between externalizing behaviors and neighborhood disadvantage and disorganization (Leventhal & Brooks-Gunn, 2000). However, the exact timing and mechanisms of the potential neighborhood effects remain unclear.

Some of the most rigorous evidence on neighborhood and child behavioral problems comes from the residential mobility experiments/quasi-experiments which help families to move from poor inner-city neighborhoods to low-poverty and/or racially integrated neighborhoods. In early 1980, the Gautreaux residential mobility program was carried out as the result of a court-ordered desegregation in Chicago. The legal settlement led to a majority of public housing residents moving to lower poverty, much less segregated neighborhoods. Studies on the program demonstrated that moving to the suburbs substantially reduced boys’ involvement with the criminal justice system compared with those stayed in Chicago but increased that of girls’ (Keels, 2008). In the 1990s, the Moving To Opportunity for fair housing program (MTO) was implemented in four big cities in the U.S., which provided
vouchers to public housing residents to relocate to low-poverty neighborhoods. The intervention improved mental health and reduced arrests among girls but increased arrests for property crimes among boys over the long term (Gennetian et al., 2012; Kling, Liebman, & Katz, 2007; Kling, Ludwig, & Katz, 2005). Despite having inconsistent findings, the two programs have supported the idea that moving to low-poverty neighborhoods reduces exposure to violence, gangs and harmful substances, which were responsible for improvements in children’s outcomes (Keels, 2008; Kling et al., 2005). However, further explanations were complicated by differences in study implementation, such as the distance of moves, the extent of improvements in neighborhood conditions, the length of stay in low-poverty neighborhoods and children’s age at the time of the move (Briggs, Comey, & Weismann, 2010; Chetty, Hendren, & Katz, 2015; Duncan & Zuberi, 2006).

It is important to note that the two residential mobility experiments were mostly based on older children and adolescents who lived in public housing in poor, segregated and dangerous neighborhoods. Longitudinal observational studies on similar populations have confirmed the role of exposure to neighborhood violence, and subsequent fear and post-traumatic stress in predicting higher rates of externalizing behaviors and delinquency in children (McCabe, Hough, Yeh, Lucchini, & Hazen, 2005; Ruchkin, Henrich, Jones, Vermeiren, & Schwab-Stone, 2007; Sharkey & Sampson, 2010). In contrast, longitudinal observational studies among non-high-risk adolescents have found parental monitoring and discipline to mediate or moderate the effects of neighborhood disadvantage and disorder on externalizing behaviors (Beyers, Bates, Pettit, & Dodge, 2003; Pettit, Bates, Dodge, & Meece, 1999; Simons, Simons, Burt, Brody, & Cutrona, 2005).

Traditionally, younger children were thought to be less affected by neighborhoods. However, more recent research has shown that similar to adolescents living in urban/high-risk settings, children living in such settings are also affected by neighborhood risks such as poverty, violence and deviant peers (Ingoldsby & Shaw, 2002; Ingoldsby et al., 2006; Xue,
Leventhal, Brooks-Gunn, & Earls, 2005). On other hand, findings from studies on general populations of children have been more equivocal. Among four studies involving national samples of young children, two has found neighborhood social disorganization to have indirect effects on child externalizing behaviors mediated by family and school processes (Humphrey, 2015; Kohen et al., 2008), and the other two has found early life neighborhood disadvantage to have a lagged effect on externalizing behaviors in early adulthood (Wheaton & Clarke, 2003), and no concurrently nor lagged effect on externalizing behaviors (Anderson, Leventhal, & Dupéré, 2014), respectively.

In sum, existing literature suggests that the aspects of the neighborhood conditions influencing child externalizing behaviors and mechanisms of such influence probably differ by residential context. Neighborhood effects are relatively clear among older children and adolescents, and in high-risk settings, but are much less clear among younger children and those in non-high-risk settings.

**Educational Attainment: Health Relevance and Developmental Trajectories**

Educational attainment is the culmination of human capital development throughout childhood and adolescence. It is a pathway to future economic opportunities and job fulfillment. In the United States in 2015, 90% of young adults 25 to 34 years of age completed high school, and 46% obtained a bachelor’s or higher degree. The latter represents a roughly seven percentage point increase since 2001 (Kena et al., 2016). The increasing prevalence of secondary education probably reflects responses to the economic returns of higher education. In 2014, the median annual earnings among young adults 25 to 34 years of age were $25,000 for high school dropouts, $30,000 for high school graduates and $52,000 for those with a bachelor’s or higher degree (Kena et al., 2016). The education-based earnings gaps have been widening since 1980, a trend still on-going today (Aud et al., 2011). High school dropouts and high school graduates also have unemployment rate of 20%
and 16% in 2015, 4 and 3 times that of those with a bachelor’s or higher degree (Kena et al., 2016).

Aside from economic opportunities and employment, education also greatly shapes one’s cognitive and socioemotional skills, social networks and support, health behaviors, and neighborhood environments (Cutler & Lleras-Muney, 2006; Ross & Wu, 1995; Zimmerman, Woolf, & Haley, 2015). As a result, education predicts dramatic differences in disease and longevity across the life span (Kaplan et al., 2000; Link & Phelan, 1995). For example, among 25-year-old adults in the United States, those without a high school diploma are expected to live 9 years less than those with college or higher education (National Center for Health Statistics, 2012). More strikingly, poorly-educated middle-aged white Americans have even experienced increase in mortality and decreased in life expectancy from 1999 to 2014 (Case & Deaton, 2015).

Educational attainment stems from years of sustained investment on behalf of the family and the child. The processes may be best described by Entwisle and colleagues’ classic work following a group of first graders to age 22 in Baltimore (D. R. Entwisle, Alexander, & Olson, 2005). Overall, children’s educational attainment was most strongly predicted by their SES at school entry. Although small SES-based gaps in educational performance were already present at school entry, the largest part of the gaps accrued as children went through their school years. The gradually enlarging gaps likely reflected the cumulative effects of parents’ economic resources and their actions to help children learn over time. These effects were thought to largely operate through children’s out-of-school experiences, including summer activities, trips and learning materials at home. Besides SES, parents’ educational expectations, children’s temperament and to a lesser extent their school and neighborhood composition, also play substantial roles in children’s educational attainment. Thus, education involves cumulative processes where children’s social and personal resources are gradually transformed into their academic aptitude, expectations and
class standing, resulting in highly stable patterns of educational trajectories over childhood and adolescence.

**Educational Outcomes and Neighborhood Environments**

Neighborhood advantage in economic and human capital resources has long been known to promote children’s educational outcomes (Johnson, 2013; Leventhal & Brooks-Gunn, 2000). However, the exact pathways of influence are not clear. One possibility is that advantaged neighborhoods promote educational efforts and expectations as the norms. This notion is supported by a small number of studies, which consistently found educational expectations and efforts to mediate the effects of neighborhood advantage on children’s educational outcomes (Ainsworth, 2002; Ceballo, Mcloyd, & Toyokawa, 2004; Leventhal & Brooks-Gunn, 2004). Another possibility is that better neighborhoods have better schools, which promotes learning and achievement. In a systematic review, although school effects on children’s educational outcomes were supported, such effects were found to be independent of, and often countermanding neighborhood effects (Johnson, 2012). The findings suggest that schools may be rather autonomous from the neighborhoods, and that school quality may not necessarily reflect neighborhood socioeconomic conditions. Alternatively, it is possible that current measures on school do not adequately reflect aspects of quality and processes that matter for students’ educational advancement (Johnson, 2012).

On the other hand, neighborhood disadvantage and disorganization have been linked to mental distress, behavioral problems and delinquency in children and adolescents (Leventhal & Brooks-Gunn, 2000; Sampson et al., 2002). Because behavioral problems and delinquency are known to compromise academic achievement (Hinshaw, 1992), it is possible that neighborhood disadvantage and disorganization may affect children’s educational outcomes indirectly through their effects on mental health and behaviors. In
addition, high levels of violence and crime in disadvantaged neighborhoods may prompt some families to adopt more restrictive parenting practices to ensure children’s safety (Leventhal & Brooks-Gunn, 2000), which may curtail children’s activities outside of school. These indirect pathways linking neighborhood disadvantage and disorganization with children’s education are largely untested.

**The Methodological Threat of Residential Selection Bias**

In most of the neighborhood literature of the past three decades, there has been persistent skepticism regarding the causal nature of the observed neighborhood effects, primarily due to concerns over residential selection. Residential selection bias refers to the inference that children’s outcomes resulted from exposure to the neighborhood when the observed effects were in fact due to family characteristics that are disproportionately represented in this neighborhood. Although the two experiments/quasi-experiments (i.e., Gautreaux residential mobility program and Moving To Opportunity) were able to largely avoid residential selection bias by manipulating families’ neighborhood conditions through mobility programs, they were unable to fully clarifying the causal nature of the neighborhood effects due to complications in their implementation. On the other hand, most of the observational studies have relied on multiple regression models to control for family characteristics related to both residential selection and children’s outcomes, and are therefore susceptible to residual confounding from unobserved factors, such as parents’ commitment to children or their future orientation (Leventhal & Brooks-Gunn, 2000; Sampson et al., 2002).

Fortunately, a few observational studies with advanced methodological designs have helped to mitigate concerns about residential selection bias. One type of studies used sibling fixed-effect models, which control for unobserved family characteristics that do not vary between siblings. These studies found significant neighborhood effects on high school
dropout (Aaronson, 1997, 1998). However, the sibling fixed-effects models have the
drawback of having no control for unobserved family characteristics that vary between
siblings. Another type of studies used instrumental variable (IV) approach, which accounts
for residential selection from unobserved variables by inducing variability in neighborhood
conditions independent from children’s outcomes. Interestingly, these studies found that
neighborhood effects estimated from multiple regression models were not inflated compare
to those from the IV models (Duncan, Connell, & Klebanov, 1997; Foster & McLanahan,
1996). The validity of the IV approach is limited by the availability of valid instrument –
variables that predict the treatment but are independent of the outcome of interest. Such
variables are difficult to find for this particular research question. More recently, scientists
have used a counterfactual approach to account for residential selection. This approach
approximates a random experiment by statistically balancing the predictors of neighborhood
treatment between cases and controls. These studies also supported a positive effect of
neighborhood conditions on children’s educational outcomes (Harding, 2003; Wodtke,
Harding, & Elwert, 2011), and found that estimates from multiple regression models were in
fact more conservative than the counterfactual estimates (Wodtke et al., 2011). Although
this counterfactual approach is only able to balance observed predictors of neighborhood
treatment between cases and controls, sensitivity analyses showed that the unobserved
factors would have to be improbably strong to account for the associations between
neighborhood conditions and children outcomes (Harding, 2003).

In conclusion, observational studies that carefully considered predictors of
neighborhood conditions and used multiple regression models to control for them likely
would not overestimate the neighborhood effects on children’s outcomes. Further, the
concerns over the causal nature of neighborhood effects should not overshadow a research
agenda to understand the mechanisms and timing of neighborhood effects, which could be
more productive for both theoretical and practical purposes.
Conceptual Frames

In the previous sections, I have reviewed the state of knowledge on residential sorting and neighborhood effects on children’s outcomes. Although a multitude of studies exist on these topics, there is a shortage of studies that examine long-term neighborhood exposures and their relations with children’s developmental trajectories. There is also an insufficient understanding of the mechanisms of the neighborhood effects, including how neighborhood interact with family and school environments to affect children’s outcomes, and how aspects of development interact to affect children’s outcomes. In this section, I describe the conceptual framework (Figure 1.1) designed to address these critical research gaps in relation to the three studies of the dissertation it guides.
Figure 1.1 Conceptual Framework

Notes: The dotted-line boxes represent unmeasured or incompletely measured constructs in the dissertation. The half circle arrows on the top left corner of each developmental context represent inter-relations among aspects of the context, as well as the stability of aspects of the context over time. The three axes represent three dimensions of the framework: the levels of nesting of the ecological context, the aspects of each context, and time.

The conceptual framework includes multiple nested or overlapping ecological contexts (Figure 1.1), and the neighborhood is the most distal level of contexts in our studies. Neighborhoods have basic structural characteristics, e.g., residents’ SES, poverty level, racial composition, and residential mobility. Neighborhoods also have social and physical characteristics, which are partially determined by their structural characteristics. These social and physical characteristics include, but are not limited to, social cohesion, informal
social control, safety and physical maintenance. Neighborhood social and physical characteristics may have direct effects on children’s development or indirect effects mediated by more proximal ecological contexts.

School, family, and peer groups are at the more proximal level of the ecological contexts where children engage in activities on a regular basis. The school may be partially nested in and partially overlapping with the neighborhood. School’s composition, institutional characteristics, instructions and social processes are all likely to be affected by the neighborhoods it serves. All of these school properties may affect children’s development.

On the other hand, the family is largely nested within the neighborhood. Economic opportunities in the neighborhood and the larger region affect family’s employment and financial circumstances. Environmental quality, safety and social support in the neighborhood also affect family members’ mental health and functioning. As a family’s resources and functioning are strong influences on major areas of children’s development, it can be an important link between neighborhood and child development. In addition, as a family’s demographics, resources and residential preferences also influence its neighborhood outcomes, the family effects on child development may be confounded with the neighborhood effects on child development.

Peer groups are agents within the school and the neighborhood that directly interact with children. Neighborhood and school composition may affect the availability of different types of peer groups. For example, neighborhoods that are disadvantaged and have weaker informal social control might have more delinquent peer groups. In contrast, advantaged neighborhoods might have more peer groups who frequently participate and excel in academic activities, sports, interest groups and community service. However, the type of peer group children select to join is not only affected by the availability of these groups, but also children’s own assets, interests and social conditions. In sum, schools, families and
peers are all potential mediators of neighborhood effects, and they are inter-related in complex ways.

Lastly, the child has distinct genetic composition and temperament, which affect the ways they respond to stimuli in their social, cultural and physical environments. The values and behaviors the child develops in turn reshape his/her environments. Over the long term, the child’s emerging cognitive and socioemotional skills shape his/her mental health and educational attainment in a cumulative fashion. In addition, his/her mental health and educational attainment also have reciprocal effects on each other.

A key dimension of the conceptual framework is time, which is embodies in children’s developmental processes, and changes in the ecological context, as well as changes in the strength of the effects of various aspects of context on children’s development. For example, for very young children, family is the most important influence. As children enter school, school and peers start to play increasingly important roles in their development. When they reach adolescence, they have more autonomy to directly interact with their neighborhoods.

In the following chapters of the dissertation, I present the study methods (Chapter II), followed by three studies corresponding to the three aims – each a research paper that could stand alone (Chapter III-V). Lastly, I conclude with a discussion on the implications of the findings for research and practice (Chapter VI).
References


6. Neighborhoods in which the author has lived. They are in Rochester, NY, Boston, and Washington, DC, respectively.


CHAPTER II

Research Design and Methods
Overview

This dissertation examines neighborhood conditions and children’s externalizing behaviors and educational attainment, focusing on longitudinal relationships and mechanisms of potential neighborhood effects. Three studies were implemented for the three aims of the dissertation. The studies used a United States national cohort of 3,563 children from the Child Development Supplement (CDS) of the Panel Study of Income Dynamics (PSID) (Panel Study of Income Dynamics, 2016). Several components of PSID, including the family main interviews, the CDS and the Transition to Adulthood Supplement (TAS), were used to derive measures of neighborhood conditions, family resources, family processes, intermediate child outcomes, and child behavioral and educational outcomes. Repeated measures on these constructs throughout participants’ childhood and adolescence were used to construct longitudinal patterns of exposures and trajectories of development. Cross tabulations, regression models and structural equation models were used to evaluate the relationships among the exposures, the outcomes and the mediating mechanisms.

The following sections describe components of the methods common to the three studies. We offer a comprehensive introduction to PSID and its component surveys, list all study measures, their sources and their roles in each study, describe core variables, and summarize common analytic approaches across all three studies. In addition, we also provide a brief description of methods used in each of the three studies. Details of the study methods are described in the three respective studies in Chapters 3, 4 and 5.

Data Sources

Panel Study of Income Dynamics and Its Components
The Panel Study of Income Dynamics (PSID) is an ongoing longitudinal study directed by the University of Michigan, which repeatedly surveys a sample of families in the United States. The main component of the study, the family main interviews, was conducted on an annual basis from 1968 to 1997, and biennially after 1997. These interviews cover a wide range of topics including employment, income, wealth, expenditure, health, marriage, childbearing, education and beyond. The sample included in the 1968 family main interviews consists of approximately 2,800 households selected from a nationally representative sampling frame maintained by the Survey Research Center at University of Michigan (the SRC sample), and about 2,000 low-income households from the Survey of Economic Opportunity directed by the U.S Census Bureau (the SEO sample). Families who participated in the 1968 survey are referred to as the core sample. All family members of the core sample and their adult descendants are sample members of PSID, and the family units formed by the sample members were interviewed in the following family main interviews. In this way, PSID maintains a nationally representative sample of families and individuals across generations. Because Latinos who entered the United States after 1968 make up a large proportion of all Latinos in the United States, and are mostly not represented in the core sample, a Latino sample of about 2,000 households was added to the study sample in 1990. However, as this sample misses other major groups immigrated since 1968 – Asians in particular – the sample was dropped in 1995. In 1997 and 1999, an immigrant sample of about 500 families was added to the study and was followed together with the core sample in subsequent surveys. In 1997, due to substantial growth in the study sample over time, the core sample was reduced to 6,300 families from 8,500 families in the previous year. The majority of the reduction was in the SEO sample, where 43% of the sample, or around 1,700 families, remained.

In 1997, the Child Development Supplement (CDS) was initiated. All PSID families that have children 0 to 12 years of age in the reduced core sample and immigrant sample
were contacted, and up to two eligible children were randomly selected from each responding family. A total of 3,563 children from 2,394 PSID families were surveyed in 1997 (88.2% response rate). In 2002 and 2008, 2,907 (91% response rate) and 1,608 CDS children (90% response rate) aged 18 years or younger were followed up. Thus, depending on children’s ages in CDS I and loss to follow up in subsequent waves of CDS, children participated in between 1 and 3 waves of the study. In each wave of CDS, the primary caregivers (PCG’s) responded to questions about themselves and the study children. Children 8 years and older also responded to questions about themselves.

In 2005, when the oldest children in CDS reached 18 years of age, a Transition into Adulthood Supplement (TAS) was initiated. All CDS children who 1) were 18 or older; 2) lived away from their parents/caregivers or were no longer attending high school, and 3) were affiliated with families active in the family main interviews were eligible to participate. All eligible young adults were included in TAS biennially thereafter. The most recent wave of TAS available to the public was conducted in 2013, where young adults born in 1994 were the youngest cohort to participate. The age of the participants in consecutive waves of CDS and TAS by their year of birth is presented in Table 2.1.
Table 2.1 Age of participants in Child Development Supplements (CDS) and Transition to Adulthood Supplement (TAS) by year of birth, up to age 22a.

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Legend:
- Participated CDS
- Participated TAS
- X A year when a survey was implemented

Notes: aAlthough the TAS includes participants who are 23 years or older, they are not included in the current studies; bThe 18-year-olds participated in TAS if they meet the eligibility criteria for CDS. Otherwise, they participated in CDS.
The neighborhood structural characteristics used in this dissertation were reported in the United States Decennial Census. The U.S. Census collects information regarding demographic characteristics and housing on all persons living in the country. The smallest geographic unit for which population and housing indicators are provided to the public is the census tract. A census tract contains between 1,000 and 8,000 people, with an optimum size of 4,000 people. It is a relatively permanent statistical subdivision of a county designed to be relatively homogeneous in population characteristics, economic status, and living conditions at the time when it was established. Indicators available on the census tract level include income, poverty, employment, education, family structure, racial composition, home ownership and residential stability.

Because some of the census tract boundaries change across Census periods, the Longitudinal Tract Database (Logan, Xu, & Stults, 2014) has re-mapped census tract indicators reported in 1980, 1990 and 2000 Censuses into tract boundaries established in the 2010 Census, so that the indicators are comparable across years. These longitudinal census tract indicators in Census years were then interpolated as a linear function of years to cover years between two censuses.

Census tract indicators are the most commonly used neighborhood measures and have been demonstrated to be relevant to children’s outcomes. Although different geographic units – such as school district, street block, and areas of daily activities – are appropriate to evaluate different outcomes of interest, the census tract has the benefit of being widely available and comparable across time, and covering the entire country. In this dissertation, the census tract structural characteristics were complemented by neighborhood measures collected in the PSID, including respondents’ subjective perceptions of neighborhood quality, safety and social organization, as well as interviewers’ observations of the physical conditions of the immediate surroundings of participants' houses.
Summary of Methods in the Three Studies

This section provides a summary of the study sample, measures and analytic approach of each of the three studies comprising the dissertation. The details of the methods are included in the respective chapters dedicated to each study. All of the data management, tabulation and regression analyses were implemented in Stata, version 12 (StataCorp, 2011), and all the structural equation models were implemented in Mplus, version 7 (Muthén & Muthén, 2010).

Aim 1 Study

Aim 1 examined children’s longitudinal exposure to poor neighborhoods (defined as neighborhoods with 20% or higher poverty rate as poor neighborhoods, per convention) throughout childhood and adolescence. The study chose to focus on children born in poor families, as family poverty at birth is highly predictive of persistent family poverty later on. The study included all CDS children whose families were poor in the years when they were born and excluded all children from the immigrant sample due to lack of data on their neighborhood residence before 1997. As a result, aim 1 included 674 children who were poor at birth. Children’s neighborhood poverty rate, family demographics and resources from birth to age 18 were repeatedly observed in annual/biennial intervals in the family main interviews, yielding 7,360 repeated observations on the sample of children, or an average of 10.9 observations per child. The CDS children and the repeated observations are used as units of analysis for different sets of analysis.

The first part of Aim 1 involved a descriptive analysis of long-term exposure to neighborhood poverty. The analyses used the 7,360 repeated observations as units of analysis. To reflect the timing of exposure to poor neighborhoods, I plotted the proportion of
children currently exposed to poor neighborhoods against their age (aim 1.1). To reflect the persistence of exposure to poor neighborhoods, I stratified children by past and current exposure to poor neighborhoods and plotted the proportion in each group against their (aim 1.2). To reflect the duration of exposure, I plotted the cumulative number of years of exposure to poor neighborhoods against children’s age by past and current exposure group (aim 1.3). Lastly, to understand the family conditions that predict the cumulative duration of exposure to poor neighborhoods, I implemented regression analysis using the 674 children as units of analysis. The total number of years each child was exposed to poor neighborhoods at age 18 was modeled as a function of average family demographics and resources over childhood and adolescence, and parents’ residential history before the child was born (Aim 1.4).

**Aim 2 Study**

Aim 2 examined the longitudinal relationships between perceived neighborhood quality and child externalizing behaviors. All 3,563 children who participated in the first waves of CDS were included in the study. Measures of perceived neighborhood quality, family processes and child externalizing behaviors were reported in consecutive waves of CDS. The measure of family resources was a composite of several variables reported in consecutive waves of family main interviews. Using latent growth curve modeling, I decomposed the repeated measures of externalizing behaviors into a baseline value and a change over time, which were modeled as functions of neighborhood quality and family resources at baseline and during follow-up respectively (aim 2.1). I also tested several family process variables as the mediators of the effects of neighborhood effects on the changes in externalizing behaviors during follow-up (aim 2.2).

**Aim 3 Study**
Aim 3 examined the longitudinal relationships of perceived neighborhood quality and neighborhood structural advantage, respectively, with educational attainment at the end of adolescence. The study included 2,512 young adults who participated in at least one wave of TAS before age 22. Educational attainments, measured by high school graduation and college attendance, were reported in the earliest wave of TAS individual participated. Perceived neighborhood quality was reported in consecutive waves of CDS, and neighborhood structural advantage was a composite of census tract indicators. Both neighborhood measures were averaged across years to represent the cumulative exposures. Family conditions reported in the family main interviews were also averaged over participants’ childhood and adolescent years to capture the cumulative exposures. The intermediary child outcomes, reported in the latest wave of CDS the child participated, including mental health, and educational motivations, behaviors and achievements were tested as mediators of neighborhood effects. To examine the independent effects of perceived neighborhood quality and neighborhood structural advantage on adolescents’ educational outcomes, I modeled high school graduation as a function of both neighborhood indicators simultaneously, controlling for relevant family conditions using structural equation modeling (aim 3.1, main model). Then, I add intermediary child outcomes to the main model to test potential mediation by these variables (aim 3.2, mediation model). Then, to examine whether effects of neighborhood conditions specific to the levels of educational attainment, I repeated the main model and the mediation model using college attendance as the outcome.

**Study Variables**

**List of Variables**
Table 2.2 lists all variables used in the dissertation, organized by measurement domains. It also identifies the variables’ sources and roles in each of the three studies.

Table 2.2 Variables by measurement domains, sources and roles in each study

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<th>Measurement Domain</th>
<th>Source</th>
<th>Variable (reporter)</th>
<th>Roles in Relevant Studies</th>
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<td>Neighborhood structural characteristics</td>
<td>Main family interview; U.S. Censuses</td>
<td>Neighborhood poverty rate (Census)</td>
<td>Aim 1 - outcome of interest</td>
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<td>Parental neighborhood poverty rate (Census)</td>
<td>Aim 1 - predictor of neighborhood outcomes</td>
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<td>Neighborhood advantage (Census)</td>
<td>Aim 3 - exposure of interest</td>
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<td>CDS</td>
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<td>Aim 2 &amp; 3 - exposure of interest</td>
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<td>Perceived neighborhood safety (PCG)</td>
<td>Auxiliary variable used to cross-validate other neighborhood measures</td>
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<td>Observed neighborhood physical disorder (interviewer)</td>
<td>Auxiliary variable used to cross-validate other neighborhood measures</td>
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<td>Family demographics &amp; resources</td>
<td>Main family interview</td>
<td>Race (head)</td>
<td>Aim 1 - predictors of neighborhood outcomes; Aim 2 &amp; 3 - confounders of neighborhood effects</td>
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Note: \(^a\)The measure of externalizing behaviors is an intermediate outcome in aim 3, and the outcome of interest in aim 2.

Abbreviates: CDS – child development supplement; TAS – transition to adulthood supplement

Description of Core Variables

**Neighborhood poverty** is a structural characteristic hypothesized to affect a range of physical and social conditions of the neighborhood. It is the outcome of interest for aim 1. Families’ census tract of residence was reported in family main interviews, and the percent of families in the census tract living under federal poverty line was reported in the U.S. Census. Neighborhoods with 20% or higher poverty rate were defined as poor neighborhoods.

**Neighborhood advantage** is another structural characteristic known to be especially relevant for children’s educational outcomes. It is one of the exposures of interest for aim 3. Three census tract indicators reported in the U.S. Censuses, including median family income, percent of adults with college degree and percent of adults holding professional jobs, were used to generate a composite measure of neighborhood advantage. I conducted an exploratory factor analysis on the three indicators using all census tracts in the mainland United States in all years between 1980 and 2010. The analysis yielded a single factor for neighborhood advantage with the lowest loading at 0.74 and a Cronbach’s alpha of 0.91. Similar measures on neighborhood advantage are commonly accepted in current literature (Johnson, 2012).

**Perceived neighborhood quality** is a subjective measure of neighborhood environments. In CDS, Primary caregivers (PCG’s) responded to the question “How would
you rate your neighborhood as a place to raise children” on a 5-point Likert scale from “excellent” to “poor”. The measure mainly captures variation in poor neighborhood qualities, but it appears to be less sensitive in reflecting variation in the good qualities. For example, neighborhoods were reported to be “excellent” or “very good” about 70% of the time, and they were reported to be “good”, “fair” and “poor” only 23%, 13% and 3% of the time, respectively. Better neighborhood quality was significantly correlated with lower census tract poverty rate ($r = -0.42$), more interviewer-observed neighborhood physical deterioration ($r = 0.40$), and lower levels of PCG-reported safety of walking at night ($r = -0.47$). Thus, the variable ‘neighborhood quality’ is primarily a measure of poor quality neighborhoods.

**Externalizing Behaviors** in childhood and adolescence are the outcomes of interest for aim 2, as well as an intermediate outcome for aim 3. PCG’s responded to the Behavioral Problem Index (BPI) (Peterson & Zill, 1986), indicating whether each of 30 statements was “often true”, “sometimes true” or “not true” based on their children’s behaviors. In an exploratory factor analysis (EFA) on all of the items, three factors emerged, corresponding to externalizing behaviors, internalizing behaviors and hyperactivity. The 10 items with loadings of at least 0.50 on the externalizing behaviors factor were summed into an externalizing behaviors score, ranging from 0 to 20, with higher scores indicating more externalizing problems (Cronbach’s alpha = 0.84). Examples of the items in the scale are “disobedient” and “mean to others”.

Although many studies have used the externalizing behaviors subscale of BPI as originally designed (Peterson & Zill, 1986), one study raised concern about the cross-ethnic and longitudinal measurement invariance of this subscale and proposed a revised subscale which has better properties in these respects (Guttmannova, Szanyi, & Cali, 2007). Our subscale was informed by our study sample, and the list of indicators included is very similar to the revised subscale by Guttmannova and colleagues.
Educational Attainment at the transition into adulthood is the outcomes of interest for aim 3. High school graduation (graduated vs. dropout) and college attendance (yes vs. no) were reported by young adults at each wave of TAS. The report from the first wave of TAS each young adult participated was used in the study, so that educational attainment immediately after termination of high school (either dropped out or graduated) and/or leaving home was evaluated.

Use of Structural Equation Modeling

Properties of Structural Equation Models

The most frequently used modeling approach in the dissertation is structural equation modeling, which is a class of models that fit networks of constructs to data. One signature of these models is the use of latent constructs. “Latent” refers to the construct being measured indirectly, usually using multiple indicators, which allow measurement errors to be estimated. Another signature of structural equation models is the ability to accommodate complex networks of relationships. These relationships are mostly constructed a priori according to the theories, and are fitted using the data. These properties of structural equation models enable studies to evaluate more complex phenomena and arguably support stronger causal inferences. In contrast, regression models can only test single-direction relationships between a dependent variable and a set of independent variables. However, a caveat of structural equation modeling is that the validity of the relationships discovered is contingent on having specified the correct set of relationships to be tested in the first place (Kline, 2015).

General Model Building Procures and Specific Model Testing
This section gives a general overview of the procedure used to construct structural equation models and criteria for model selection and testing in the dissertation.

All structural equations models were constructed *a priori*, informed by theories and previous empirical evidence. As a first step, the measurement models were tested separately using confirmatory factor analysis (CFA). When they were satisfactory, the structural components of the models were added. Whenever available, fit statistics (RMSEA, SRMR, CFI and TLI) were used to evaluate the overall model fit, and modification indices were consulted to make specific modifications to existing models. Bayesian information criterion (BIC) was used to compare fit across models with the same set of observed variables. All models used full-information maximum likelihood estimators, which handles missing data within the analysis model, instead of replacing or imputing the missing values in separate steps. Multiple group analysis was routinely conducted to examine potential differences in the target relationships between males and females, and across age groups.

The externalizing behavior subscale used in both aim 2 and aim 3 was tested in a CFA. The overall fit and measurement invariance across age and gender were evaluated and found to be satisfactory. Eventually, the sum of scores from all items included in the subscale was used in the analysis.

In aim 2, because externalizing behavior trajectories potentially involves different timings in the initiation, continuation and desistance of the behaviors (Broidy et al., 2003; Moffitt, 1993; Odgers et al., 2008), they were initially test-modeled using latent growth mixture models. The latent growth mixture models classify growth trajectories into groups by their distinct patterns and estimate a set of latent growth factors for each group of trajectories, thus allowing for heterogeneity among trajectories. Using BIC values, I compared a latent growth mixture model estimating two groups of trajectories with a latent growth curve model estimating a single group of trajectories for all observations, and eventually chose to use the latent growth curve model.
Sample Weight and Clustering

PSID Sample Weights

The PSID has a representative sample of the United States population. For the family main interviews in a specific year, PSID created longitudinal family weights to make the sample representative of the United States population. These weights take account of the differential probability of selection in the initial samples (e.g. core sample, immigrant sample) and attrition over time. For interviews in 1997 and afterwards, the longitudinal family weights also take account of the selection probability related to core sample reduction. The 1997 CDS child weights are a product of three factors: 1) a family selection weight similar to the 1997 longitudinal family weight, 2) a post-stratification factor, which adjusts the sample to be comparable in demographic and geographic characteristics to the families in the 1997 Current Population Survey, and 3) a within-family selection weight, which is the inverse of the probability of selection among all eligible children in the family (Panel Study of Income Dynamics, 1999). The wave II and III of CDS used CDS child weights from wave I, adjusted for subsequent sample attrition. After applying CDS child weights, the CDS samples of children are representative of all children of their age cohort in the United States.

Application of Weights in the Dissertation

In aim 1, the descriptive analysis used repeated observations from the main family survey as the units of analysis. The units were weighted by CDS children’s weights in the corresponding years. Specifically, observations from 1985 to 2001 were weighted using the 1997 CDS weights; observations between 2002 and 2006 were weighted using the 2002 CDS weights, and those in 2007 and after were weighted using the 2007 CDS weights. The regression analysis used children as the units of analysis, which was weighted by CDS

The aim 2 analysis was weighted by CDS children’s weight in 1997. The weighted samples represented all children in the corresponding age cohorts in the United States.

In aim 3, I created a set of young adults’ weights, which took account of 1997 CDS children’s weight in 1997 (Panel Study of Income Dynamics, 1999) and attrition afterwards. An attrition adjustment factor was created as the inverse probability of having at least one follow-up in TAS between age 18 and 22, conditional on being eligible to participate in any wave of TAS. The estimation procedures were similar to those used to estimate young adults’ weights for a single wave TAS (Gouskova & Heeringa, 2008). The weighted sample represents young adults in the corresponding age cohorts in the United States.

**Treatment of Sample Clusters**

Because up to two children were selected within each family to participate in the CDS, children in the study samples were not independent. Further, because repeated observations were made on each child, analyses using these observations as the units of analysis also have non-independence across observations. In all of the regression models and structural equation models, the clustering of children within families and of repeated observations within children were taken account of in the estimations of parameters and standard errors.
References


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CHAPTER III

Poor Children’s Long-Term Exposure to Neighborhood Poverty and Its Family Correlates
Abstract

Background: Neighborhood poverty may compromise children’s educational outcomes and contribute to behavioral and mental health problems; the extent of the effects depends on the timing and duration of such exposures. The study examined long-term exposure to neighborhood poverty among a national cohort of poor children.

Methods: The study was based on 674 non-immigrant children born in poor families who participated in the Child Development Supplement of the Panel Study of Income Dynamics. A total of 7,360 repeated observations were made on the study children from birth to age 17. Children’s census tract of residence and their family conditions were reported in each of the observations. Census tracts with 20% or higher poverty rate were defined as poor neighborhoods. In the descriptive analyses, children’s current exposure, cumulative pattern of exposure and cumulative duration of exposure to poor neighborhoods were plotted against children’s age. In the regression analysis, children’s ever exposure and cumulative duration of exposure to poor neighborhoods from birth to age 17 were modeled as functions of their families’ demographics, socioeconomic conditions and neighborhood histories.

Results: Around half of the children were residing in poor neighborhoods at any time during their childhood and adolescence. The majority of children born in poor neighborhoods remained in poor neighborhoods at age 17. These children accounted for more than a third of all children in the sample and spent most of their childhood and adolescence in poor neighborhoods. Ever exposure to poor neighborhoods was strongly and solely predicted by being racial/ethnic minorities. Total duration of exposure to poor neighborhoods was predicted by being racial/ethnic minorities, family histories in poor neighborhoods, and to a lesser extent, extreme family poverty.

Conclusions: A substantial proportion of children born in poor families experienced inter-generational and persistent exposure to neighborhood poverty. Such exposures may have important implications for children’s health and development. Minorities and children with
family histories living in poor neighborhoods were at greatly enhanced risks for exposure to poor neighborhoods. Interventions that actively redress neighborhood racial segregation and income stratification may help poor families and their children to escape persistent neighborhood poverty permanently.
Introduction

Neighborhood environments are important for children’s development. Children living in neighborhoods with high levels of poverty, on average, experience more violence, have fewer positive role models and attend lower quality schools. Their parents may also have difficulties in maintaining optimal functional state due to stress and lack of social support for parenting (Leventhal & Brooks-Gunn, 2000). As a result, neighborhood poverty may compromise educational outcomes and contribute to behavioral and mental health problems in children (Leventhal & Brooks-Gunn, 2000).

In the United States, due to severe income stratification and racial segregation in the residential space (Sampson & Sharkey, 2008), large segments of the population live in neighborhoods with high levels of poverty, and the poor and racial/ethnic minorities bear an especially heavy burden. For example, one-fourth of all Americans currently live in poor neighborhoods (where 20% or more households are below the federal poverty level), and 4% live in extremely poor neighborhoods (where 40% or more households are the below federal poverty level). In contrast, half and 12% of poor Americans live in poor and extremely poor neighborhoods, and as high as 25% of poor African Americans live in extremely poor neighborhoods (Jargowsky, 2014). As neighborhood poverty usually compounds families’ economic and social disadvantages, it may contribute to the persistent income and racial disparities in children’s health and development existing today (Flores, 2010; Larson & Halfon, 2010; McLoyd, 1998). The extent of the contribution may be partially contingent on the developmental stage when children are exposed to poor neighborhood, and the cumulative duration of the exposure (Harding, Gennetian, Winship, Sanbonmatsu, & Kling, 2010). Surprisingly, despite the large amount of literature devoted to neighborhood effects on children’s outcomes, the more basic questions on the timing and duration of children’s exposure to neighborhood poverty are rarely examined. The current study examines these
questions in a longitudinal cohort of children who were born in poor families – a group of children most likely to be exposed to neighborhood poverty.

The Creation of Neighborhood Inequality and Residential Segregation

The highly segregated and unequal neighborhood landscape existing in the United States today was largely created by major social forces and public policies during the second half of the twentieth century. During World War II and the following decades, large numbers of African Americans migrated from the rural South into the industrial cities in the North. Partially to flee the increasing African American presence, middle-class white Americans left the city centers in droves to live in predominantly white neighborhoods in the suburbs (Boustan, 2010). At the same time, massive suburban development was supported by a series of federal subsidies, including in interstate highway system (Baum-Snow, 2007), suburban infrastructures, homeowners tax credit (Ewing, 2008) and home mortgage insurance (Hanchett, 2000). In particular, the federal home mortgage insurance has made home mortgage much more affordable, contributing to dramatic increase in home ownership in the United States since its inception. However, for four decades, federal housing administration had explicitly required banks and other private lenders to restrict lending in many inner-city minority neighborhoods, causing under-investment and plummeting housing values in these areas. While a combination of these social forces and the public policies has contributed to flourishing suburban neighborhoods, it has led to depopulation, poverty and decay in the inner-cities (Salins, 1993). The resulting racial and economic divides between inner-city and suburban neighborhoods was largely maintained across generations until today (Sharkey, 2008).

Theories on Residential Sorting
Within the confines of available neighborhoods in a local area, families decide where to live to satisfy their residential preferences within the limits of their resources. Several classic theories describe the processes in which families sort into neighborhoods. The *residential satisfaction model* posits that families evaluate their housing and neighborhood conditions against family members’ life cycle needs, such as getting married and raising children, and they consider moving when their needs are not satisfied (Speare, 1974). As families’ neighborhood choices have to be supported by their abilities to afford housing in the given location, the *human capital model* posits that families usually end up in neighborhoods that “match” their socioeconomic status (SES) (South & Crowder, 1997). In addition, due to racial segregation and steeper neighborhood SES stratification among some minority groups (South et al., 2005), black families, and to a lesser extent other racial/ethnic minority families, usually reside in much more disadvantaged neighborhoods than white families of similar SES (Alba & Logan, 1993; Logan & Alba, 1993). The phenomenon is referred to as *place stratification*, because neighborhood is considered to constitute another level of social stratification beyond the family SES. In a highly segregated and unequal landscape, the sorting of families according to their SES and race yields a structural pattern of population flows across neighborhoods which serves to reproduce this landscape (Sampson & Sharkey, 2008).

**Neighborhood Challenges Faced by Poor Families with Children**

Poor families face significant challenges to satisfy adults and children’s housing needs within their limited economic resources. This was illustrated vividly by the Moving To Opportunity program (MTO), a residential mobility experiment carried out in the 1990s in four cities in the United States which provided public housing residents with vouchers to relocate to low-poverty neighborhoods. Although MTO participants who moved to low-poverty neighborhoods valued the safety and other features of their new neighborhoods,
many returned to high-poverty neighborhoods (Briggs et al., 2010). These moves were often initiated when their housing needs changed: they may need larger homes to accommodate growth in family size or children’s age, or they may need separate housing due to relationship changes or to live away from the extended families. With limited financial resources, MTO participants often had to move to a poorer neighborhood to afford basic housing needs (Rosenblatt & DeLuca, 2012).

Beyond the factors considered in the classic theories on neighborhood sorting, poor families’ neighborhood choices may also be affected by their residential histories. For example, many MTO participants thought their life-long experiences living in poor and dangerous neighborhoods enabled them to fall back to such neighborhoods when they faced challenges to remain in low-poverty areas. They believed that the strategies they developed to cope with dangerous surroundings would protect themselves and their children from harm (Rosenblatt & DeLuca, 2012). In contrast to MTO’s failure to maintain participants’ neighborhood benefits over long term, the Gautreaux residential mobility program, a court-ordered desegregation in Chicago during 1980s, has succeeded in largely maintain participants’ advantageous neighborhood conditions some twenty years later into the second generation (DeLuca, Duncan, Keels, & Mendenhall, 2010). The contrast is partially explained by the Gautreaux program participants being largely first- or second-generation public housing residents, whereas the MTO participants’ had much longer histories living in such neighborhoods (Duncan & Zuberi, 2006). In addition, the effects of families’ residential histories on their neighborhood outcomes were also supported elsewhere, and were found to be both independent of, and stronger than, the effects of their childhood family background and their educational advancements (Sharkey, 2008).

Long-Term Exposure to Poor Neighborhoods
Besides the predictors of families’ neighborhood outcomes, families’ neighborhood experiences have rarely been examined as a continuous phenomenon, over relatively long periods of time. Three decades ago, Wilson described an African American underclass residing in segregated poor inner-city neighborhoods, assuming little exchange between such neighborhoods and the mainstream, more affluent areas (Wilson, 1987). This “isolation assumption” was later tested by Quillian in a study on adults’ long-term exposure to poor neighborhoods. The study found that it was not uncommon for residents of poor neighborhoods to move into non-poor neighborhoods. However, returns to poor neighborhoods were also very frequent. In addition, independent of their poverty status and family structure, African Americans on average stayed much longer and were much more likely to return to poor neighborhoods than whites (Quillian, 2003). Thus, a large segment of the population, especially of African Americans, is constantly circulating in and out of poor neighborhoods, but never permanently escapes such neighborhoods. If the exchanges between poor and non-poor neighborhoods among children are such that residence in poor neighborhoods is as persistent as observed among adults, exposed to poor neighborhoods may have great implications for children’s outcomes.

The Current Study

To understand the impact of poor neighborhoods on children’s health and development, we investigate the timing and cumulative duration of such exposures. The study is based on a cohort of non-immigrant children born in poor families followed throughout the course of their development. Using repeated measures on children’s neighborhood outcomes, the study first described the timing, persistence and duration of children’s exposure to poor neighborhoods in relation to their age (i.e. per observation analyses). Using aggregates of repeated measures on children’s neighborhood outcomes and family conditions across time, the study then modeled children’s ever exposure and
cumulative duration of exposure to poor neighborhoods as a function of their family characteristics (i.e. per child analyses).

**Methods**

**Data Source and Study Sample**

The Panel Study of Income Dynamics (PSID) (Panel Study of Income Dynamics, 2016) is a national longitudinal study which interviews U.S. families in annual intervals from 1968 to 1997 and biennial intervals afterwards (i.e. family main interviews). In 1997, 3,563 children aged 0 to 12 years from 2,380 PSID families were selected to participate in the Child Development Studies (CDS). They were subsequently followed up for two additional waves of surveys in 2002 and 2007. These children constitute the most recent cohort in PSID to reach adulthood. Among the initial sample of CDS children, over 90% was offspring of the *core sample* originally recruited in 1968, and the remaining was part of the *immigrant sample* newly recruited in 1997. Children’s weights were provided in each of the three waves of CDS, which account for initial probability of selection as well as lost to sample attrition (Gouskova, Heeringa, McGonagle, Schoeni, & Stafford, 2008). After applying the weights, samples in the three waves of CDS were representative of their age cohort in the United States in the respective years.

The current study included CDS children whose families were poor in the years they were born, and it excluded children from the immigrant sample, due to a lack of data on them before 1997. As a result, the study contains 674 children. Children’s neighborhood outcomes and family conditions from birth up to age 17 were repeatedly observed in the annual/biennial family main interviews, resulting to 7,360 observations, or an average of 10.9 observations per child (ranges between 1 and 16 observations per child). Six observations missing neighborhood outcomes excluded from the descriptive analyses.
These observations were made between 1984, when the oldest children were born, to 2011, when the latest interviews were available and the youngest children were 14 years old (see Table S.1 for children’s age by year of birth and year of family main interviews. See Table S.2 for number of observations by children’s age). The descriptive analyses were based on the 7,354 repeated observations, and the regression analyses were based on summary measures on the 674 children.

Measures

The following measures on neighborhood outcomes and family conditions were all defined using repeated observations as units of analysis.

**Neighborhood Poverty.** Children’s neighborhood poverty status was defined by their census tract poverty rate in a study observation. Specifically, children’s residential addresses, recorded in the annual/biennial PSID main family interviews, were geocoded into census tracts. Tract boundaries established in 2010 Census were used for addresses recorded in all years to ensure consistency in tract boundaries across years. The census tract poverty rates for the census years (1980, 1990, 2000 and 2010) were obtained from the Longitudinal Tract Database project, which also re-mapped the census indicators into 2010 tract boundaries (Logan et al., 2014). The rates for years between censuses were obtained by interpolating data in census years as a linear function of year. Because neighborhood poverty is known to encourage negative behaviors among residents starting around 20% of poverty (Galster, Quercia, & Cortes, 2000), following conventions, we define “poor neighborhood” as one with 20% or higher poverty (Jargowsky, 2014). This study adopted the 20% poverty threshold to define poor neighborhood. To test the sensitivity of the findings to the threshold used to define poor neighborhood, we have also run sensitivity analyses using a 30% poverty threshold.
Cumulative Patterns of Exposure to Neighborhood Poverty. Children’s cumulative patterns of exposure to poor neighborhoods reflect the persistence of such exposure. The patterns were defined by children’s neighborhood poverty status from birth up to each study observation. Specifically, six exposure patterns were defined by cross-classifications of neighborhood poverty status (poor vs. non-poor) at birth, neighborhood poverty status at the time of the observation, and transitions between poor and non-poor neighborhoods (yes vs. no) (See Table 3.1 for details). Ranging from the most to the least persistent exposure, the six patterns were: born in poor neighborhoods and … 1) always exposed; 2) currently exposed, with gaps between periods of exposure; 3) only previously exposed; born in non-poor neighborhoods and … 4) currently exposed; 5) only previous exposed; 6) never exposed.

Cumulative Duration of Exposure to Neighborhood Poverty. Children’s cumulative duration of exposure to poor neighborhoods at each time of observation were calculated as the total number of years of exposure from birth up to the time of the observation. We counted observations with annual intervals as one year and those with biennial intervals as two years, allowing the sum of the durations of all observations on a child to reflect the full length of the duration of follow-ups.

Family Conditions. Family conditions that may contribute to children’s neighborhood outcomes include family demographics, socioeconomic conditions, and neighborhood histories. These variables were also reported in the family main interviews. Family demographics reflect family relations and members’ life-cycle stage, both of which are related to families’ housing preferences. These variables include the age and marital status of the household head (married vs. single, divorced or separated), number of children in the household, age of the target child, and household changes (no changes vs. child split-off from the household or moved to a relative’s house). Another family demographic variable is the race of the household head (white vs. non-white), which captures the structural
limitations racial/ethnic minorities face in their locational choices. Because the immigrant sample is not included in the study, the non-white sample mostly consists of African Americans.

*Family socioeconomic conditions* largely reflect families’ resources to support their locational choices. These variables include parental education (higher between head and wife), family poverty status (extremely poor, poor, near poor vs. non-poor), unemployment in the household head (yes vs. no) and housing tenure (owning vs. renting/other). Specifically, family poverty status was defined by income to needs ratio, which was calculated as the sum of annual family taxable and transfer incomes, divided by federal poverty level in the survey year for the family of the given size. Needs ratios that were < 0.5, 0.5-0.9, 1.0-1.9 and > 2.0 were categorized as extremely poor, poor, near poor and non-poor, respectively.

*Family neighborhood histories*, including whether the child was born in a poor neighborhood, and years parents spent in poor neighborhoods in the five years before the birth of the child, were used to capture the continuity of neighborhood context across time and generations. Children's birth in poor neighborhoods was defined as living in a poor neighborhood in the first main family interview they participated (almost always when they were younger than 2 years of age). The parental histories in poor neighborhoods were calculated as the average between two the parents if data were available on both of them; five years before the birth of the child represented parents’ most recent residential history.

**Statistical Analysis**

Describe the Timing, Persistence and Cumulative Duration of Exposure to Poor Neighborhoods (Per Observation Analyses). To reflect the timing of exposure, we plotted the proportion of children currently exposed to poor neighborhoods against their age. To illustrate the extent to which family poverty may contribute to exposure to poor neighborhoods, we also plotted the proportion of children whose families were poor against
their age in the same figure (Figure 3.1). To reflect the persistence of children’s exposure to poor neighborhoods, we plotted proportions of children following each cumulative exposure patterns against their age (Figure 3.2). Lastly, to reflect the cumulative durations of exposure, we plotted the durations for each cumulative exposure patterns against children’s age (Figure 3.3).

The descriptive analyses applied CDS children’s weights. Specifically, observations up to 2001 were weighted using the 1997 CDS weight; observations between 2002 and 2006 were weighted using the 2002 CDS weights, and observations in 2007 and after were weighted using the 2007 CDS weights. The carry-over of weights across years is common and appropriate in PSID family main interviews (Gouskova et al., 2008).

Predict Ever Exposure and Total Duration of Exposure to Poor Neighborhoods (Per Child Analyses). Children’s exposure to poor neighborhoods across observations was aggregated from birth to age 17 to represent their overall levels of exposure. Children were defined as ever exposed to poor neighborhoods if they were exposed to poor neighborhood in any of the observations. Children’s total duration of exposure to poor neighborhoods was defined as the total number of observations exposed. Unlike the cumulative exposure duration variable calculated in the descriptive analysis, both annual and biennial interviews were counted as one year of observation.

The family conditions used to predict children’s overall exposures to neighborhood poverty were also summarized from birth to age 17. Specifically, all variables that do not change across observations (i.e. race of household head, parental education, and whether child born in a poor neighborhood) took on the values measured at the first family interview a child participated. The only exception is parental exposure to poor neighborhoods in the five years before the birth of the child, which was aggregated from annual observations on the parents in corresponding years. Variables that change across observations were aggregated across all observations on each child, either into mean values (i.e. age of
household head, number of children in the household, and age of the target child), or the number of observations when a certain condition was met (i.e. household head single; family change; household head unemployed; family extremely poor, poor, or near poor; and family renting home).

In a logistic regression model, children’s ever exposure to poor neighborhoods was modeled as a function of all the family demographic and socioeconomic variables (variables on families’ neighborhood histories were not included because they fully predict the outcomes in some of the children). Then, in a linear regression model, children’s total duration of exposure to poor neighborhoods among those ever exposed was modeled as a function of all the family demographic, socioeconomic and neighborhood history variables. Because the study children were born in different years and may be followed up by different intervals and for different durations, both regression models were adjusted for the total number of observations made on each child, and the mean of the calendar years when the observations were made. The models were weighted using the 1997 CDS weights and accounted for the clustering of children within the household using robust standard error estimates. In the first model, only 2 out of 674 children had missing values on any of the covariates, and in the second model, only 39 out of 570 children ever exposed to poor neighborhoods had missing values on any of the covariates (almost all of the missing values are on parental neighborhood histories). Because the extent of missingness was very limited, observations were missing values were excluded from the analyses.

Sensitivity analyses using 30% of poverty threshold to define poor neighborhoods were presented in Table S.3, Figure S.1-S.3 and Table S.4. These results were largely in line with the main analyses and did not alter any of the major study conclusions.
Results

Sample Characteristics

The background characteristics of the children born in poor families were shown for study observations (N=7,360) and children (N=674) on the left and right panel of Table 3.2, respectively. The weighted sample characteristics were reported below. On average, each child had 10.9 observations (standard deviation (SD) = 2.8) (right panel), and these observations were made in 1998 (SD = 6.2) (left panel). The children were 44% white, 53% African American and 3% of other race/ethnicity (right panel). Fifty-six percent of them were born in poor neighborhoods, and 55% had parents who lived in poor neighborhoods for the majority part of the five years before their birth (right panel). On average, the observations were made when children were 7.5 years of age (SD = 5.0) (left panel). Children lived in poor neighborhoods in more than half of the observations (left panel). Across their entire childhood and adolescence, 76% of children have ever resided in poor neighborhoods; the entire sample of children on average lived in poor neighborhoods for 5.9 observations (SD = 4.8) (right panel).

Describe the Timing, Persistence and Cumulative Duration of Exposure to Poor Neighborhoods (Per Observation Analyses).

Figure 3.1 shows the proportion of study children currently living in poor neighborhoods and the proportion currently living in poor families at each age. At birth, 58% of children lived in poor neighborhood. The proportion decreased slightly over the years and reached around 50% at age 17. In contrast, the proportion of children in poor families declined sharply during early childhood from 100% at birth to around 65% at age 3, then gradually to around 30% at age 17.

Figure 3.2 shows the proportions of children following each cumulative exposure pattern by their age. At birth, 58% were in poor neighborhoods and 42% were in non-poor
neighborhoods. Among children born in poor neighborhoods, around 30% have always been in poor neighborhoods, 30% exited poor neighborhoods but re-entered at some point – both groups were still in poor neighborhoods at age 17; the remaining 40% were no longer in poor neighborhoods at age 17. Among children born in non-poor neighborhoods, 72% have never lived in poor neighborhoods, 10% entered poor neighborhoods but exited at some point – both were still in non-poor neighborhoods at age 17; only the remaining 18% resided in poor neighborhoods at age 17.

Figure 3.3 shows the cumulative duration of children exposure to poor neighborhoods, averaged for each cumulative exposure pattern across age. Overall, years of exposure increased as linear functions of children’s age for all exposure patterns. At age 17, children born in poor neighborhoods and 1) always exposed to poor neighborhoods, 2) currently exposed with gaps between periods of exposure, and 3) only previously exposed had 17, 12 and 9 years of exposure; children born in non-poor neighborhood and 4) currently exposed, and 5) only previously exposed had 9 and 4 years of exposure.

In sum, around half of all children born in poor neighborhoods were exposed to poor neighborhoods at any age. Despite the dramatic decline in family poverty rate, proportion of children in poor neighborhoods declined only slightly from birth to age 17. The majority of children born in poor neighborhoods remained in poor neighborhoods at age 17. These children accounted for more than a third of all children in our sample and spent most of their childhood and adolescence in poor neighborhoods.

**Predict Ever Exposure and Total Duration of Exposure to Poor Neighborhoods (Per Child Analyses).**

The associations between family conditions and children’s ever exposure to poor neighborhoods are shown on the left panel of Table 3.3. Among survey variables adjusted for, more recent years of observation were associated with increased risk of ever exposure
(OR = 1.16, \( p = 0.04 \)). Although several family factors, such as head being single, household changes and extreme family poor, were associated with slightly elevated risk of ever exposure, and younger age of children was associated with slightly decreased risk of ever exposure, none of the associations were significant. In contrast, household head being non-white was associated with 13 times the odds of living in poor neighborhoods (\( p < 0.001 \)).

The associations between family conditions and children’s total duration of exposure to poor neighborhoods among those ever exposed were shown on the right panel of Table 3.2. For each additional observation on a child, an average of 0.53 observations was spent in poor neighborhoods (\( p < 0.001 \)). Household head being non-white was associated with 1.24 more observations in poor neighborhoods (\( p = 0.04 \)). Being born in poor neighborhoods was associated with 2.33 (\( p < 0.001 \)) more observations in poor neighborhoods. One additional year parents spent in poor neighborhood in the five years before the birth of the child was associated 0.50 (\( p < 0.001 \)) more observations in poor neighborhoods. Lastly, one additional year of extreme family poverty was associated with 0.24 (\( p = 0.03 \)) more observations in poor neighborhoods.

### Discussion

This is a study on long-term exposure to poor neighborhoods in a national cohort of non-immigrant children born in poor families. The study found that around half of the sample was residing in poor neighborhoods at any time during their childhood and adolescence. The majority of children born in poor neighborhoods remained in poor neighborhoods at age 17. These children accounted for more than a third of all children in the sample and spent most of their childhood and adolescence in poor neighborhoods. Ever exposure to poor neighborhoods was strongly and solely predicted by being racial/ethnic minorities. The total
duration of exposure to poor neighborhoods was predicted by being racial/ethnic minorities, family histories in poor neighborhoods, and to a lesser extent, extreme family poverty.

In the descriptive analyses, we found that the proportion of children residing in poor neighborhoods did not change substantially in response to large declines in family poverty as children grew (Figure 3.1). This finding, albeit omitted other influences on neighborhood outcomes, made a strong argument that residence in poor neighborhoods was not very contingent on families’ financial conditions in this sample.

As we classified children according to their current and previous neighborhood conditions, we found that although families did move between poor and non-poor neighborhoods, the majority of children born in poor neighborhoods either never left, or, when they did, returned after short stays in non-poor neighborhoods. These children accounted for one-third of the entire sample (Figure 3.2) and spent the majority of their childhood and adolescence in such neighborhoods (Figure 3.3). Similarly, most children born in non-poor neighborhoods have never entered poor neighborhoods (Figure 3.2). The findings suggest remarkable continuity in the type of neighborhoods families reside in.

When using family conditions to predict children’s overall exposure to poor neighborhoods, we found the race of household head to be the sole predictor of children’s ever exposure to neighborhood poverty. Being minority (predominantly African Americans) dramatically increased children’s odds of exposure, and also slightly increased their overall duration of stay. These associations likely reflect the effects of racial segregation in the residential landscape, and steeper neighborhood income stratification among African Americans (South et al., 2005). The findings partially replicated Quillian’s report that being African American was the strongest predictor of longer duration of stay in and a higher chance of re-entering into poor neighborhoods (Quillian, 2003).

A novel and remarkable finding was how strongly families’ neighborhood histories predicted longer exposure to poor neighborhoods in children. Although family neighborhood
histories cannot be evaluated in relation to children's ever-exposure to poor neighborhood in regression analyses, the descriptive showed that children's neighborhood outcomes were largely continuations of those of their parents' (Figure 3.2). The remarkable power of families' histories living in poor neighborhoods in predicting children's exposure to such neighborhoods may reflect families' lack of motivations to move out permanently – because they were accustomed to living in such conditions (Rosenblatt & DeLuca, 2012), and/or because they had social ties there (Speare, 1974). On the other hand, it may also reflect the continuation of segregation and housing market conditions in the local area, which restricted families' neighborhood options (Deck, 2010). In contrast to findings in cross-sectional studies, which found families' SES to predict their neighborhood outcomes (Alba & Logan, 1993; Sampson & Sharkey, 2008; South & Crowder, 1997), our study found almost none of the family SES variables to predict children's long-term neighborhood exposures. It may suggest that advancements in employment and financial situations among this sample of families were too limited to affect their neighborhood outcomes. Alternatively, the previous findings on the neighborhood – family SES association may simply reflect the effects of living in poor neighborhoods on their family SES (B. Entwisle, 2007). In any case, the findings reflect the difficulties for poor families to move out of poor neighborhoods permanently, and support the notion that place may be another layer of social stratification, which operate relatively independent from traditional stratifiers such as income, education and occupation (Sharkey, 2008).

Limitations

The study has several limitations. First of all, although PSID was designed to follow children continuously from birth to age 17, the survey changed from annual to biennial intervals in 1997. In addition, some children were lost to follow-up before age 17. As a result, study children vary in the number of observations available on them, as well as the age
when observations are made. This variability in study observations was controlled for in the regression analysis. Although it was not accounted for in the descriptive analysis, they were unlikely to alter the strong findings regarding the persistence of exposure to neighborhood poverty. The second limitation is the inability of the study to include the post-1968 immigrants, who did not participate PSID until 1997. As a result, the study is mostly concerned with whites and African Americans, and cannot be generalized to other racial groups and new immigrants. Lastly, the current study only evaluated the family conditions in relation to children’s neighborhood outcomes. Many structural conditions of the residential space – such as the extent of racial segregation across neighborhoods, tightness of housing market and local zoning regulations – may be important for families’ neighborhood outcomes.

Conclusions and Implications for Research and Policies

A large proportion of non-immigrant children born in poor families were persistently exposure to poor neighborhoods. The exposure was strongly predicted by being racial/ethnic minorities, and family histories of such exposures. The persistent exposures to neighborhood poverty throughout childhood and adolescence may have strong impact on children’s health and development. In the current literature on neighborhood and child development, children’s neighborhood conditions were mostly measured cross-sectionally or for very short periods of time. As such measures lump children who lived in poor neighborhoods all their lives together with those who stay transitorily, estimates of neighborhood effects in these studies were likely to be biased towards the null. Indeed, studies that accounted for the durations of exposure (Wodtke et al., 2011) or multi-generational exposure to neighborhood poverty (Sharkey & Elwert, 2011) supported more powerful effects of persistent neighborhood exposure on children’s developments. Future
studies on neighborhood effects should ideally measure neighborhood exposure for a long period of time in order to provide unbiased estimate.

This study suggests that minorities in poor neighborhoods have great difficulties escaping their neighborhoods, even if they have bettered themselves economically. The families’ neighborhood experiences reflect the powerful effects of racial segregation and income stratification in the residential landscape. It indicates that conventional cash and in-kind aids to poor families that have no place-based interventions are unlikely to help the poor to improve the neighborhood conditions. Although federal government provides low-income housing assistance, they only cover a very limited share of the eligible population (Center on Budget and Policy Priorities, 2015), and are only slightly effective in improving poor families’ neighborhood conditions (Deng, 2007; Pendall, 2000; Turner, 1998). This study indicate that place-based interventions that actively redress neighborhood racial segregation and income stratification, such as abolishing land use and zoning regulations that limit affordable housing in affluent suburban jurisdictions, and embracing development strategies that promote geographically balanced development, may be effective in helping poor family to escape poor neighborhoods permanently.
References


# Tables and figures

Table 3.1 Number of observations by cumulative patterns of exposure to poor neighborhood (N= 7,354)

<table>
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<th>Neighborhood of birth</th>
<th>Current neighborhood of residence</th>
<th>Transitions</th>
<th>Description</th>
<th># of observations</th>
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<td>2) Currently exposed, with gaps between periods of exposure</td>
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<td>5) Only previously exposed</td>
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<tr>
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Notes: No. – number; Wt.- weighted.
Figure 3.1 Proportions of children born in poor families who currently live in poor neighborhoods and in poor families by age (N = 7,354)
Figure 3.2 Proportion of children born in poor families in each cumulative exposure group by age (N = 7,354)
Figure 3.3 Cumulative number of years children born in poor families were exposure to poor neighborhoods by cumulative exposure patterns across age (N = 7,354)
Table 3.3 Regression of ever exposure and total duration of exposure to poor neighborhoods on family conditions

<table>
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<tr>
<th>Characteristics</th>
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<th>Total durations of exposure among the exposed (linear regression, N = 531)</th>
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<td>SE</td>
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<tr>
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<tr>
<td>Years parents spent in poor neighborhoods in the five years before birth of child</td>
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<tr>
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\(^a\)The mean of all observations on the child

\(^b\)The total number of observations fulfilling the given criterion
CHAPTER IV

Perceived Neighborhood Quality, Family Processes and Trajectories of Child and Adolescent Externalizing Behaviors
Abstract

Background: Externalizing behavior problems are common among children and adolescents, and have considerable negative impacts on their long-term health and well-being. Neighborhoods are known to contribute to externalizing behaviors among adolescents in high-risk urban contexts, primarily through exposure to violence, stress, and gangs. In addition, ecological theories suggest that neighborhoods may also affect the development of externalizing behaviors in lower risk communities and among younger children through effects on parental and family functioning.

Methods: Using a United States national cohort of 3,563 children surveyed in 1997, 2002 and 2007, the current study examines the relationships between parents’ perceived neighborhood quality and children and adolescents’ externalizing behaviors. In cross-sectional analysis, we examined externalizing behaviors across levels of neighborhood quality in a regression model. Then, in longitudinal analysis, we examined the effects of neighborhood quality on trajectories of externalizing behaviors using a Latent Growth Curve Model (LGCM). Both analyses took account of the effects of family resources.

Results: The regression model found poorer neighborhood quality to be associated with more externalizing behaviors across a gradient of neighborhood quality. The LGCM showed that at baseline, better neighborhood quality was moderately associated with fewer externalizing behaviors among 7- to 12-year-olds, but was not associated with externalizing behaviors among 0- to 6-year-olds. During the follow-up period, better neighborhood quality had small and indirect effects on reducing externalizing behaviors, primarily mediated by lower levels of parental distress and family conflict. The findings suggest that neighborhood effects on externalizing behaviors begin to accumulate in childhood and that such effects are largely mediated by family processes.
Conclusions: The study expands the evidence for neighborhood effects on child behavior development to younger ages, across a wider variety of neighborhoods than previously demonstrated, and highlights the role of family processes.
Introduction

Externalizing behaviors comprise a cluster of problem behaviors marked by defiance, impulsivity, disruptiveness, aggression and antisocial acts (Achenbach & Edelbrock, 1981). A common form of child maladaptation, externalizing problems are estimated to affect 10-15% of preschool children (Campbell, 1995) and around 6% of adolescents (Merikangas et al., 2009). They interfere with children’s social functioning and learning (Patterson, 1986), and predict outcomes such as substance abuse and criminality later in life (Odgers et al., 2008). Both theoretical (Bronfenbrenner & Morris, 2006) and empirical (Leventhal & Brooks-Gunn, 2000) science suggest the role of children’s neighborhood environments in the development of externalizing behaviors. Understanding these influences can support efforts to modify environments in ways that improve children’s chances for lifelong health and well-being.

Neighborhood environments are powerful influences on children’s development. The bioecological model posits that the most proximal environments, especially family-level influences, have the most powerful effects on child development, whereas more distal environments, including neighborhoods, act both positively and negatively on these more proximal environments (Bronfenbrenner & Morris, 2006). In an extensive review of empirical research, Leventhal and Brooks-Gunn (2000) identified three mechanisms based on theories of neighborhood effects proposed by Jencks & Mayer and Sampson (Jencks & Mayer, 1990; Sampson, 1992). Neighborhoods' institutional resources, such as libraries, parks and schools, provide local opportunities for learning, play and social interactions. Neighborhoods also affect children indirectly through their effect on parents, a more proximal influence. Finally, neighborhood collective efficacy, defined as shared values, mutual trust, and willingness to intervene on behalf of common good, enables residents to monitor and supervise others’ behaviors, can help directly curb deviant behaviors, and reduce violence, crime and access to drugs. These theories suggest potential effects of neighborhood environments on child externalizing behaviors, but they do not specify the
putative mechanisms of the effects.

The Ecological Model of Externalizing Behaviors: Links to Neighborhood Influences

According to Patterson’s social interaction model (Patterson, 1986), antisocial behavior is initially learned through repeated interactions with one’s family. Persistent problem behaviors initially arise when parents use rewards and punishments non-contingently, so children fail to develop necessary self-regulatory mechanisms. Parents’ coercive and inconsistent discipline is met by children’s hostile and aggressive responses, creating cycles of negative exchanges which escalate over time. At the same time, there may also be a parallel lack of training in pro-social skills. Children’s “training” in noncompliant and coercive behaviors subsequently leads to peer rejection and academic failure. These factors, together with lax parental supervision, set the stage for children to seek out deviant peer groups, which are major training grounds for delinquency and drug use.

Contextual factors may predispose families to this type of ineffective parenting and subsequent child problem behaviors. Conger’s family stress model (Conger et al., 1992; Conger et al., 1994) posits that family stressors such as financial difficulties lead to parental depressed mood and family conflicts, disrupting parenting practices and eventually causing child problem behaviors. Neighborhood social disorganization and danger may be among such family stressors, which has been associated with a similar set of family dysfunctions and subsequent negative child outcomes (Kohen et al., 2008; Kotchick et al., 2005).

In addition to potential contributions to family dysfunction, dangerous and disorganized neighborhoods may present more deviant peer groups, violence and stress, thus may reinforce and further the deviant behaviors among children who already have externalizing tendencies.
Empirical Evidence of Neighborhood Effects on Children’s Externalizing Behaviors

A substantial literature links neighborhood poverty, social disorganization and danger to children’s externalizing behaviors (Ge, Brody, Conger, Simons, & Murry, 2002; Jocson & McLoyd, 2015; Leventhal & Brooks-Gunn, 2000; Ma, 2016; Moren-Cross, Wright, LaGory, & Lanzi, 2006; Mrug & Windle, 2009). However, most of this literature is limited by threats common to research about neighborhood effects on child development. First, because families’ resources and residential preferences affect the type of neighborhood they live in, children’s outcomes that appear to be associated with characteristics of the neighborhood may result from selection of neighborhoods by families with certain characteristics (i.e., resources and residential preferences). Confounding by residential selection is difficult to take account of in empirical studies (Sharkey & Faber, 2014) and even if neighborhoods do affect child development, the timing, the sector of the affected population and the mechanisms of such effects are still not well understood (Sharkey & Faber, 2014).

Considering these limitations, as we review the literature of neighborhood effects on child externalizing behaviors, we focus on studies with an experimental or longitudinal design. The experimental design induces variability in neighborhood conditions independent of family conditions, and the longitudinal design ensures correct temporal ordering of exposures and outcomes – both offering stronger causal inferences than cross-sectional designs. Because developmental processes are crucial, we organize the literature by child age, as well as by the nature of the study sample and potential mechanisms of neighborhood effects.

Two major urban residential mobility programs have provided experimental/quasi-experimental evidence regarding neighborhood effects on child behavioral outcomes. The Gautreaux residential mobility program was the result of court-ordered desegregation in Chicago in the early 1980s. The legal settlement led to a majority of public housing residents moving to lower poverty, much less segregated neighborhoods. Quasi-experimental studies
of the Gautreaux program found that, compared to moving within Chicago, moving to the suburbs substantially reduced boys' involvement with the criminal justice system, but increased girls' criminal convictions (although conviction rates were still very low compared to boys') (Keels, 2008). In the 1990s, as part of the Moving To Opportunity for fair housing program (MTO), public housing residents in four cities were randomly assigned to receive housing vouchers to relocate to low-poverty neighborhoods. Comparisons between participants who did and did not receive housing vouchers suggest that the intervention improved mental health and reduced arrests among girls, but increased arrests for property crimes among boys (Gennetian et al., 2012; Kling et al., 2007; Kling et al., 2005). Inconsistent findings between the two experimental studies may be partially explained by differences between them, including the distances participants moved, the length of stay in low-poverty neighborhoods, and children’s ages at the time of the move. However, both studies suggest that moving to low-poverty neighborhoods reduced exposure to violence, gangs and harmful substances, with at least some positive effects for children (Keels, 2008; Kling et al., 2005).

Studies of these two residential mobility programs were limited to older children and teenagers who lived in public housing in poor, segregated and/or dangerous neighborhoods and used criminal activity as their outcome of interest. Several longitudinal observational studies of adolescents in urban and/or high-risk settings have found that exposure to neighborhood violence, subsequent fear and post-traumatic stress predict higher rates of externalizing behaviors and youth violence (McCabe et al., 2005; Ruchkin et al., 2007; Sharkey & Sampson, 2010), and that poor parental monitoring and discipline may mediate the effect of neighborhood social organization on gang membership and violence among boys (Tolan, Gorman-Smith, & Henry, 2003).

In contrast to studies among high-risk adolescents, studies among general adolescent populations have a stronger ecological focus. These studies commonly find that
neighborhood conditions primarily act by *moderating* the effects of family and peer processes on adolescents’ outcomes. Specifically, the detrimental effects of unsupervised peer contact and lax parenting practices on children’s behavioral outcomes are amplified in dangerous and disorganized neighborhoods compared with safe and organized neighborhoods (Beyers et al., 2003; Pettit et al., 1999; Simons et al., 2005). In addition, neighborhood danger and disorganization may also affect adolescents’ outcomes directly and indirectly through their effects on parenting practices (Pettit et al., 1999; Simons et al., 2005).

Traditionally, studies of neighborhood effects focus on adolescents, who have more autonomy in their neighborhoods than children. However, a systematic review of neighborhood and behavioral problems in middle childhood found that neighborhood poverty, violence and affiliation with deviant peers were associated with behavioral problems even at this early age (Ingoldsby & Shaw, 2002). Such findings were also supported by longitudinal studies of children in urban/high-risk environments (Ingoldsby et al., 2006; Xue et al., 2005). In contrast, studies with national samples are more equivocal. Among four studies involving national samples of young children, two found neighborhood social organization to have an indirect effect on child externalizing behaviors mediated by family and school functioning (Humphrey, 2015; Kohen et al., 2008), whereas two others found early life neighborhood disadvantage had a lagged effect on externalizing behaviors in early adulthood (Wheaton & Clarke, 2003), and no effect on externalizing behaviors concurrently or in adolescence (Anderson et al., 2014), respectively.

In summary, it is relatively clear that in high-risk/urban contexts, neighborhood poverty, disorganization and danger contribute to adolescents’ externalizing behaviors, delinquency and crime, at least in part through exposure to violence and deviant peers. However, in residential contexts where direct exposure to violence and gangs is rare, whether and how neighborhoods affect adolescents’ externalizing behaviors remains
ambiguous. In addition, there is still a lack of evidence to conclude that neighborhoods affect behavioral outcomes before adolescence. Among the general population and among children for whom direct exposure to neighborhood threats is limited, an ecological model involving proximal developmental processes at home and with peers may better capture the mechanisms of neighborhood effects on child behavioral outcomes.

**Neighborhood Effects on Parental and Family Processes**

A key premise of an ecological model of neighborhood effects is that poor neighborhood conditions affect relevant parental and family processes, e.g., parental depression, family conflict and compromised parenting practices. In a literature review, neighborhood problems (e.g., traffic, noise, access to resources), violence and lack of social cohesion were linked to adult depression (Diez Roux & Mair, 2010). Although neighborhood influences on family conflict have not been a focus in the literature, existing evidence suggests an intersection between stressors and violence in the communities and violence at home (Leventhal & Brooks-Gunn, 2000).

In a recent systematic literature review of neighborhood and parenting (Cuellar, Jones, & Sterrett, 2015), neighborhood danger and disorganization were associated with parenting style and practices (e.g., parental warmth, monitoring). However, the direction of associations varied. For example, some studies reported less active monitoring whereas others reported stricter monitoring in dangerous neighborhoods. The authors suggest that the inconsistent findings may be explained by the moderating effects of family income, children’s gender and age, as well as the mediating effects of parental distress and family functioning.

In summary, the body of evidence suggests that neighborhood conditions, particularly danger and social disorganization, may affect parental mental health and family
conflict; neighborhood conditions may or may not affect parenting practices, with parental mental health and family conflict as potential mediating pathways.

**Neighborhood Dimensions and Measures**

Both the neighborhood theories (Jencks & Mayer, 1990; Sampson, 1992) and the empirical evidence support neighborhood social processes (e.g. danger and social disorganization) and physical features (e.g. physical facilities and physical stressors such as trash and dilapidated housing) as key features of neighborhood environments that affect residents. Although neighborhood structural characteristics – such as income level, racial composition and residential stability – are perhaps the most common metrics due to availability of census data, they likely only affect residents through social and physical aspects of neighborhoods (Leventhal & Brooks-Gunn, 2000). Subjective reports from parents are alternative measures that may better reflect the aspects of neighborhoods that matter for children. These measures have been shown to be closely related to neighborhood socioeconomic status, adult protective behaviors, and child mental health and behaviors (Aneshensel & Sucoff, 1996; Elliott et al., 1996; Roosa et al., 2005; Ross & Jang, 2000)

**Study Objectives**

Using data from a nationally representative cohort of children followed longitudinally in three consecutive waves of surveys, the current study evaluates the effects of parents’ perceived neighborhood quality on children’s externalizing behaviors. In the cross-sectional analyses, we investigate whether children’s externalizing behaviors are associated with a gradient of neighborhood quality, thus advancing the focus beyond the “worst” neighborhoods. In the longitudinal analysis, we examine the effects of perceived neighborhood quality on externalizing behaviors at baseline and their changes throughout follow-up, which enables us to differentiate timing of the neighborhood effects. Following the
ecological model of the development of externalizing behaviors, the longitudinal analysis also tests the role of family and peer processes as potential mediating pathways of the neighborhood effects.

**Methods**

**Data source and Participants**

The Panel Study of Income Dynamics (PSID) (Panel Study of Income Dynamics, 2016) is a longitudinal study that has conducted interviews with United States families since 1968, either annually (before 1997) or biennially (since 1997). The Child Development Supplement (CDS) was initiated in 1997. PSID families with children 0 to 12 years old were contacted, and up to two eligible children were randomly selected from each responding family. A total of 3,563 children from 2,394 PSID families were surveyed in 1997 (88.2% response rate). They were followed up in 2002 (2,907 children), and again in 2007 (1,608 children) if they were 18 years or younger at the time of the survey. This study is based on all children who participated in CDS.

**Measures**

All measures were obtained from the three waves of CDS, and most were available at all three waves. The only exception is the measure of family resources, which was obtained from the family main interviews from the birth of each child to the end of their CDS follow-up.

*Externalizing behaviors (outcome variable).* The Behavioral Problem Index (BPI) (Peterson & Zill, 1986) was completed for children three years and older. Primary Caregivers (PCG's) indicate whether each of 30 statements is “often true”, “sometimes true” or “not true” based on the child’s behaviors. In an exploratory factor analysis (EFA) on all the
items, three factors emerged, corresponding to externalizing behaviors, internalizing behaviors and hyperactivity. The 10 items with loadings of at least 0.50 on the externalizing behaviors factor were summed into an externalizing behaviors score (Cronbach’s alpha = 0.84), ranging from 0 to 20, with higher scores indicating more externalizing problems. Examples of the items in the scale are “disobedient” and “mean to others”.

Perceived neighborhood quality. PCG’s responded to the question “How would you rate your neighborhood as a place to raise children” on a 5-point Likert scale from “excellent” to “poor”, with higher scores indicating better quality. Better neighborhood quality was significantly correlated with low rates of census tract poverty ($r = -0.42$), fewer interviewer-reported poor neighborhood physical qualities ($r = -0.40$), and greater PCG-reported safety of walking in the neighborhood at night ($r = 0.47$).

Family resources. Families’ overall level of resources was measured as the sum of resources across several domains, as adapted from an existing scoring system (Kochanska, Kim, & Boldt, 2013). The domains include: income-to-needs ratio (< 0.5, 0.5 – 0.9, 1.0 – 1.9 vs. ≥ 2); education (less than high school, high school vs. college and above); occupation of family head (unemployed, temporarily laid off/student/homemaker, employed non-professional vs. employed professional); public assistance (yes vs. no); marital status of family head (married/long-term cohabitating, divorced/widowed/separated vs. never married); number of children (1 - 2, 3 vs. 4 or more); mother’s age when child born (≤ 19, 20 – 22, 23 – 24 vs. ≥ 25); parental health (both parents good/excellent, either fair vs. either poor). Higher scores represent higher levels of resources.

Parental distress. Using the Kessler Psychological Distress Scale (K-6) (Kessler et al., 2002), PCG’s reported their frequency of experiencing each of the six non-specific distress symptoms during the past four weeks, generating a sum score ranging from 0 to 24. Higher scores indicate more distress.
Family conflict. PCG’s rated five Likert-scale items on family conflict resolution methods from the National Survey of Families and Households (Sweet, Bumpass, & Call, 1988). Four items with loadings of 0.5 or higher in the EFA formed a family conflict factor (example items are, “We fight a lot in our family” and “Family criticizes”), with higher scores indicating higher levels of conflict.

Non-corporal discipline. PCG’s reported on whether or not they would take a series of nine disciplinary actions if their child were to display disruptive behaviors such as a temper tantrum. The four items (“grounding”, “give the child chores to do”, “taking away allowances” and “taking away privileges”) with loadings of 0.5 or higher on the first factor formed a non-corporal discipline score, with higher scores indicating a wider range of disciplinary actions the PCG would use.

Parental monitoring. Children 12 years and older responded to six Likert-scale items on how often their parents knew of their activities and how often they disclosed such information to their parents. A single factor was generated based on all six items, with higher scores indicating more effective parental monitoring. The measure reflects parental monitoring from children’s perspective, known to be more closely linked to delinquency than parents’ reports (Stattin & Kerr, 2000).

Deviant peer affiliation. Children 10 years and older reported on how many of their friends engaged in six deviant activities on a 5-point Likert-scale. Examples include: “Encourage you to disobey your parents” and “In gangs”. A single factor was generated based on all six items, with higher scores indicating a greater number of deviant peers.

Analysis

For the first objective, we examined the cross-sectional relationships between children’s externalizing behaviors and perceived neighborhood quality, pooling observations from all three waves of CDS and treating each observation as a unit of analysis. We plotted
the distribution of children’s externalizing behaviors at each level of neighborhood quality in a series of histograms. Then, we compared the mean externalizing behavior scores across levels of neighborhood quality in a linear regression model controlling for family resources. The model applied children’s weight from each wave of CDS and used robust standard error estimates to account for correlations among repeated observations and between siblings within a family.

For the second objective, we constructed a latent growth curve model (LGCM) within a structural equation model (SEM) framework to examine the effects of neighborhood quality on baseline levels and changes in children’s externalizing behaviors over the three waves of CDS. The LGCM used measurement occasions (i.e., wave I, II and III of CDS) as the time variables, a latent intercept to represent the baseline externalizing behavior scores at CDS wave I, and a latent slope to represent the change in the scores between two adjacent CDS waves, over five years’ time. A direct effect on the latent intercept was drawn from perceived neighborhood quality measured at baseline (CDS wave I), representing the prior cumulative effects of neighborhood exposures. Indirect effects on the latent slope were drawn from perceived neighborhood quality measured during follow-up (the mean values of CDS wave II & III), mediated by concomitant family and peer processes. These direct and indirect effects on child externalizing behaviors from neighborhood quality were paralleled by those from family resources measured at baseline (mean of values from birth to baseline CDS) and during the follow-up (mean of values from baseline CDS to end of CDS follow-up), respectively (the model is illustrated in Figure 4.2).

Because the CDS enrolled children across a wide range of ages, we divided our sample into a younger group (age 0 to 6 at baseline, 10 to 16 at the end of follow-up) and an older group (age 7 to 12 at baseline, age 17 to 18 at the end of follow-up). We allowed the effect of baseline neighborhood exposure on the latent intercept to vary by age group, and we hypothesized this effect would be larger among older children, who had longer
neighborhood exposure histories than younger children. We also allowed the effects of deviant peer affiliation on changes in children's outcomes to vary by age group to reflect the increasing influence of peer groups as children age.

In the LGCM, observations were weighted using weights in CDS wave I to represent the cohort of children 0 to 12 years in the United States in 1997. The model used a robust full information likelihood estimator, which served to account for missing values and to account for the clustering of children within families. Model fit indices suggested good model fit (RMSEA = 0.022 (90% CI 0.018-0.026), CFI = 0.971, TLI = 0.966, SRMR = 0.050).

Results

Sample Characteristics

The background characteristics of the 3563 CDS children at baseline in 1997 are shown in Table 4.1. The sample was gender balanced and distributed evenly from age 0 to 12 years. After weighting, the distribution of the sample by race, family structure and socioeconomic conditions was largely representative of their proportions in the national population, as intended. Among the weighted sample of children for whom neighborhood quality was reported, 30% of was in neighborhoods rated by PCG as "excellent" for raising children, 32% in "very good", 24% in "good", 12% in "fair", and 2% in "poor" neighborhoods.

The completeness, mean values and standard deviations (SD) of the study measures, and their pair-wise correlations are shown in Table 4.2. Of note, all measures on family and peer processes were standardized (mean = 0, SD = 1).

Distributions of Externalizing Behaviors by Levels of Perceived Neighborhood Quality

Histograms illustrating the relationship of externalizing behavior scores to each of five levels of perceived neighborhood quality are shown in Figure 4.1. With increasing
neighborhood quality, the entire distribution of externalizing behaviors shifted to lower scores, such that most children in the highest quality neighborhoods had very low externalizing scores. The regression model estimated the association between levels of neighborhood quality and children’s externalizing behaviors net of family resources. Compared with children in “excellent” neighborhoods, average externalizing scores were 0.44 (p = 0.001), 0.68 (p < 0.001), 0.78 (p = 0.001) and 1.82 (p = 0.002) points higher among children in “very good”, “good”, “fair” and poor neighborhoods, respectively.

**Effects of Neighborhood Quality on Trajectories of Externalizing Behaviors**

The effects of neighborhood quality on children’s externalizing behavior trajectories were modeled in LGCM. As estimated by the latent intercept of the LGCM, at baseline, on average, children in the younger and older age group had externalizing behavior scores of 4.21 (SD = 2.46) and 3.86 (SD = 2.74), respectively. The latent slope indicates that for every five years of follow-up, children in the younger group on average had a 0.38 point decrease (SD = 1.48) and those in the older group had a 0.14 point increase (SD = 1.50) in externalizing behavior scores. Compared with boys, girls had lower baseline scores (β = -0.81, p < 0.001) but also slower rates of decline as they aged (β = -0.47, p < 0.001).

The LGCM results for the effects of neighborhood quality on child externalizing behaviors at baseline and during follow-up are presented in Figures 2a and 2b, respectively. At baseline, one SD increase in neighborhood quality reduced the latent intercept for externalizing behaviors by 0.16 points for the younger group (p = 0.17), and by 0.43 point for the older group (p < 0.001) (see Figure 4.2a). During the follow-up, better neighborhood quality reduced parental distress (β = -0.12, p < 0.001) and family conflict (β = -0.18, p < 0.001). Both parental distress (β = 0.23, p < 0.001) and family conflict (β = 0.34, p < 0.001) directly contributed to increasing externalizing behaviors over time, and had very small, indirect effects mediated by non-corporal discipline and parental monitoring. Neighborhood
quality had null effects on deviant peer affiliation (see Figure 4.2b). Summing up the indirect pathways mediated by family and peer processes (i.e. total indirect effects), a one SD improvement in neighborhood quality contributed to 0.12 point ($p < 0.001$) and 0.13 point ($p < 0.001$) decreases in externalizing behavior scores during follow-up among the younger and older groups, respectively.

The effects of family resources on child externalizing behaviors were similar in magnitude to the effects of neighborhood quality. At baseline, a one SD increase in family resources reduced the latent intercept by 0.24 points ($p = 0.007$) (see Figure 4.2a). During follow-up, effects of family resources on the latent slope were mainly mediated by parental distress. Summing up the indirect pathways mediated by family and peer processes, a one SD increase in family resources contributed to a 0.12 point decrease in externalizing behaviors during follow-up among both age groups ($p < 0.001$).

**Discussion**

This study examined the effects of perceived neighborhood quality on the development of externalizing behaviors in a US national cohort of children. Cross-sectional analyses revealed that children’s externalizing behaviors were associated with a gradient of perceived neighborhood quality. In a longitudinal model that decomposed externalizing behaviors into baseline level and change over the follow-up period, we found perceived neighborhood quality to be associated with externalizing behaviors at baseline among 7- to 12-year-olds, but not among 0- to 6-year-olds. We also found perceived neighborhood quality to have small, indirect effects on changes in externalizing behaviors during follow-up, primarily mediated by parental distress and family conflict.

Existing research provides support for the effects of extremely dangerous and disadvantaged neighborhoods on youths’ behavioral problems. Our results suggest that
similar effects exist across a spectrum of neighborhood quality. Because exposure to violence and gangs is probably rare in most neighborhoods, it is unlikely to be the primary mechanism for the neighborhood effects observed in this study. In addition, since there was no clear “threshold” at which neighborhood quality had an effect on children’s outcomes, neither is behavioral contagion likely to be the main mechanism (Galster et al., 2000). This population-wide neighborhood effect is more consistent with mechanisms mediated by parental and family functioning.

In the longitudinal model, at baseline, there was no association between neighborhood quality and children’s outcomes among those ages 0 to 6 years, but there was a moderate association among those ages 7-12 years ($\beta = 0.43$). The baseline association likely reflects the impact of cumulative neighborhood exposure before baseline, and the absence of such an association among younger children, which is consistent with their short exposure history. During the follow-up period, neighborhood exposure had a small total effect on changes in children’s outcomes ($\beta = 0.12$ and 0.13 among the younger and the older group, respectively). The contrast between the magnitude of the baseline effect and the effect across the follow-up periods suggests that cumulative neighborhood exposure during childhood may be more important than concurrent neighborhood environments in adolescence for the development of behavioral problems. Among existing studies focusing on adolescents, those with high-risk urban samples support the effect of neighborhoods on children’s behavioral outcomes (McCabe et al., 2005; Ruchkin et al., 2007; Sharkey & Sampson, 2010), whereas those with samples drawn from the general population are less consistent (Beyers et al., 2003; Pettit et al., 1999; Simons et al., 2005). It is possible that effects demonstrated among adolescents in high-risk urban environments stem from early and persistent exposure to such environments, more so than from concurrent neighborhood exposure.
The importance of childhood environments is consistent with the social interaction model of children’s antisocial behaviors (Patterson, 1986). The model posits that “basic training” for disruptive behaviors occurs at home during early life, and that problems in wider social domains emerge as a result of children bringing their existing disruptive behavioral style into school and peer interactions. Empirical studies of neighborhood effects on behavioral problems among general populations of children have been sparse and inconsistent (Anderson et al., 2014; Kohen et al., 2008; Wheaton & Clarke, 2003). More studies are needed to understand the issue of timing regarding the neighborhood effects.

In further tests of the ecological model, parental distress and family conflict were observed to be the primary mediators of the effects of neighborhood quality on changes in externalizing behaviors. The mediating role of parental distress and family conflict has previously been demonstrated in studies of the effects of neighborhood cohesion (Kohen et al., 2008) and danger (Roosa et al., 2005) on children’s externalizing behaviors. Although neighborhood quality also had effects on parental monitoring and non-corporal discipline mediated by parental distress and family conflicts, the magnitude of these effects was negligible. In sensitivity analyses, we did not find neighborhood quality to moderate the effects of parenting practices as reported in other studies (Beyers et al., 2003; Pettit et al., 1999; Simons et al., 2005). Because these studies focused on early adolescence, it is possible that the moderation effects previously observed are specific to that age range. Lastly, neighborhood quality did not affect deviant peer affiliation in our study. The finding is not surprising as deviant peer association may be more a result of children’s antisocial tendencies and subsequent rejection by normal peers, rather than a function of having a large supply of deviant peers in the community.

Limitations
The primary limitation of the study is the use of PCG-perceived neighborhood quality to measure the exposure of interest. As the measure involves a single item, it is impossible to remove random measurement error as would be possible for a multi-item measure. This random error, however, likely attenuates the strength of the associations, providing more conservative results. On the other hand, because depressed PCGs tend to report their neighborhood more negatively, and report their children to have more behavioral problems than non-depressed parents (Najman et al., 2000), the effect of neighborhood quality on child outcomes may be over-estimated. To guard against this possibility, we conducted a sensitivity analysis using an interviewer-observed measure of neighborhood physical qualities (i.e., deterioration of housing units on the face-block, neglect of the street, garbage on the street/sidewalk, signs of drugs on the street/sidewalk, and noise outside of the house) in place of PCG-reported neighborhood quality. Because the measure was only available during follow-up (CDS wave II and III) but not at baseline, we were unable to model the effects of neighborhood physical quality on externalizing behaviors at baseline. However, during follow-up, effects of interviewer-observed neighborhood physical quality on externalizing behaviors were similar in magnitude to PCG-reported neighborhood quality, which increases confidence in our findings.

Similar to other observational studies on this topic, our results are subject to residual confounding from unmeasured variables that may affect both child outcome and perceived neighborhood quality. However, the study controlled for a composite measure of family resources encompassing a very comprehensive list of such variables, measured on annual/biennial basis. In addition, effects of neighborhood quality on changes in externalizing behaviors are less susceptible to confounders that do not vary with time, supporting stronger causal inferences than studies that only examine the current state of externalizing behaviors.
Lastly, most of the assessments were implemented between 1997 and 2007. However, given the increasing concentration of poverty in residential space over the past two decades (Jargowsky, 2014), the threats of neighborhood quality on child development we discovered are not less relevant today.

Conclusions and Implications

Consistent with bioecological and social interaction theories, this longitudinal study in a US national sample suggests that cumulative neighborhood quality during childhood has moderate effects on externalizing behaviors, and that concurrent neighborhood quality during adolescence continues to have small effects on the development of externalizing behaviors during adolescence, mediated by parental distress and family conflict. Given the high prevalence of externalizing behaviors and their extremely negative impact on child outcomes and society as a whole, interventions need to be considered to ameliorate their environmental causes. One possible set of interventions targets children’s neighborhood conditions. Federal low-income housing assistance programs such as housing vouchers and low-income housing credits may help the very poor to avoid the most impoverished neighborhoods (Deng, 2007). These programs may need to prioritize families with young children and maintain support over time to benefit the children. In addition, local community development approaches and land use regulations may have broader impacts on neighborhood conditions (Katz, Turner, Brown, Cunningham, & Sawyer, 2003). Attention by local governments and policy makers to the links between urban development and human development may improve children’s outcomes. Another set of possible interventions targets families. In impoverished neighborhoods, family support programs, such as federal home visitation programs or public preschool programs, may link parents to services to improve mental health and reduce family conflicts, which may buffer the detrimental effects of the neighborhood on child development.
References


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### Tables and Figures

Table 4.1 Background characteristics of children in child development studies (CDS) in 1997

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<td><strong>Household head marital status</strong></td>
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<tr>
<td>Married</td>
<td>2,404</td>
<td>67.5</td>
<td>75.4</td>
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<tr>
<td>Never married</td>
<td>553</td>
<td>15.5</td>
<td>9.7</td>
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<tr>
<td>Divorced, Separated or Widowed</td>
<td>606</td>
<td>17.0</td>
<td>14.9</td>
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<td><strong>Education, higher of household head &amp; wife</strong></td>
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<tr>
<td>Less than HS</td>
<td>489</td>
<td>13.7</td>
<td>12.1</td>
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<tr>
<td>HS</td>
<td>1,241</td>
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<td>29.8</td>
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<tr>
<td>Any college</td>
<td>1,830</td>
<td>51.4</td>
<td>58.0</td>
</tr>
<tr>
<td>(Missing)</td>
<td>3</td>
<td>0.1</td>
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<tr>
<td><strong>Income to needs ratio</strong></td>
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<tr>
<td>&lt;0.5</td>
<td>364</td>
<td>10.2</td>
<td>7.8</td>
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<td>0.5-0.9</td>
<td>432</td>
<td>12.1</td>
<td>10.0</td>
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<tr>
<td>1.0-1.9</td>
<td>828</td>
<td>23.2</td>
<td>22.6</td>
</tr>
<tr>
<td>2.0-3.9</td>
<td>1,197</td>
<td>33.6</td>
<td>34.7</td>
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<tr>
<td>&gt;4.0</td>
<td>742</td>
<td>20.8</td>
<td>24.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,563</td>
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Table 4.2 Description of the study measures

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<th>Variable</th>
<th># elig.</th>
<th># avail.</th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
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<tbody>
<tr>
<td>Externalizing, baseline</td>
<td>2815(^a)</td>
<td>2732</td>
<td>3.97</td>
<td>3.54</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Externalizing, wave II</td>
<td>3563</td>
<td>2900</td>
<td>3.97</td>
<td>3.65</td>
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<td></td>
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<tr>
<td>Externalizing, wave III</td>
<td>2384(^b)</td>
<td>1604</td>
<td>3.69</td>
<td>3.58</td>
<td>.39</td>
<td>.57</td>
<td>-</td>
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<tr>
<td>Neighborhood quality, baseline</td>
<td>3563</td>
<td>2225</td>
<td>3.61</td>
<td>1.11</td>
<td>-.15</td>
<td>-.13</td>
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<td>Neighborhood quality, FU</td>
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<td>3.72</td>
<td>1.06</td>
<td>-.10</td>
<td>-.12</td>
<td>-.15</td>
<td>.48</td>
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<td>Family resources, baseline</td>
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<td>3551</td>
<td>12.39</td>
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<td>.18</td>
<td>.17</td>
<td>-.33</td>
<td>-.38</td>
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<tr>
<td>Family resources, FU</td>
<td>3563</td>
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<td>12.85</td>
<td>2.61</td>
<td>.16</td>
<td>.19</td>
<td>.20</td>
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<td>-.35</td>
<td>.86</td>
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<td>PCG distress, FU</td>
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<td>2988</td>
<td>0.00</td>
<td>1.00</td>
<td>.17</td>
<td>.27</td>
<td>.29</td>
<td>-.09</td>
<td>-.18</td>
<td>.28</td>
<td>.32</td>
<td>-</td>
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<tr>
<td>Family conflict, FU</td>
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<td>2128</td>
<td>0.00</td>
<td>1.00</td>
<td>.22</td>
<td>.31</td>
<td>.30</td>
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<td>.26</td>
<td>-</td>
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<td>Peer antisocial, FU</td>
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<td>2614</td>
<td>0.00</td>
<td>1.00</td>
<td>.08</td>
<td>.15</td>
<td>.12</td>
<td>-.02</td>
<td>n.s.</td>
<td>-.05</td>
<td>.06</td>
<td>.05</td>
<td>.03</td>
<td>n.s.</td>
<td>.05</td>
<td>-</td>
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<tr>
<td>Non-corporal discipline, FU</td>
<td>3563</td>
<td>2991</td>
<td>0.00</td>
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<td>.06</td>
<td>.09</td>
<td>.12</td>
<td>-.05</td>
<td>-.07</td>
<td>.09</td>
<td>.08</td>
<td>.07</td>
<td>.08</td>
<td>.01</td>
<td>n.s.</td>
<td>-</td>
</tr>
<tr>
<td>Parental monitoring, FU</td>
<td>3113(^c)</td>
<td>2167</td>
<td>0.00</td>
<td>1.00</td>
<td>-.08</td>
<td>-.16</td>
<td>-.25</td>
<td>.09</td>
<td>.08</td>
<td>-.09</td>
<td>-.07</td>
<td>-.05</td>
<td>-.13</td>
<td>-.37</td>
<td>-.07</td>
<td>-</td>
</tr>
</tbody>
</table>

\(^a\)Children younger than 3 years of age were not eligible for the externalizing behaviors measure.
\(^b\)Children 19 years or older were not eligible for the wave III survey.
\(^c\)Children younger than 12 at both CDS wave II and III were not eligible to report the parental monitoring measure.
n.s. – Not significant; FU – follow-up; elig.- eligible; avail. – available.
Figure 4.1. Distribution of behavior problems index (BPI) externalizing behavior score by perceived neighborhood quality
Figure 4.2. Longitudinal effect of neighborhood quality on child externalizing behaviors. (Note that Figures 2A and 2B represent parts of the same model).

2a. Effects of neighborhood quality and family resources on baseline child externalizing behavior scores.

2b. Effects of neighborhood quality and family resources on change in externalizing behavior scores over time.

\(^a\)Younger children (0-6 at baseline).
\(^b\)Older children (7-12 at baseline).


Double-sided curved arrows represent correlation. Solid lines represent statistically significant paths; dotted lines represent non-significant paths. Effects of age and sex were not shown. All measures are standardized, except for the latent intercept, latent slope and the externalizing behaviors scores. The effect of neighborhood quality at baseline on the latent intercept and the effect of deviant peer affiliation on the latent slope were allowed to vary by age group.
CHAPTER V

Neighborhood Conditions and Educational Attainment at the Transition to Adulthood:

The Mediating Role of Mental Health, Motivation and Behaviors
Abstract

Background: Educational attainment is a pathway to economic opportunities, and has great implications for individual’s health across the life span. Because various aspects of neighborhood conditions have been linked to children’s educational attainment, the current study examines the independent relationships of aspects of neighborhood conditions with educational attainment at the transition to adulthood, as well as the mediating pathways of these relationships.

Methods: The study included a cohort of 2,512 18- to 22-year-olds who participated in the Transition to Adulthood Studies of the Panel Study of Income Dynamics. Perceived neighborhood quality was reported by the primary caregivers repeatedly for up to three times during participants’ childhood and adolescence. Neighborhood advantage was measured annually/biennially using census tract indicators reported in the United States Census. Both measures were averaged over time to reflect the cumulative effects of the exposures. High school graduation and college attendance were evaluated as the outcomes in two separate sets of structural equation models. In each set of models, we first evaluated the effects of neighborhood advantage and neighborhood quality on the outcomes in one model; then we added the mediators – including educational aspirations, homework efforts, academic achievement, externalizing behaviors, subjective well-being and extra-curricular activities during adolescence – into the initial model.

Results: Better neighborhood quality independently and uniquely predicted lower risk of high school dropout, whereas higher levels of neighborhood advantage independently and uniquely predicted higher rates of college attendance. The effect of neighborhood quality on high school graduation was mediated by children’s externalizing behaviors, subjective well-being and participation in extra-curricular activities, and the effect of neighborhood advantage on college attendance was mediated by academic aspirations, homework effort and academic achievement.
Conclusions: Policies and programs that support mixed-income neighborhoods and address neighborhood safety and environmental qualities, and interventions that promote mental health, educational atmosphere and extracurricular activities may improve children’s educational prospects in disadvantaged neighborhoods.
Introduction

Educational attainment is the culmination of human capital development throughout childhood and adolescence. It is a pathway to economic opportunities and job fulfillment in adulthood. In the United States in 2015, 90% of young adults 25 to 34 years of age completed high school and 46% obtained a bachelor’s or higher degree. The latter represents a roughly seven percentage points increase since 2001 (Kena et al., 2016). The rising demands for secondary education probably reflect responses to the enormous economic returns of higher education. In 2014, the median annual earnings among young adults 25 to 34 years of age were $25,000 for high school dropouts, $30,000 for high school graduates and $52,000 for those with a bachelor’s or higher degree (Kena et al., 2016). The education based earnings gaps have been widening since 1980, a trend still on-going today (Aud et al., 2011). In addition, high school dropouts and high school graduates also have 20% and 16% of unemployment rate in 2015, 3 to 4 times that of those with a bachelor’s or higher degree (Kena et al., 2016). Thus, in general, a college degree makes the difference between an adult life of economic prosperity, and one of financial distress and instabilities.

Because of its enormous implications on a person’s economic opportunities, as well as on one’s cognitive and non-cognitive skills, social networks, health behaviors and living environments (Cutler & Lleras-Muney, 2006; Ross & Wu, 1995; Zimmerman et al., 2015), education is one of the most important predictors of health and longevity across the life span (Kaplan et al., 2000; Link & Phelan, 1995). For example, among 25-year-old adults in the United States, those without a high school diploma are expected to live 9 years less than those with college or higher education (National Center for Health Statistics, 2012). More strikingly, since the beginning of the new millennium, men with high school or less education have even seen increases in mortality rates at mid-life, whereas mortality rates for those with college or higher education have continued to decline (Case & Deaton, 2015). The neighborhood is an important part of the ecological context for child development
(Bronfenbrenner & Morris, 2006). Because various aspects of neighborhood conditions have been linked to children’s educational attainment, the current study examines the relationships between neighborhood conditions and educational attainment at the transition of adulthood, and the mediating pathways of these relationships. The findings of the study may inform interventions that improve children’s educational attainment in disadvantaged neighborhoods.

Neighborhood Conditions and Child Educational Attainment

Educational attainment stems from years of sustained investments of families and schools on children (D. R. Entwisle et al., 2005). However, the availability of resources that they can invest is partially affected by the neighborhood they live in. Neighborhoods with concentrated advantage in economic and human capital resources have long been identified as a positive influence on children’s education (Johnson, 2013; Leventhal & Brooks-Gunn, 2000). Such neighborhoods are theorized to present more positive adult role models, attesting to the economic opportunities education and hard work could bring (Jencks & Mayer, 1990). Such neighborhoods are also theorized to have better schools, childcare facilities and enrichment opportunities such as parks, libraries and after-school programs, which promote learning and encourage positive development (Jencks & Mayer, 1990). However, despite ample evidence supporting the effects of neighborhood advantage on children’s educational outcomes, the exact pathways mediating such effects are not clearly understood.

On the other hand, neighborhood disadvantage and social disorganization may compromise children’s development. Specifically, neighborhood socioeconomic disadvantage contributes to social disorganization, demonstrated by weakened social networks and organizational participation, and lack of willingness to intervene on behalf of the common good (Sampson et al., 2002). Disadvantaged and disorganized neighborhoods
have been linked to higher rates of mental distress, disruptive behaviors and delinquencies among youth (Leventhal & Brooks-Gunn, 2000; Sampson et al., 2002). This is likely due to such neighborhoods’ inability to enforce collective control of youths’ deviant behaviors (Groves & Sampson, 1989; Sampson, 1992), their negative impact on parental mental health and family functioning (Kohen et al., 2008; Kotchick et al., 2005; Roosa et al., 2005; Simons et al., 2005; Tolan et al., 2003), and/or children’s exposure to violence in such neighborhoods (McCabe et al., 2005; Ruchkin et al., 2007; Sharkey & Sampson, 2010).

Externalizing behaviors and delinquency are known to negatively affect children’s academic achievements (Hinshaw, 1992; Masten et al., 2005; McLeod & Kaiser, 2004; Moilanen, Shaw, & Maxwell, 2010). For example, symptoms of externalizing behaviors, such as inattention, impulsivity and aggression, may directly limit opportunities for learning in the classroom. In addition, externalizing behaviors also lead to rejection by prosocial peers and encourage affiliation with deviant peers, further distancing children from school and learning (Patterson, DeBaryshe, & Ramsey, 1989). So far, evidence regarding the direct effects of neighborhood disadvantage on children’s educational outcomes has been inconsistent (Johnson, 2013). However, there is a possibility that neighborhood disadvantage and disorganization indirectly affect children’s educational achievement, through its effects on their mental health and behaviors.

In sum, both neighborhood advantage and neighborhood disadvantage/disorganization may affect children’s educational outcomes. Interestingly, rarely are the two aspects of neighborhood conditions examined simultaneously in one empirical study (Johnson, 2013). As a result, the relative importance of these effects, as well as their independence from each other, is still largely unknown.

Potential Mediating Pathways of Neighborhood Effects on Children’s Educational Outcomes
It has been theorized that affluent neighborhoods have more adult role models and education-promoting norms among peers, resulting in higher educational expectations and efforts in children, and better educational achievements (Jencks & Mayer, 1990). Despite limited research, existing studies examining the role of educational expectations and efforts in mediating the effects of neighborhood advantage on children’s educational outcome consistently support this view (Ainsworth, 2002; Ceballo et al., 2004; Leventhal & Brooks-Gunn, 2004). Perceived poor neighborhood quality and deterioration have also been linked to lower educational expectations (Mello & Swanson, 2007; Williams, Davis, Cribbs, Saunders, & Williams, 2002); however, the specific mechanisms involved have not been clearly elucidated.

It has also been theorized that advantaged neighborhoods provide a wider variety of extra-curriculum activities (Leventhal & Brooks-Gunn, 2000). In addition, such neighborhoods may have more families that engage in a wide range of activities, making participation a norm. In contrast, neighborhood danger may promote restrictive parenting practices intended to ensure children’s safe, which may also limit children’s access to the activities (Leventhal & Brooks-Gunn, 2000). Extra-curricular activities are known to promote academic achievements, mental health and positive development (Mahoney, Larson, Eccles, & Lord, 2005). However, very few studies have investigated the links between neighborhood conditions and participation in extra-curricular activities, and these studies have yielded mixed findings (Dearing et al., 2009; Wimer et al., 2008).

Although neighborhood disadvantage and disorganization have been linked to compromised mental health and deviant behaviors, subsequent effects on children’s education have not been examined. Some studies have found neighborhood social disorganization and violence to compromise school attendance and school social behaviors, which may be consequences of compromised emotional well-being (Bowen & Bowen, 1999; Bowen, Bowen, & Ware, 2002).
Study Objectives

Using longitudinal data on a United States national cohort of children followed from birth to age 18, the current study examines the effects of cumulative neighborhood advantage and poor neighborhood quality (reflecting the consequence of disadvantage and disorganization) on high school graduation and college attendance. We also evaluate the potential mediating pathways during middle childhood and adolescents, including educational aspirations, homework effort, educational achievements, extra-curricular activities, externalizing behaviors and subjective well-being. We hypothesize that neighborhood advantage and poor neighborhood quality both predict high school graduation and college attendance, independent of the effect of one another. We expect educational expectations, homework efforts and intermediary educational achievements to mediate the effect of neighborhood advantage; externalizing behaviors and psychosocial well-being to mediate the effects of neighborhood quality; and extra-curricular activities to mediate the effects of either or both neighborhood indicators.

Methods

Data Source and Study Sample

The Panel Study of Income Dynamics (PSID) (Panel Study of Income Dynamics, 2016) is a longitudinal survey that has conducted interviews with United States families on an annual basis between 1968 and 1997, and biennially thereafter (i.e. main family interview). The Child Development Supplement (CDS) was initiated in 1997, in which PSID families with children 0 to 12 years old were contacted, and up to two eligible children were randomly selected from each responding family. A total of 3,563 children from 2,394 families participated. Two subsequent waves of CDS conducted in 2002 and 2007 followed these
children until their 18th birthday. CDS participants who reached 18 years of age and who lived away from parents/caregivers or were not longer attending high school subsequently entered the Transition to Adulthood Supplement (TAS). TAS was conducted on a biennial basis since 2005. The most recent wave of TAS available to the public was conducted in 2013 when PSID participants born in 1995 and aged 2 in 1997 were the youngest age cohort to participate.

PSID CDS and TAS, together with the family main interviews, provide rich, longitudinal developmental data covering a nationally representative cohort of children and their families throughout the course of development. The current study included 2,512 TAS participants who were 18 to 22 years old when they first participated in TAS. The family main interviews from 1984 to 2013 provided repeated measures of children's family backgrounds and neighborhood advantage from birth to their 18th birthday. The CDS provided up to three repeated measures on neighborhood quality and intermediary developmental outcomes spanning over ten years. The first wave of TAS each child participated provided data on their educational outcomes at the end of adolescence.

Measures

Educational Outcomes

The TAS participants reported whether they graduated from high school (graduated vs. dropped out) and attended college (no vs. yes).

Neighborhood Measures

Neighborhood advantage was measured by objective neighborhood indicators on the census tract level. Census tract is the smallest geographic unit for which United States Census provides a range of population and housing indicators. A census tract contains between 1,000 and 8,000 people, with an optimum size of 4,000 people. It is a relatively
permanent statistical subdivision of a county that was designed to be relatively homogeneous in population characteristics, economic status, and living conditions at the time it was established. Census tract indicators are the most commonly used neighborhood measures and have been demonstrated to be relevant to children’s outcomes (Leventhal & Brooks-Gunn, 2000). In PSID, children’s census tract of residence was repeatedly reported in the family main interviews. Three tract-level indicators, including median family income, percent of adults with college degree and percent of adults holding professional jobs, were used to generate a composite measure of neighborhood advantage. To ensure that the census tracts are consistent across years, tract boundaries established in 2010 Decennial Census were used to define the census tracts from all years. The corresponding tract-level indicators were obtained from the Longitudinal Tract Database (Logan et al., 2014) for the census years (1980, 1990, 2000 and 2010), and they were interpolated as linear function of year for years between censuses. We conducted an exploratory factor analysis of the three tract-level indicators from all tracts in the mainland United States in all years between 1980 and 2010. It yielded a single factor on neighborhood advantage with the lowest loading at 0.74, and Cronbach’s alpha of 0.91. The repeated measures of neighborhood advantage between children’s birth and their 18th birthday were averaged to represent cumulative exposure.

**Neighborhood quality** measures the subjective evaluation of the neighborhood. In the CDS, primary caregivers (PCG’s) responded to the question “How would you rate your neighborhood as a place to raise children?” on a 5-point Likert scale from “excellent” to “poor”. The measure seemed to mainly reflect variations in the poorer quality end of the distribution, as well as problems in the neighborhoods. For example, children’s neighborhood was rated as “excellent” or “very good” in more than 60% of observations, and they are rated as “good”, “fair” and “poor” in 23%, 13% and 3%, respectively. Poorer neighborhood quality was significantly correlated with higher census tract poverty rate ($r =$
0.42), more interviewer-observed neighborhood physical deteriorations \((r = 0.40)\), and more PCG-reported danger walking in the neighborhood at night \((r = -0.47)\). The repeated measures of neighborhood quality in three waves of CDS were averaged to represent cumulative exposure.

**Family Background Variables**

Family background variables that predicts children’s educational attainments include **race of household head** (white vs. nonwhite), **family structure** (married, divorced/separated/widowed vs. single), **family income** (in log scale), **parental education** (in years, higher of household head and wife), **parental occupational status** (four categories: head unemployed, head temporarily laid off/student/home maker, head employed and neither head nor wife are professional vs. head employed and either head or wife are professional) and **receipt of public assistance** (yes vs. no). These variables were all reported in the family main interviews. Repeated observations between children’s birth and their 18th birthday were averaged to reflect the cumulative effect of the variable. Family income, parental education, parental professional status and receipt of public assistance were used to form a factor on **socioeconomic status** (SES).

Other family background variables including the number of siblings, maternal age when the child was born, and preterm birth were also tested but found to be not associated with children’s educational attainment. These variables were not included in the analyses.

**Intermediary Outcomes**

All intermediary outcome variables were based on the value reported in the last wave of CDS in which the participant responded, when >95% of the sample was between 10 and 17, so that the effects of longest cumulative neighborhood exposure were reflected.
PCG’s completed the Behavioral Problem Index (BPI) (Peterson & Zill, 1986), indicating whether each of 30 statements is “often true”, “sometimes true” or “not true” based on the child’s behaviors. In an exploratory factor analysis (EFA), three factors emerged, corresponding to externalizing behaviors, internalizing behaviors and hyperactivity. The 10 items with loadings of at least 0.50 on the externalizing behaviors factor (Cronbach’s alpha = 0.84) were summed into an **externalizing behaviors** score, ranging from 0 to 20, with higher scores indicating more externalizing problems. Examples of the items in the scale are “disobedient” and “mean to others”.

Children 12 years and older responded to a set of questions regarding experiences of a set of subjective well-being in the past month on a 6-point Likert Scale from “never” to “every day”. The items were adapted from the emotional well-being scale from MacArthur Midlife in the United States (MIDUS) Youth, and work on positive mental health (Keyes, 2002), and measure three domains – emotional, psychological and social well-being. A scale of **subjective well-being** was constructed by PSID based on items retained in factor analysis. The scale ranged from 3 to 18, with higher scores corresponding to better well-being. Examples of the items are “happy”, “challenged to grow” and “belong to group”.

PCG’s reported children’s participation in extra-curricular lessons, organized sports, and community groups in the last 12 months. Children 10 years and older reported on their participation in organized sports, school clubs, community groups and summer camp in the last 12 months. Children were considered to have participated in a particular activity if either the parent or the child reported participation. The total number of domains of activities children participated in represents the breadth of **extra-curricular activities**.

Children 10 years and older reported on how often they spent time on homework during the last school year. The measure was summed into three categories: “once a week or less frequent”, “several times a week” and “almost every day”, reflecting children’s **homework effort**. Higher values correspond to greater homework frequency.
Children 12 years and older responded to the question “How far would you like to go in school?” with options ranging 8 levels from “leaving high school before graduation”, to “get more than 4 years of college”. The question measured children’s educational aspirations. Higher values correspond to higher aspirations.

Children’s academic achievement was assessed using Woodcock-Johnson Revised Tests of Achievements (WJR). In CDS wave II & III, the Letter-Word Identification, Applied Problems and Passage Comprehension subtests were administered. Scores were standardized based on national norms (mean = 100, standard deviation = 15), and were summed across the three subtests to form a total score.¹

Statistical Analysis

Structural equation modeling (SEM) was used to evaluate the relationships between children’s neighborhood conditions, educational outcomes and the intermediary outcomes. The educational outcomes of high school graduation and college attendance were evaluated separately in two sets of models; each set included a main model and a mediation model. Because the logistic models² produce odds ratio (OR) estimates that greatly exaggerate the relative risk it intends to approximate when modeling very frequent outcomes (Diaz-Quijano, 2012), we chose to model the less frequent outcomes of high school dropout and no college attendance (13.5% and 23.5% of the weighted sample, respectively) instead of their complements of educational successes. In the main model (Figure 5.1a), family backgrounds, including SES, race of the family head and family structure were allowed to have effects on neighborhood advantage and neighborhood quality; both family background variables and neighborhood variables were allowed to affect children’s educational

¹ The Letter-Word Identification, Passage Comprehension, Applied Problems and Calculation combine to create scores for Broad Reading and Broad Math. As the Calculation subscale was not administered in CDS II and CDS III, the total WJR score based on the rest of the three subscales was only an approximation of the children’s broad reading and math skills.

² We chose logistic model over alternative binary models such as probit model and complementary log-log model, because logistic models are easier to interpret and more robust to violations of assumptions.
outcomes. Correlations were estimated among family background variables and the two neighborhood indicators. The meditational model (Figure 5.1b) added the intermediary outcomes as potential mediators of the effects of family background variables and neighborhood indicators on the educational outcomes, while still allowing direct effects from family background variables and neighborhood indicators on the educational outcome.

Before fitting the structural models, a separate measurement model for SES was evaluated using the four indicators described above. The model was found to have satisfactory fit (RMSEA = 0.061, SRMR = 0.019, CFI = 0.985, TLI = 0.954), with a minimum standardized loading of 0.69.

The SEM models took account of sample weights and clustering of siblings within the same family unit using complex survey data analysis. The parameters were estimated using robust maximum likelihood estimator, and the standard errors were computed using a sandwich estimator. Missing values were taken account of by full information likelihood estimation. Because the binary educational outcomes were modeled using logistic regression, the Monte Carlo integration algorithm was used for maximum likelihood estimation. All analyses were conducted using Mplus version 7 (Muthén & Muthén, 2010).

Weights were applied to the study sample to represent the national cohort of the same age in the United States, and the clustering of children within the same family was accounted for using robust standard error estimation. The sample weights were calculated as a product of CDS children’s weights in 1997 and a factor adjusting for attrition from CDS to TAS. The estimation procedures were adapted from those PSID used to estimate sample weight in each wave of TAS (Gouskova & Heeringa, 2008), and reflected individuals’ inverse probabilities of participating at least one wave of TAS between age 18 and 22.
Results

The 2,512 participants included in this study were from 1,816 family units. In the weighted sample, half were male and half female, 70% were white and 30% were non-white, and 17% were Hispanic. The median age at the TAS interview was 19.3 years (standard deviation (SD) 0.97). The weighted sample participated in a median of 13 waves of family main interviews (range 3 to 17, SD 3.3). Forty percent of the sample participated in all three waves of CDS, 52% in two waves of CDS, and 8% in one wave of CDS. In the latest wave of CDS in which each child participated (where the intermediate outcomes were reported), the median age of participants was 15.4 years (range 2.1 to 19.3 years, SD 2.5). Descriptions of the study measures and the correlations among them are listed in Table 5.1 and Table 5.2.

Table 5.3 shows the parameter estimates of the main models on high school dropout (left panel) and no college attendance (right panel). In both models, higher SES and two-parent household, but not race, were associated with more advantaged neighborhoods; whereas higher SES and head being white, but not head marital status, were associated with better perceived neighborhood quality. After accounting for family background variables, lower odds of high school dropout were predicted by better neighborhood quality \(b\) (i.e., standardized estimates) = -0.16, odds ratio (OR) = 0.85, \(p = 0.001\), but not by neighborhood advantage \(b = -0.06, OR = 0.95, p = 0.34\). Similarly, lower odds of not attending college were predicted by higher levels of neighborhood advantage \(b = -0.15, OR = 0.86, p = 0.004\), but not by neighborhood quality \(b = -0.05, OR = 0.95, p = 0.22\).

Table 5.4 shows the parameter estimates of the mediation models on the two educational outcomes. In both models, better neighborhood quality significantly predicted less externalizing behaviors \(b = -0.13, p < 0.001\), better subjective well-being \(b = 0.13, p = 0.001\) and wider participation in extra-curriculum activities \(b = 0.08, p = 0.03\), whereas higher levels of neighborhood advantage significantly predicted higher educational aspirations \(b = 0.04, p = 0.05\), more frequent homework effort \(b = 0.11, p = 0.001\) and
greater educational achievement \( (b = 0.16, p < 0.001) \). All of the intermediary outcomes, but most notably externalizing behaviors, extra-curricular activities and educational achievement, significantly predicted high school dropout; all intermediary outcomes except subjective well-being and homework effort significantly predicted college attendance, among which educational aspirations and educational achievement showed the strongest effects. After accounting for the intermediary outcomes, the effects of neighborhood quality on high school dropout were reduced but still significant \( (b = -0.09, OR = 0.91, p = 0.03) \), but the effects of neighborhood advantage on no college attendance were smaller and no longer significant \( (b = -0.07, OR = 0.93, p = 0.11) \).

**Discussion**

Using a United States national longitudinal cohort followed from birth to early adulthood, the current study found that better neighborhood quality independently and uniquely predicted lower risk of high school dropout, whereas higher levels of neighborhood advantage independently and uniquely predicted higher rates of college attendance. We also found that the effect of neighborhood quality on high school graduation was mediated by children’s externalizing behaviors, subjective well-being and participation in extra-curricular activities, and the effect of neighborhood advantage on college attendance was mediated by academic aspirations, homework effort and academic achievement.

Despite being substantially correlated \( (r = 0.37, p < 0.001) \), PCG perceived neighborhood quality and the census-derived measure on neighborhood advantage were independently associated with high school graduation and college attendance, as well as different sets of intermediary outcomes. In the existing literature, poorer perceived quality was found to reflect the conditions of physical dilapidation (Weden et al., 2008), danger (Aneshensel & Sucoff, 1996), drug and alcohol problems (Aneshensel & Sucoff, 1996;
Schaefer-McDaniel, 2009), general stressors (Wen et al., 2006), and a lack of social cohesion (Aneshensel & Sucoff, 1996). Perceived neighborhood quality was frequently found to be a proximal predictor of residents' mental health, and that objective neighborhood measures such as affluence and poverty only exert an effect on mental health through their effects on perceived neighborhood quality (Aneshensel & Sucoff, 1996; Weden et al., 2008; Wen et al., 2006). Our finding that poorer perceived neighborhood quality predicted more behavioral problems and worse subjective well-being in children is largely consistent with the existing evidence. The potential effects may be mediated by the influence of perceived neighborhood quality on parental mental health and family function, as demonstrated by an earlier study of ours based on the same dataset (Li, Riley, Johnson, & Musci, 2016). It may also reflect the direct influence of neighborhood problems, such as danger, dilapidation and other stressors, on children’s mental health, or failure of disorganized neighborhoods in exercising collective control of children’s deviant behaviors.

Consistent with the overwhelming evidence (Johnson, 2013; Leventhal & Brooks-Gunn, 2000), our study found neighborhood advantage to predict children's educational outcomes. It also contributes to the emerging evidence that motivations, behaviors and abilities mediate the effects of neighborhood advantage on educational outcomes (Anderson et al., 2014; Carpiano, Lloyd, & Hertzman, 2009; Gordon & Monastiriotis, 2006).

Disadvantaged neighborhoods, especially poor urban minority neighborhoods, have long been thought of as isolated from the mainstream society (Wilson, 1987), and providing few positive role models motivating children to escape poverty through education (Jencks & Mayer, 1990). Disadvantaged neighborhoods may also have poorer quality schools and underachieving peers (Jencks & Mayer, 1990). Adults, schools and peers may shape children’s sense of who they are – their place in the social hierarchy, whether higher education is an open path for them, and their own future professional identities – which consciously and unconsciously influence their expectations for educational attainment,
efforts to realize the expectations and resulting educational achievements (Destin & Oyserman, 2009, 2010; Destin, Richman, Varner, & Mandara, 2012). Our findings on the links between neighborhood advantage and children’s educational motivation, behaviors and abilities may reflect the effect of neighborhood context on children’s developing sense of self.

In our study, extra-curricular activities have been a predictor of high school graduation and college attendance. Existing research on extra-curricular activities suggests that they can place youths in safe environments, teach them personal and social skills, and provide them opportunities to build relationships with peers and adults (Council, 2002). Programs with certain features were found to be effective in promoting positive social development and academic achievements (Durlak, Weissberg, & Pachan, 2010). Although we hypothesized that both neighborhood advantage and perceived quality might affect participation in extra-curricular activities, our findings only supported the effect efforts of the neighborhood quality. Among the sparse literature currently existing on this topic, one study has found that neighborhood risk index consisting of poverty, disorder and lower collective efficacy did not predict participation in each and any of the activities (Wimer et al., 2008). However, another has found that neighborhood advantage, but not safety and order, predicted participation in each and any types of the activities (Dearing et al., 2009). Due to differences in neighborhood conditions and measures of the activities (specific type, any type vs. total number of types), common inferences cannot be drawn.

Lastly, the study findings have been consistent with the general pattern where neighborhood quality mainly affects children’s mental health and neighborhood advantage mainly affects children’s education-related outcomes (Leventhal & Newman, 2010). It has also found that the effects of neighborhood quality on children’s mental health do spill over to education. More interestingly, neighborhood quality independently and uniquely predicted high school graduation through intermediary outcomes on children’s mental health and
extra-curricular participation, suggesting that high school graduation mainly requires children to avoid problems and engaging in schooling until graduation. In contrast, neighborhood advantage independently and uniquely predicted college attendance through motivation and preparation for higher education, suggesting that college attendance requires more of actual educational aptitudes (accessed by standardized tests), beyond mere engagement.

**Limitations**

The study was unable to assess the effects of school quality on children's educational outcomes, an important pathway hypothesized to mediate the effect of neighborhood advantage. Although neighborhood SES has been found to be linked with aspects of school quality (Chiodo, Hernández-Murillo, & Owyang, 2010; Holme, 2002; Kane, Riegg, & Staiger, 2006), in a systematic review simultaneously examining the effects of neighborhood and school on children's educational outcomes, school effects were found to be of much smaller magnitude than the neighborhood effects (Johnson, 2012). Counter-intuitively, school effects frequently have been found to counter-balance the effects of the neighborhood effects and the family effects (Benson & Borman, 2010; Downey, Von Hippel, & Broh, 2004; Entwistle & Alexander, 1992). This finding suggests schools' role as an equalizer among students of different neighborhood and family backgrounds and an autonomous institution that is somewhat distinct from the neighborhood (Johnson, 2012). If this is the case, the omission of school quality in the current study might have provided somewhat conservative estimates of the effects of neighborhood advantage.

Another limitation is related to the observational nature of the study. Because the type of neighborhood families live in is affected by the characteristics of the family, correlations between neighborhood conditions and children's outcomes may also reflect the effects of additional unmeasured family characteristics rather than only the effects of
exposure to the neighborhoods. The potential for confounding from this residential selection process has been one of the acutest concerns in neighborhood research. However, studies using instrumental variable approaches to generate exogenous variability in neighborhood conditions have found little evidence of such bias (Duncan et al., 1997; Foster & McLanahan, 1996). Aside from controlling for race, and continuously measured family SES and family structure throughout participants’ childhood and adolescence, the study also tested and excluded a comprehensive set of potential confounders, including the number of children in the family, maternal depression, maternal age at child birth and low birth weight. If anything, such an approach to directly control for potential confounding is likely to slightly underestimated the neighborhood effects, as demonstrated by studies using propensity score weighting techniques (Wodtke et al., 2011).

Similarly, the observed mediating effects of intermediary outcomes may arguably reflect residential selection on these factors instead of effects from neighborhood exposure. However, our previous study demonstrated that neighborhood quality predicts changes in externalizing behaviors over time (Li et al., 2016), for example, and largely ruled out time-invariant confounding. In addition, we conducted sensitivity analyses using educational achievement measured in the earlier waves of CDS as the mediating variable instead of that measured in the latest wave of CDS. The mediating effects were found to be weaker than what is presented in the study, suggesting an increasing correlation between educational achievement and neighborhood advantage, possibly due to cumulative effects of prolonged exposure.

**Conclusions and Implications**

The study suggests that better neighborhood quality contributes to high school graduation, partially mediated by effects of high-quality neighborhoods reducing youths’ behavior problems, improving subjective well-being and promoting participation in extra-
curricular activities. In addition, higher levels of neighborhood advantage contribute to college attendance, primarily mediated by effects on a set of educational motivations, behaviors and abilities. The study highlighted the multi-dimensional nature of neighborhood environments, and the uniqueness of the putative aspects of neighborhood environments and the mediating processes even on such closely related outcomes as high school graduation and college attendance. It also demonstrates the insufficiency and unproductiveness of the question of “whether there is a neighborhood effect”, and the necessity of drawing from a variety of relevant theories, and of understanding relevant aspects of neighborhood environments and the mechanisms specific to the outcome of interest (Sharkey & Faber, 2014).

Many federal policies intended to address the deleterious effects of residing in poor neighborhoods have focused on poverty deconcentration and improving mobility. However, increasing evidence suggests that neighborhood socioeconomic advantage (higher income, more college educated and holding professional occupations), rather than the absence of disadvantage (poverty, female-headed household, residential instability) is directly responsible for educational under-achievements. Thus policies actively promoting mixed-income communities are likely to be more effective than those aimed at passively dispersing the poor. In addition, improving neighborhood quality without necessarily manipulating neighborhood socioeconomic composition could be another solution. From existing research, we know that neighborhood problems such as crimes, drugs, alcohol, physical dilapidation and trash are all be aspects of quality that affect mental health and family functioning. These neighborhood problems could be targeted by local level policies (e.g. limiting access to buying alcohol), public services (e.g. road maintenance) and organized community grass-root efforts (e.g. community watch groups). Such efforts may help in both preventing mental health problems and improving children’s educational outcomes. Lastly, the mediating effects of the intermediary outcomes suggest that improving the life chance of children living
in problematic neighborhoods may require systematic programs targeting mental health, educational atmosphere and involvement in activities.
References


Tables and Figures

Figure 5.1 Analytic models with hypothesized effect pathways
Figure 5.1a Main model of neighborhood conditions on educational outcomes.

![Diagram](image)

Types of pathways

- SES latent variable to SES indicators; Family backgrounds to neighborhood conditions; neighborhood conditions to educational outcome.
- Family background to educational outcome.
Figure 5.1b Meditational model including pathways linking family background and neighborhood conditions to educational outcomes.

Notes: SES – socioeconomic status. Effects of sex on mediators and educational outcomes were not illustrated. Correlations among family background variables, among neighborhood conditions and among mediators were also not illustrated. Effects of SES latent variable on SES indicators were not illustrated in Figure 1b. High school dropout and never attending college were each modeled as the educational outcome in separate main models and mediation models.
Table 5.1 Descriptions of study measures

<table>
<thead>
<tr>
<th>Variables</th>
<th># obs.</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family income, log scale&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2512</td>
<td>11.1</td>
<td>0.7</td>
<td>(8.4, 13.8)</td>
</tr>
<tr>
<td>Parental education, years&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2510</td>
<td>13.5</td>
<td>2.7</td>
<td>(2.0, 17.0)</td>
</tr>
<tr>
<td>Parental occupation&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2512</td>
<td>3.1</td>
<td>0.6</td>
<td>(1.3, 4.0)</td>
</tr>
<tr>
<td>Receive public assistance&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2512</td>
<td>0.2</td>
<td>0.3</td>
<td>(0.0, 1.0)</td>
</tr>
<tr>
<td>Head marital status&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2512</td>
<td>1.3</td>
<td>0.5</td>
<td>(1.0, 3.0)</td>
</tr>
<tr>
<td>Neighborhood advantage&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2512</td>
<td>-0.1</td>
<td>0.9</td>
<td>(-1.5, 3.2)</td>
</tr>
<tr>
<td>Neighborhood quality&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2399</td>
<td>3.8</td>
<td>1.0</td>
<td>(1.0, 5.0)</td>
</tr>
<tr>
<td>Externalizing behavior score&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2507</td>
<td>3.7</td>
<td>3.6</td>
<td>(0.0, 20.0)</td>
</tr>
<tr>
<td>Educational aspirations&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1994</td>
<td>5.6</td>
<td>1.5</td>
<td>(1.0, 7.0)</td>
</tr>
<tr>
<td>Psychosocial well-being&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1982</td>
<td>12.9</td>
<td>2.9</td>
<td>(3.2, 18.0)</td>
</tr>
<tr>
<td>Extra-curriculum activities&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2218</td>
<td>2.1</td>
<td>1.3</td>
<td>(0.0, 5.0)</td>
</tr>
<tr>
<td>Homework efforts&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2033</td>
<td>2.4</td>
<td>0.8</td>
<td>(1.0, 3.0)</td>
</tr>
<tr>
<td>WJR total score&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2365</td>
<td>311.6</td>
<td>43.7</td>
<td>(120.0, 515.0)</td>
</tr>
<tr>
<td>High school dropout&lt;sup&gt;d&lt;/sup&gt;</td>
<td>2507</td>
<td>0.14</td>
<td>0.34</td>
<td>(0.0, 1.0)</td>
</tr>
<tr>
<td>No college attendance&lt;sup&gt;d&lt;/sup&gt;</td>
<td>2231</td>
<td>0.24</td>
<td>0.42</td>
<td>(0.0, 1.0)</td>
</tr>
</tbody>
</table>

Notes: obs. – observations; SD – standard deviation. <sup>a</sup>Averaged over family main interviews from birth to age 18. <sup>b</sup>Averaged over all three waves of Child Development Supplement studies (CDS). <sup>c</sup>Taken from the latest wave of CDS participated. <sup>d</sup>Reported in the first wave of Transition to Adulthood Supplement participated.
Table 5.2 Correlation matrix among study measures

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Family income, log scale(^a)</td>
<td>1.00</td>
<td></td>
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<td></td>
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<tr>
<td>2 Parental education, years(^a)</td>
<td>0.60</td>
<td>1.00</td>
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<tr>
<td>3 Parental occupation(^a)</td>
<td>0.75</td>
<td>0.61</td>
<td>1.00</td>
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<tr>
<td>4 Receive public assistance(^a)</td>
<td>-0.75</td>
<td>-0.46</td>
<td>-0.68</td>
<td>1.00</td>
<td></td>
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<tr>
<td>5 Head marital status(^a)</td>
<td>-0.65</td>
<td>-0.31</td>
<td>-0.51</td>
<td>0.60</td>
<td>1.00</td>
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<tr>
<td>6 Neighborhood advantage(^a)</td>
<td>0.56</td>
<td>0.53</td>
<td>0.50</td>
<td>-0.36</td>
<td>-0.29</td>
<td>1.00</td>
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<tr>
<td>7 Neighborhood quality(^b)</td>
<td>0.44</td>
<td>0.34</td>
<td>0.39</td>
<td>-0.41</td>
<td>-0.35</td>
<td>0.37</td>
<td>1.00</td>
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<tr>
<td>8 Externalizing behavior score(^c)</td>
<td>-0.14</td>
<td>-0.10</td>
<td>-0.15</td>
<td>0.17</td>
<td>0.10</td>
<td>-0.06</td>
<td>-0.15</td>
<td>1.00</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9 Educational aspirations(^c)</td>
<td>0.27</td>
<td>0.27</td>
<td>0.28</td>
<td>-0.22</td>
<td>-0.15</td>
<td>0.22</td>
<td>0.19</td>
<td>-0.17</td>
<td>1.00</td>
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</tr>
<tr>
<td>10 Psychosocial well-being(^c)</td>
<td>0.08</td>
<td>0.10</td>
<td>0.09</td>
<td>-0.05</td>
<td>-0.03</td>
<td>0.07</td>
<td>0.09</td>
<td>-0.13</td>
<td>0.18</td>
<td>1.00</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>11 Extra-curriculum activities(^c)</td>
<td>0.29</td>
<td>0.29</td>
<td>0.28</td>
<td>-0.20</td>
<td>-0.14</td>
<td>0.22</td>
<td>0.17</td>
<td>-0.10</td>
<td>0.28</td>
<td>0.22</td>
<td>1.00</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>12 Homework efforts(^c)</td>
<td>0.17</td>
<td>0.15</td>
<td>0.18</td>
<td>-0.12</td>
<td>-0.08</td>
<td>0.21</td>
<td>0.07</td>
<td>-0.13</td>
<td>0.25</td>
<td>0.19</td>
<td>0.22</td>
<td>1.00</td>
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<tr>
<td>13 WJR total score(^c)</td>
<td>0.45</td>
<td>0.43</td>
<td>0.46</td>
<td>-0.36</td>
<td>-0.31</td>
<td>0.42</td>
<td>0.27</td>
<td>-0.19</td>
<td>0.40</td>
<td>0.09</td>
<td>0.25</td>
<td>0.21</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 High school dropout(^d)</td>
<td>0.32</td>
<td>0.24</td>
<td>0.30</td>
<td>-0.34</td>
<td>-0.23</td>
<td>0.19</td>
<td>0.26</td>
<td>-0.27</td>
<td>0.34</td>
<td>0.16</td>
<td>0.24</td>
<td>0.18</td>
<td>0.30</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>15 College no attendance(^d)</td>
<td>0.29</td>
<td>0.25</td>
<td>0.31</td>
<td>-0.26</td>
<td>-0.20</td>
<td>0.23</td>
<td>0.18</td>
<td>-0.18</td>
<td>0.33</td>
<td>0.32</td>
<td>0.32</td>
<td>0.28</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: \(^a\)Averaged over family main interviews from birth to age 18. \(^b\)Averaged over all three waves of Child Development Supplement studies (CDS). \(^c\)Taken from the latest wave of CDS participated. \(^d\)Reported in the first wave of Transition to Adulthood Supplement participated.
Table 5.3 Parameter estimates for main models on high school failure and no college attendance (N = 2512)

<table>
<thead>
<tr>
<th>Model</th>
<th>High school dropout(^a)</th>
<th>No college attendance(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Std. Est. (SE)</td>
<td>P-Value</td>
</tr>
<tr>
<td><strong>Measurement Model</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES -&gt; Family income</td>
<td>0.92 (0.01) &lt; 0.001</td>
<td>0.92 (0.01) &lt; 0.001</td>
</tr>
<tr>
<td>SES -&gt; Parental education</td>
<td>0.69 (0.02) &lt; 0.001</td>
<td>0.69 (0.02) &lt; 0.001</td>
</tr>
<tr>
<td>SES -&gt; Parental occupation</td>
<td>0.81 (0.02) &lt; 0.001</td>
<td>0.81 (0.02) &lt; 0.001</td>
</tr>
<tr>
<td>SES -&gt; Assistance</td>
<td>-0.76 (0.02) &lt; 0.001</td>
<td>-0.76 (0.02) &lt; 0.001</td>
</tr>
<tr>
<td><strong>Structural Model</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES -&gt; Neigh. advantage</td>
<td>0.73 (0.03) &lt; 0.001</td>
<td>0.73 (0.03) &lt; 0.001</td>
</tr>
<tr>
<td>Race -&gt; Neigh. advantage</td>
<td>-0.02 (0.03) 0.49</td>
<td>-0.02 (0.03) 0.49</td>
</tr>
<tr>
<td>Marital status -&gt; Neigh. advantage</td>
<td>0.21 (0.04) &lt; 0.001</td>
<td>0.21 (0.04) &lt; 0.001</td>
</tr>
<tr>
<td>SES -&gt; Neigh. quality</td>
<td>0.44 (0.04) &lt; 0.001</td>
<td>0.44 (0.04) &lt; 0.001</td>
</tr>
<tr>
<td>Race -&gt; Neigh. quality</td>
<td>-0.15 (0.04) &lt; 0.001</td>
<td>-0.15 (0.04) &lt; 0.001</td>
</tr>
<tr>
<td>Marital status -&gt; Neigh. quality</td>
<td>0.01 (0.04) 0.77</td>
<td>0.01 (0.04) 0.84</td>
</tr>
<tr>
<td>Child sex -&gt; Edu. outcome</td>
<td>-0.14 (0.04) 0.001</td>
<td>-0.13 (0.04) &lt; 0.001</td>
</tr>
<tr>
<td>SES -&gt; Edu. outcome</td>
<td>-0.35 (0.07) &lt; 0.001</td>
<td>-0.34 (0.07) &lt; 0.001</td>
</tr>
<tr>
<td>Race -&gt; Edu. outcome</td>
<td>-0.12 (0.05) 0.02</td>
<td>-0.11 (0.04) 0.01</td>
</tr>
<tr>
<td>Marital status -&gt; Edu. outcome</td>
<td>0.07 (0.05) 0.15</td>
<td>0.01 (0.05) 0.78</td>
</tr>
<tr>
<td>Neigh. advantage -&gt; Edu. outcome</td>
<td>-0.06 (0.06) 0.34</td>
<td>-0.15 (0.05) 0.004</td>
</tr>
<tr>
<td>Neigh. quality -&gt; Edu. outcome</td>
<td>-0.16 (0.05) 0.001</td>
<td>-0.05 (0.04) 0.22</td>
</tr>
</tbody>
</table>

Note: Unstd. Est. – unstandardized estimates; Std. Est – standardized estimates; SE – standard error of estimation. Neigh. – neighborhood; Edu. – education; SES – socioeconomic status; Cov. – Covariance; Res. – Residual.

\(^a\)The educational outcome was high school dropout in the model presented on the left panel, and it was no college attendance in the model presented on the right panel.
Table 5.4 Parameter estimates for main models on high school failure and no college attendance (N = 2512)

<table>
<thead>
<tr>
<th></th>
<th>High school dropout</th>
<th>No college attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Std. Est. (S.E)</td>
<td>P-Value</td>
</tr>
<tr>
<td>Measurement Part</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES -&gt; Family income</td>
<td>0.92 (0.01)</td>
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<tr>
<td>SES -&gt; Parental education</td>
<td>0.69 (0.02)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>SES -&gt; Parental occupation</td>
<td>0.82 (0.02)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>SES -&gt; Assistance</td>
<td>-0.76 (0.02)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Structural Part</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES -&gt; Neigh. Advantage</td>
<td>0.73 (0.03)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Race -&gt; Neigh. Advantage</td>
<td>-0.02 (0.03)</td>
<td>0.53</td>
</tr>
<tr>
<td>Marital status -&gt; Neigh. Advantage</td>
<td>0.21 (0.03)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>SES -&gt; Neigh.quality</td>
<td>0.45 (0.04)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Race -&gt; Neigh.quality</td>
<td>-0.15 (0.04)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Marital status -&gt; Neigh.quality</td>
<td>0.01 (0.04)</td>
<td>0.78</td>
</tr>
<tr>
<td>Child sex -&gt; Externalizing</td>
<td>-0.05 (0.03)</td>
<td>0.08</td>
</tr>
<tr>
<td>SES -&gt; Externalizing</td>
<td>-0.14 (0.06)</td>
<td>0.02</td>
</tr>
<tr>
<td>Race -&gt; Externalizing</td>
<td>-0.11 (0.03)</td>
<td>0.001</td>
</tr>
<tr>
<td>Marital status -&gt; Externalizing</td>
<td>0.04 (0.04)</td>
<td>0.32</td>
</tr>
<tr>
<td>Neigh. advantage -&gt; Externalizing</td>
<td>0.05 (0.04)</td>
<td>0.15</td>
</tr>
<tr>
<td>Neigh. quality -&gt; Externalizing</td>
<td>-0.13 (0.04)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Child sex -&gt; Psychosocial well-being</td>
<td>0.03 (0.03)</td>
<td>0.3</td>
</tr>
<tr>
<td>SES -&gt; Psychosocial well-being</td>
<td>0.13 (0.06)</td>
<td>0.02</td>
</tr>
<tr>
<td>Race -&gt; Psychosocial well-being</td>
<td>0.08 (0.04)</td>
<td>0.03</td>
</tr>
<tr>
<td>Marital status -&gt; Psychosocial well-being</td>
<td>-0.01 (0.04)</td>
<td>0.89</td>
</tr>
<tr>
<td>Neigh. advantage -&gt; Psychosocial well-being</td>
<td>-0.01 (0.04)</td>
<td>0.87</td>
</tr>
<tr>
<td>Neigh. quality -&gt; Psychosocial well-being</td>
<td>0.13 (0.04)</td>
<td>0.001</td>
</tr>
<tr>
<td>Child sex -&gt; Extra-curr.</td>
<td>0.09 (0.03)</td>
<td>0.001</td>
</tr>
<tr>
<td>SES -&gt; Extra-curr.</td>
<td>0.34 (0.06)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Race -&gt; Extra-curr.</td>
<td>0.04 (0.04)</td>
<td>0.32</td>
</tr>
<tr>
<td>Marital status -&gt; Extra-curr.</td>
<td>0.11 (0.04)</td>
<td>0.01</td>
</tr>
<tr>
<td>Neigh. advantage -&gt; Extra-curr.</td>
<td>0.04 (0.04)</td>
<td>0.33</td>
</tr>
<tr>
<td>Neigh. quality -&gt; Extra-curr.</td>
<td>0.08 (0.04)</td>
<td>0.03</td>
</tr>
<tr>
<td>Source</td>
<td>Outcome</td>
<td>Unstd. Est.</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Child sex -&gt; Edu. Aspiration</td>
<td>0.07 (0.03)</td>
<td>0.02</td>
</tr>
<tr>
<td>SES -&gt; Edu. aspiration</td>
<td>0.34 (0.07)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Race -&gt; Edu. aspiration</td>
<td>0.07 (0.04)</td>
<td>0.09</td>
</tr>
<tr>
<td>Marital status -&gt; Edu. Aspiration</td>
<td>0.1 (0.04)</td>
<td>0.02</td>
</tr>
<tr>
<td>Neigh. advantage -&gt; Edu. Aspiration</td>
<td>0.08 (0.04)</td>
<td>0.05</td>
</tr>
<tr>
<td>Neigh. quality -&gt; Edu. Aspiration</td>
<td>0.04 (0.04)</td>
<td>0.35</td>
</tr>
<tr>
<td>Child sex -&gt; Homework</td>
<td>0.10 (0.03)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>SES -&gt; Homework</td>
<td>0.25 (0.05)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Race -&gt; Homework</td>
<td>0.12 (0.03)</td>
<td>0.001</td>
</tr>
<tr>
<td>Marital status -&gt; Homework</td>
<td>0.03 (0.04)</td>
<td>0.43</td>
</tr>
<tr>
<td>Neigh. advantage -&gt; Homework</td>
<td>0.11 (0.03)</td>
<td>0.001</td>
</tr>
<tr>
<td>Neigh. quality -&gt; Homework</td>
<td>-0.05 (0.03)</td>
<td>0.14</td>
</tr>
<tr>
<td>Child sex -&gt; Edu. achievement</td>
<td>0.01 (0.03)</td>
<td>0.59</td>
</tr>
<tr>
<td>SES -&gt; Edu. achievement</td>
<td>0.34 (0.06)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Race -&gt; Edu. achievement</td>
<td>-0.13 (0.04)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Marital status -&gt; Edu. achievement</td>
<td>0.06 (0.04)</td>
<td>0.16</td>
</tr>
<tr>
<td>Neigh. advantage -&gt; Edu. achievement</td>
<td>0.16 (0.04)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Neigh. quality -&gt; Edu. achievement</td>
<td>0.04 (0.04)</td>
<td>0.22</td>
</tr>
<tr>
<td>Sex -&gt; Edu. outcome</td>
<td>-0.09 (0.04)</td>
<td>0.02</td>
</tr>
<tr>
<td>SES -&gt; Edu. outcome</td>
<td>-0.17 (0.07)</td>
<td>0.02</td>
</tr>
<tr>
<td>Race -&gt; Edu. outcome</td>
<td>-0.08 (0.05)</td>
<td>0.09</td>
</tr>
<tr>
<td>Marital status -&gt; Edu. Outcome</td>
<td>0.10 (0.05)</td>
<td>0.02</td>
</tr>
<tr>
<td>Neigh. advantage -&gt; Edu. outcome</td>
<td>0.02 (0.06)</td>
<td>0.78</td>
</tr>
<tr>
<td>Neigh. quality -&gt; Edu. Outcome</td>
<td>-0.09 (0.04)</td>
<td>0.03</td>
</tr>
<tr>
<td>Externalizing -&gt; Edu. Outcome</td>
<td>0.17 (0.03)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Psychosocial well-being -&gt; Edu. outcome</td>
<td>-0.11 (0.05)</td>
<td>0.01</td>
</tr>
<tr>
<td>Extra-cur. -&gt; Edu. Outcome</td>
<td>-0.17 (0.05)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Edu. aspirations -&gt; Edu. outcome</td>
<td>-0.13 (0.04)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Homework -&gt; Edu. Outcome</td>
<td>-0.09 (0.04)</td>
<td>0.04</td>
</tr>
<tr>
<td>Edu. achievement -&gt; Edu. outcome</td>
<td>-0.15 (0.05)</td>
<td>0.004</td>
</tr>
</tbody>
</table>


The educational outcome was high school dropout in the model presented on the left panel, and it was no college attendance in the model presented on the right panel.
CHAPTER VI

Conclusions and Implications for Practice and Research
Neighborhood is an important part of children’s and adolescents’ developmental context. Because residential space in the U.S. is severely stratified by income and race, neighborhood may be an important pathway in which neighborhood inequality leads to disparities in developmental outcomes in children. This dissertation examines the effects of neighborhood conditions on two fundamental building blocks of lifelong health among children and adolescents – mental health and educational attainment. The three studies focused on elucidating the timing and mechanisms of the potential neighborhood effects, which may help to inform policies and programs aiming to reduce disparity in children’s development. In this Chapter, I first summarize the findings and discuss the contributions of each of the three studies. Then, I examine the dissertation’s broader implications for research on neighborhood and child development. Lastly, I review the historical context and policies that lead to neighborhood inequalities in the United States and discuss the dissertation’s policy implications against this backdrop.

Summary of Results

Long Term Exposure to Neighborhood Poverty (aim 1)

As of 2010, approximately one in four Americans and one in two poor Americans lives in a poor neighborhood (20% or higher poverty rate); around 4% and 13% of them lived in an extremely poor neighborhood (20% or higher poverty rate) (Jargowsky, 2014). The effects of neighborhood poverty on child development depend on the timing and duration of the exposure. In aim 1, I examined the long-term patterns of exposure to neighborhood poverty among a sample of non-immigrant children born in poor families.

When examining the timing of exposure to neighborhood poverty, I found that around half of the children born in poor families were residing in poor neighborhoods at any given time. This proportion did not change substantially from birth to age 18, even though family
poverty rates declined dramatically as children grew older (aim 1.1). When examining the persistence of exposure to neighborhood poverty, I found that as children grew, some of those born in poor neighborhoods left to live in non-poor neighborhoods, but many returned after some time. As a result, the majority of children born in poor neighborhoods were still living in poor neighborhoods at the end of adolescence. In contrast, the overwhelming majority of children born in non-poor neighborhoods avoided living in poor neighborhoods throughout childhood and adolescence (aim 1.2). When examining the duration of exposure to neighborhood poverty, I found that children born in poor neighborhoods on average stayed more than half of their childhood and adolescence in poor neighborhoods (aim 1.3).

Further, I found that ever living in a poor neighborhood was strongly predicted by household head being non-white, but not any other family characteristics. I also found that longer duration of exposure to poor neighborhoods was predicted by being non-white, birth in a poor neighborhood, and parents’ prior experience living in poor neighborhoods, but not by other family characteristics (aim 1.4).

Overall, the findings suggest that a large proportion of non-immigrant children born in poor families live in poor neighborhoods for extended periods of time during childhood and adolescence. Residence in poor neighborhoods was largely a function of the families’ race and neighborhood histories, and it appeared to be minimally affected by other major aspects of family conditions. The aim 1 study is among the first to examine children’s long-term exposure to poor neighborhoods. It echoes some of the existing literature regarding the role of parents’ neighborhood histories in affecting children’s neighborhood conditions (Rosenblatt & DeLuca, 2012; Sharkey, 2008), and highlights the difficulties poor families face in permanently escaping poor neighborhoods (Briggs et al., 2010). Persistent exposure to neighborhood poverty may have strong cumulative effects on children’s developmental outcomes.
Neighborhood and Child Externalizing Behaviors (aim 2)

Neighborhood violence, drugs and gangs have been consistently linked to externalizing behaviors and delinquency in high-risk contexts and among older children and adolescents. However, whether neighborhood conditions play a role in the development of externalizing behaviors in non-high risk contexts or among younger children is still unclear. Aim 2 examined the relationships between parents’ perceptions of neighborhood quality and externalizing behaviors, focusing on understanding the timing and mechanisms of potential neighborhood effects.

Using a latent growth curve model, I decomposed repeated measures of child externalizing behaviors into the baseline value and change over time. I found that at baseline, better neighborhood quality was associated with moderately fewer externalizing behaviors among 7- to 12-year-olds, but it was not associated with externalizing behaviors among 0- to 6-year-olds. I also found that during the follow-up period, better neighborhood quality was associated with small decrease in externalizing behaviors in the entire sample (aim 2.1). These findings suggest that effects of neighborhood quality start as early as early childhood and continue into adolescence. The relationship was primarily mediated by lower levels of parental distress and family conflict (aim 2.2). The study expanded the existing evidence on neighborhoods effects on child externalizing behaviors into younger age and non-high risk context. It also highlighted the role of family processes as the primary mediators of neighborhood effects on child behavioral outcomes.

Neighborhood and Educational attainment (aim 3)

Neighborhood concentrated advantage has been known to contribute children’s educational success, but the mechanisms of these effects are still unclear. In addition, neighborhood danger and disadvantage have been linked to poorer mental health in children, but the extent to which such effects cascade into the domain of education has not
been tested before. Aim 3 examined neighborhood advantage and perceived neighborhood quality (reflecting neighborhood danger and disadvantage) in relation to educational attainment at the transition into adulthood, and tested several intermediate child outcomes as the mediators of these relationships.

In the main models, neighborhood quality and neighborhood advantage were included in a single model to predict young adults’ educational outcomes. Better neighborhood quality predicted higher rates of high school graduation whereas neighborhood advantage predicted higher rates of college attendance, independent of the effects of each other (aim 3.1).

In the mediation models, better neighborhood quality predicted fewer externalizing behaviors, better subjective well-being and wider participation in extra-curricular activities, and these three factors partially mediated the effects of neighborhood quality on high school graduation. In contrast, neighborhood advantage predicted higher educational aspiration, more homework efforts and higher academic achievement, and these three factors partially mediated the effects of neighborhood advantage on college attendance (aim 3.2).

The study suggests that neighborhood quality primarily affects children’s mental health and their activities outside of school, which uniquely contribute to high school graduation, whereas neighborhood advantage primarily affects children’s educational motivations, behaviors and achievements, which uniquely contribute to college attendance. The study is among the first to examine the independent and unique effects of multiple aspects of the neighborhood on various educational outcomes. It also enriches our understandings of the mechanisms by which neighborhoods affect child educational attainment.
Implications for Research

For most part of the past three decades, research on neighborhood and child development has been dominated by debates over whether neighborhood matters for child development. Although such skepticism is well-founded on methodological concerns regarding residential selection, casting neighborhood influences dichotomously as absence versus presence has dwarfed the broader and potentially more productive research agenda. Indeed, effective policies and interventions require an understanding of the aspects of neighborhood exposure responsible for the observed outcomes, the dynamic interactions of neighborhoods with other aspects of the ecological context, and individual’s susceptibilities to neighborhood influences, among other issues. In fact, absence or presence of the neighborhood effect may exactly depend on these more specifics. Fortunately, a new generation of neighborhood research has begun to address this research agenda (Sharkey & Faber, 2014). Our study advanced this agenda in the following respects.

Measuring Neighborhood Exposure

In most of the literature on neighborhood and child development, the neighborhood is measured by a single structural indicator (e.g., disadvantage, income and racial composition) evaluated at one point in time. Some of the findings of this dissertation suggest that such measures are insufficient, and can result in bias in estimating neighborhood effects.

First, the dissertation supported the use of longitudinal measures of children’s neighborhood exposures. In aim 1, I found that among children born in poor families, some lived in poor neighborhoods throughout their lives, and some were able to avoid poor neighborhoods altogether. However, a sizable proportion of children moved between poor and non-poor neighborhoods, resulting in varying durations of exposure to poor neighborhoods. The point-in-time measures lump children who lived in one type of
neighborhood all their lives together with those who had transient stay. If the magnitude of
the neighborhood effects depends on the duration of exposure, the point-in-time measures
would result in errors in measuring the “dosage” of exposure and attenuation of the potential
neighborhood effects. Indeed, there is evidence that neighborhood measures that account
for the duration of exposure resulted in larger effect estimates than measures taken cross-
sectionally or over short periods of time (Chetty et al., 2015; Sharkey & Elwert, 2011).

Secondly, the dissertation supported the use of neighborhood measures specific to
the outcome of interest. Traditionally, neighborhood studies have relied on structural
measures mainly due to their wide availability. However, most of the structural
characteristics do not operate directly on children’s outcomes (Leventhal & Brooks-Gunn,
2000), but instead affect children through physical and social processes such as social
networks, social support, informal social control, danger, drugs and alcohol, school quality,
built environments, pollution and noise, to name a few (Sharkey & Faber, 2014). Our studies
found that subjective evaluation of neighborhood quality uniquely contributes to children’s
mental health and high school graduation, whereas neighborhood advantage uniquely
contributes to educational motivations, behaviors and achievement, and college attendance.
These findings demonstrated that relevant aspects of neighborhood conditions may be
unique to different outcomes, even within the same domain of educational attainment. In
sum, our studies imply that future research would benefit from using longitudinal measures
of neighborhood exposure, and using measures on aspects of neighborhood environments
most relevant to the outcomes of interest.

Cumulative Effects and Sensitive Periods of Neighborhood Exposure

In life-course theories, environments can influence development through
programming effects or cumulative effects (Halfon & Hochstein, 2002). Programming effects
are dependent on the timing of exposure to certain environments in relation to critical and/or
sensitive periods of development, and cumulative effects are dependent on the duration of exposure. The two principles interact to shape human development (Halfon & Hochstein, 2002). Although the timing and duration of neighborhood exposure have been conceptualized as important dimensions in neighborhood research (Harding et al., 2010), empirical studies rarely tested the extent to which neighborhood effects follows the programming principle and the cumulative principle. Several studies have demonstrated that the cumulative duration of neighborhood exposure during childhood and adolescence is associated with one’s long-term outcomes, most notably educational attainment and earning in adulthood (Chetty & Hendren, 2015a; Chetty et al., 2015; Clampet-Lundquist & Massey, 2008; Wodtke et al., 2011). Relatively fewer studies have focused on the timing of neighborhood effects, and there is some indication that early and middle childhood could be sensitive periods when neighborhood exposures can have lasting effects on aspects of behavioral adjustment and academic achievement (Anderson et al., 2014; Wheaton & Clarke, 2003).

By modeling the trajectories of child externalizing behaviors, aim 2 advanced our understanding of the timing and duration of neighborhood effects on child developmental outcomes. I found that cumulative neighborhood exposure before the study baseline was moderately associated with baseline externalizing behaviors. Such association was stronger among older children (7- to 12-year-olds) than among younger children (0- to 6-year-olds). As the older children had been exposed to their neighborhoods for longer durations than the younger ones, the stronger association among them supports the cumulative mechanism. Further, I found the duration of exposure to poor quality neighborhoods during study follow-up to be associated with small increases in externalizing behaviors over childhood and adolescence, which also supports the cumulative mechanism. On the other hand, the effects of an average of 9.5 years of neighborhood exposure before baseline among older children was about four times as large as the effect of every five years of neighborhood exposure.
during follow-up. This finding implies that early and middle childhood could be sensitive period when neighborhood quality affect child externalizing behaviors. Overall, aim 2 study suggests that the neighborhoods affect children’s behavioral development via cumulative mechanisms, with stronger effects during early and middle childhood. Currently, a large share of empirical studies has examined child outcomes in relation to concurrent neighborhood exposures. Future studies would benefit from using explicit developmental models – cumulative and/or programming – into their studies.

**Infusing Developmental Perspectives into Neighborhood Research**

Historically, interest in neighborhood research was largely sparked by concerns over concentrated poverty, urban under-class, and associated social problems such as crimes, drug abuse, and educational underperformance (Shaw & McKay, 1942; Wilson, 1987). More recently, interest in neighborhood research has been rekindled by concerns over rising income and neighborhood inequality, and much of the attention has been focused on neighborhood impacts on labor force development and economic opportunities (Chetty & Hendren, 2015a; Jargowsky, 2014). The sociological focus of these guiding theories (e.g. neighborhood institutional resources model, collective socialization model, social disorganization model and collective efficacy model) and empirical studies has obscured children’s developmental processes affected by the neighborhood conditions that lead to the final outcomes.

The current studies infused developmental science into existing neighborhood theories and empirical studies, resulting in a more complete picture of how neighborhoods affect child development. For example, aim 2 examined pathways of neighborhood influence on externalizing behaviors, as specified in Patterson’s social interaction model of the development of antisocial behaviors (Patterson, 1986). The model suggests that interactions with parents very early on are the primary influences on the development of externalizing
behaviors in children, whereas interactions with peers and non-familial adults increase the risk of antisocial behaviors only if children already had such tendencies from their learning at home (Patterson, 1986). Aim 2 supported the role of family interactions as the primary mediators of neighborhood effects on externalizing behaviors throughout childhood and adolescence, but did not support the role of peer interactions. These findings expand and confront our current understanding of the mechanisms of neighborhood effects on child behavioral problems, which largely focus on adolescents’ exposure to violence, drugs and gangs (McCabe et al., 2005; Ruchkin et al., 2007; Sharkey & Sampson, 2010).

Similarly, aim 3 also incorporated knowledge from developmental science to better understand the mechanisms of neighborhood influences on educational attainment. Longitudinal studies on children’s education trajectories have described how children’s resources are gradually transformed into educational motivations, behaviors and classroom standings, which eventually lead to educational attainment (D. R. Entwistle et al., 2005). In addition, research on externalizing behaviors has found a negative influence of externalizing behaviors on children’s educational progress and attainment (Hinshaw, 1992; Masten et al., 2005; McLeod & Kaiser, 2004; Moilanen et al., 2010). Informed by this knowledge, aim 3 tested and supported the role of education-related intermediate outcomes in mediating the effects of neighborhood advantage on children’s educational attainment. It also tested and supported the roles of externalizing behaviors and subjective well-being in mediating the effects of neighborhood quality on children’s educational attainment.

In sum, the two studies demonstrated that infusing developmental perspectives into neighborhood studies can help expand and enrich our understanding of the mechanisms of neighborhoods effects. Such an approach complements the focuses of existing empirical work on sociological theories.
Implications for Policies and Programs

In the past two decades in the United States, both affluence and poverty have become more concentrated spatially, and neighborhood inequality has continued to intensify (Jargowsky, 2014; Pendall & Hedman, 2015). Neighborhood inequality often amplifies disparities in resources and living conditions across family socioeconomic conditions and race, contributing to disparities in children’s mental health and education. In this section, I reflect upon policies in the United States that have historically facilitated and perpetuated neighborhood inequality. Using history as a critical starting point, I then evaluate current policies and programs intended to disperse concentrated poverty and discuss potential solutions to improve conditions of disadvantaged neighborhoods without directly moving the residents. Lastly, when conditions of disadvantaged neighborhoods cannot be improved immediately, I discuss family-, school- and community-based interventions that could buffer children from negative neighborhood influences.

Historical Policies Contributed to Residential Segregation and Urban Decay

The highly unequal neighborhood landscape we see today was largely shaped by major social and political forces during the second half of the twentieth century. These forces facilitated residential segregation and heralded an era of urban decay, both of which continue to affect many cities and metropolitan areas today.

In the years after World War Two, the United States saw massive migration from the urban areas to the suburbs, primarily resulting from a combination of push and pull factors. These factors include increasing urban crowding, large-scale housing developments in suburbia with attractive living environments, and advancements in transportation which enabled easy commuting from the suburbs to urban employment centers (Jackson, 1985). The city to suburb migration primarily consisted of middle-class white Americans and was in part in response to the influx of African Americans from the rural South and the successive...
waves of immigrants into the cities (Boustan, 2010; Jackson, 1985). The so-called “white flight” has led to prosperous and predominantly white suburbs and has left predominantly minority populations in the inner-cities to suffer depopulation, tax base erosion, and disinvestment and disrepair (Goldberg, 1998).

Aside from social forces, federal policies have explicitly or inadvertently promoted residential racial segregation and urban decay. One of the most important policies is “redlining”, the practice of labeling certain neighborhoods as high-risk for mortgage investment based on their racial composition, and systematically denying mortgages to home buyers in these locations. The policy began during the 1930s when the federal government created the Federal Housing Administration (FHA). The FHA was charged with providing mortgage insurance to home loans issued by banks and other private lenders. Before the establishment of FHA, few people had the resources to pay for a home and bank loans were a very expensive way to purchase a home. The FHA backed mortgage insurance led to dramatic drops in mortgage interest rates and the size of down payments and expanded home ownership from 30% in the 1930s to 65% in 1995. While the FHA spurred housing expansion in the prosperous suburbs, it led to the restriction of home loans in inner-city minority neighborhoods. This has contributed to falling property values and withdrawal of businesses and services in these areas, and subsequent economic hardship and social problems (Coates, 2014).

Although redlining was outlawed by the Fair Housing Act of 1968, and the banks were obliged to disclose their lending patterns by the Home Mortgage Disclosure Act of 1975, more subtle form of housing discrimination have persisted (Badger, 2015; Turner et al., 2013). More importantly, the damage to inner-city minority neighborhoods was well under way and has persisted. Highly segregated metropolitan areas reproduced their segregation through the collective locational choice of successive waves of residents (Sampson & Sharkey, 2008). The racial inequality in neighborhood poverty that existed in
the 1970s has been transmitted, for the most part unchanged, to the current generation (Sharkey, 2008). Today, the burden of neighborhood poverty is still mostly born by urban minority neighborhoods (Jargowsky, 2014).

The racial and economic divide between inner cities and the suburbs has enormous repercussions for local development. Because the poor reside disproportionately in inner-cities, these jurisdictions were charged with providing services to a majority of poor populations in metropolitan areas. At the same time, most of them suffered from insufficient tax bases to fund these services (Summers & Gyourko, 2010). Higher taxes and higher public expenditures on services for the poor made it undesirable for existing businesses and middle-class residents to stay in inner-cities (Salins, 1993). In places where racial segregation within the metropolitan area was severe, the suburbs also passed laws prohibiting the inner-cities from annexing the well-off population in surrounding areas (Stegman, 1992). Unable to expand its tax base, the inner cities are condemned to the fate of persistent fiscal difficulties, underinvestment and decay. While earlier national policies subsidized the expansions of housing, businesses, highways and infrastructure in the suburbs, federal urban policies since the 1970s have had no major effects to alleviate the inner cities crisis. These urban policies failed largely due to the lack of major budget commitment, organizational fragmentations, and the false assumption that general economic gains will automatically benefit the cities (Stegman, 1992).

Today, only a few cities such as New York, San Francisco and Boston have succeeded in restructuring their economies to focus on high-end technological and financial services. However, these advances have usually come at the expense of the poor, who are pushed out by soaring living expenses. Many of the traditional urban centers in the Northeast are still struggling in poverty and decline. Residents of poor minority neighborhoods have not only suffered from depreciation of their homes and evaporation of their savings (Newman & Holupka, 2015), but they also see the decline of their communities
and generations of their youth failed by a lack of education and economic opportunities to escape poverty (Wilson, 1987).

Aim 1 demonstrated that poor children who were born in poor neighborhoods mostly did not escape such neighborhoods by age 18. Further, having parents who lived in poor neighborhoods and being racial/ethnic minorities dramatically increased children’s exposure to poor neighborhoods. Surprisingly, even the families who started out poor but whose family economic conditions improved over time tended to maintain in poor neighborhoods. These findings suggest that deprived of resources and human capital, minorities in high poverty neighborhoods have great difficulty in escaping their neighborhoods, even if they have bettered themselves economically. This appears to be a reflection of the direct aftermath of early federally-sponsored systematic housing discrimination, poorly informed and imbalanced development strategies and decades of ignorance about urban problems by national policy makers. Concentrated poverty contributed to wasted opportunities in large segments of the population to develop healthily, receive education and become productive members of society. The injustice of the creation and maintenance of neighborhood inequality, as well as the huge burden concentrated poverty place on its residents and the society as a whole obligate today’s policy makers to remediate the damage and be part of the solutions to the problems.

**Housing Policies and Programs**

Housing policies and programs are the most relevant interventions to improve families’ neighborhood conditions currently available. Among these interventions, federal housing policies are the only ones targeting very low-income households and providing “deep” subsidies sufficient to have a meaningful impact on the housing situation of the recipients (Mueller & Schwartz, 2008). Despite being severely under-budgeted, these policies currently provide housing assistance to millions of very low-income families.
First established by the 1937 U.S. Housing Act, public housing is the earliest federal housing assistance program for the poor that is still ongoing. The program rents publicly-owned housing units to low-income households at below market prices. Although the program succeeded in meeting basic housing needs of the assisted, it contributed to the spatial concentration of poverty (Newman & Schnare, 1997), and is perceived by the public as responsible for a range of social problems including crimes, drugs and educational underperformance.

The 1974 Housing and Community Development Act amended the 1937 U.S. Housing Act and created the Section 8 programs, which provides assistance to low-income households who are renting privately-owned properties. One form of rental assistance is “tenant-based”, primarily vouchers, which pay the landlord all/part of the rent, and can be used by renters in any rental property in the private market with at least minimum housing quality. The advantage of tenant-based assistance is that renters can choose where to rent, as long as landlords are willing to rent at a modest price and accept the vouchers. Another form of rental assistance is “project-based”, which can only be used in designated housing units in privately owned housing projects participating in the assistance program. In addition to Section 8 programs, another project-based rental assistance program is the Low Income Housing Tax Credit (LIHTC). The LIHTC was created by the Tax Reform Act of 1986. It provides tax incentives for the development of low-income housing projects, which are rented to low-income households at affordable price. The major advantage of project-based assistance is that it creates low-income housing stock that would otherwise not exist.

One of the purposes of rental assistance programs is to reduce the concentration of poverty seen in public housing and to improve low-income households’ neighborhood conditions. The programs have proven to have small effects in achieving such ends. For example, voucher recipients on average were less likely to live in poverty stricken neighborhoods than unassisted poor families (Newman & Schnare, 1997; Pendall, 2000).
However, they still experienced higher than average neighborhood poverty rates (Deng, 2007; Pendall, 2000; Turner, 1998). Suboptimal neighborhood outcomes were partially the result of a limited supply of quality, modestly priced rental units in the private housing market, especially in neighborhoods with good employment and school opportunities (Basolo & Nguyen, 2005; McClure, 2010). In addition, minority voucher recipients faced more difficulty moving out of racially segregated and economically distressed neighborhoods (Basolo & Nguyen, 2005), especially when the larger area was segregated (Deng, 2007). The neighborhood conditions of the recipients of project-based assistance were quite similar to those of the voucher recipients (Deng, 2007).

As of 2014, 1.1 million low-income households lived in public housing, 2.1 million received housing vouchers and 1.2 million received Section 8 project-based assistance (Center on Budget and Policy Priorities, 2015). In addition, 2.8 million low-income housing units have been placed in service by LIHTCs since the initiation of the program in 1986 (Office of Policy Development and Research, 2016). However, the number served by public housing and Section 8 rental assistance only represents about one in four families eligible for these programs. Moreover, because the elderly and people with chronic medical conditions are a priority for housing assistance in many communities, only 36% of recipients are families with children (Center on Budget and Policy Priorities, 2015). The programs’ budgets are severely limited, and the lists for assistance are long in most parts of the country (Sard & Fischer, 2013).

To conclude, the existing federal housing assistance programs have small effects in improving neighborhood conditions of a limited proportion of the low-income population in the country. For the existing programs to maximize their benefits for children’s development, the results of this dissertation suggest that the housing-related assistance needs to be provided to families starting when children are very young and maintained over relatively long periods of time.
At the state and local level, although policies and programs rarely offer deep subsidies per unit or target the very poor, there are opportunities to shape the residential landscape to become less segregated by race and income levels (Mueller & Schwartz, 2008). For example, regulations such as zoning policies, lands use restrictions, building codes and rent controls may determine whether and where different types of housing can be developed, how much they cost, and how they are maintained. Abolishing some of the existing land use and development regulations that have unfairly limited affordable housing in their jurisdiction and contributed to residential segregation, and adopting inclusionary zoning and growth management policies may create powerful incentives for private developers to produce more affordable housing where it is needed most (Katz et al., 2003).

**Residential Mobility Programs**

Compared with federal low-income housing assistance programs whose top priorities are to meet basic housing needs and improve housing affordability, experimental housing mobility programs have been carried out mainly to help low-income families to move out of poor neighborhoods. In early 1980s, the Gautreaux residential mobility program led to a majority of public housing residents moving to lower poverty and racially integrated neighborhoods, resulting in large and persistent neighborhood improvements (Keels, 2008; Keels, Duncan, DeLuca, Mendenhall, & Rosenbaum, 2005). Compared with resettlement in Chicago, resettlement in suburban neighborhoods has led to better educational outcomes (Rosenbaum, 1995) and crime reductions among boys but not girls (DeLuca et al., 2010). Resettlement in neighborhoods with high levels of resources and low levels of African American population was also associated with less time on welfare among mothers (DeLuca et al., 2010; Mendenhall, DeLuca, & Duncan, 2006).

During the 1990s, the Moving To Opportunity (MTO) voucher intervention resulted in substantially lower neighborhood poverty rate and much safer environments. However, the
benefit did not last long, as many participants moved back to poorer neighborhoods after a few years (Briggs et al., 2010). In addition, the destination neighborhoods were still highly segregated (Orr et al., 2003). The intervention resulted in impressive improvements in the mental health of the mothers and girls, a moderate reduction in crime among girls, but an increase in crime among boys (Gennetian et al., 2012). When the families moved before the children were 13 years of age, the intervention significantly improved children’s college attendance rates and earnings as adults.

Overall, the two mobility experiments suggest that when rental assistance is coupled with requirements to relocate to low-poverty and racially integrated neighborhoods, and when help is provided to find suitable rental properties, low-income households have large gains in neighborhood quality. However, such gains may be difficult to maintain among some families. Echoing some of the findings in MTO qualitative studies (Rosenblatt & DeLuca, 2012), the Aim 1 study underscores the effects of parents’ histories of living in poor neighborhoods as leading to children’s early and persistent exposure to poor neighborhoods. It suggests that on-going support may be needed to maintain neighborhood gains among families with long histories in poor neighborhoods.

In addition, the program effects on family self-sufficiency and child behavioral and labor market outcomes have been mixed. Our findings suggest that neighborhood has the strongest influences on child development in early and middle childhood, and that neighborhood influences accumulate over the course of development. Thus echoing some of the findings from MTO (Chetty & Hendren, 2015a), our findings suggests that mobility interventions that start when children are young and are maintained over time may have better outcomes.

**Neighborhood Improvements**
Housing policies and residential mobility programs achieved moderate neighborhood improvements through physically relocating low-income families. However, expanding these policies and programs requires a significant amount of financial commitment, which the current political climate does not support. Another intervention approach could be improving aspects of neighborhood environments without moving residents. These interventions have the benefit of directly addressing aspects of neighborhood environments relevant for children’s outcomes.

From existing research, we know that neighborhood problems such as crime, drugs and alcohol abuse, physical dilapidation and trash may compromise residents’ mental health and family functioning (Cuellar et al., 2015; Truong & Ma, 2006). Our studies also found that perception of poor neighborhood quality, which to a certain extent reflects these conditions (Aneshensel & Sucoff, 1996; Schaefer-McDaniel, 2009), contributes to parental distress, family conflict, and subsequent externalizing behaviors in children. Beyond safety and physical maintenance, a broader range of neighborhood environments may affect children’s specific developmental outcomes. For example, local food systems may affect access to healthy food, cooking habits and nutrition; roads and public transportation may affect access to jobs and entertainment and the amount of time spent on commuting; built environments may affect opportunities to engage in outdoor physical activity; and finally, locations of highways, industrial plants and garbage disposal may affect noise, air and water pollution around residential areas.

As discussed earlier, investment in specific aspects of local environments requires resources that economically struggling jurisdictions usually do not have. In this case, the federal government may play an important role in leveling the fiscal playground through block grants to states to aid disadvantaged jurisdictions (Salins, 1993). In the long run, ending local regulatory bans in developing affordable housing in well-off jurisdictions and developing mixed race and income neighborhoods are still the most fundamental measures
to ensure equal sharing of economic fruits and justice in living environments across race and social classes.

**Family-, School- and Community-Based Interventions**

As demonstrated by some existing studies as well as the dissertation, neighborhood effects on child development are mediated and/or moderated by social processes taking place in communities, families and schools, and early functional outcomes are critical for the development of important long-term outcomes. As a result, interventions targeting these social processes and children’s early functional outcomes in high-risk neighborhood settings may help to buffer negative neighborhood impacts on child development.

An example of family-based interventions is the Federal Home Visitation Program, which provides in-home nursing, social work and paraprofessional services to parents and children in at-risk communities. The programs have been found to improve aspects of parenting (Caldera et al., 2007), improve child development (Caldera et al., 2007), and result in less child maltreatment (J. Eckenrode, Ganzel, Henderson, Jr, & et al., 2000). Female children of visited mothers also had less involvement with criminal justice system 18 years after the program, as compared to controls who did not receive the intervention (John Eckenrode et al., 2010). Similarly, other programs that provide mental health treatment to parents, or prevent domestic violence and child maltreatment may also help to prevent behavioral problems and crime in children in high-risk neighborhoods.

An example of the school-based interventions is the Good Behavior Game, a behavior strategy that reinforces inhibition of inappropriate and aggressive behavior in a group context in elementary school. The intervention was found to have a consistent impact on impulsive and disruptive behaviors, and to reduce substance use and severe antisocial behaviors among children (Embry, 2002). Another example of an evidence-based school-based intervention is Promoting Alternative Thinking Strategies (PATH), a classroom-based
social emotional learning curriculum for elementary students that promotes self-control, emotional understanding, positive self-esteem, relationships, and interpersonal problem-solving. The curriculum was also found to reduce aggression and behavioral problems (Crean & Johnson, 2013). Such school-based interventions may be candidates for reducing children’s behavior problems in high-risk neighborhoods.

At the community level, a prevention system, named the Communities that Care (CTC), was designed to help community stakeholders and decision makers understand and address the specific risk and protective factors in the ecological context that affect children’s development. The system provides tools to identify the specific risk and protective factors facing the community’s youth, and a menu of evidence-based interventions to address these issues. The program has resulted in sustained reductions in risk exposure and youth problem behaviors in some communities (Hawkins, Oesterle, Brown, & et al., 2012).

In sum, effective family-, school- and community-based interventions exist to buffer the detrimental effects of living in disadvantaged neighborhoods on children. Compared with policies targeting structural changes, they have the benefits of having relatively standard implementation procedures and can be more easily financed and implemented by state and federal agencies or non-profit organizations. They also face less political opposition than the policies targeting structural changes. In the current political and fiscal climate, they offer promises in ameliorating the detrimental effects of neighborhood disadvantage on child development.

**Conclusion**

Neighborhood is incontrovertibly an aspect of the ecological context that shapes the development of health, behaviors and human capitals in the early stages of life. A large proportion of children born in poor families is exposed to neighborhood poverty, often for
extended periods of time during childhood and adolescence. In the United States, such exposures are solely predicted by being born into a minority race/ethnic group and having parents who lived in poor neighborhoods before the children’s birth. The persistent and often multi-generational exposure to neighborhood poverty likely compromises children’s outcomes more severely than previously thought. Better neighborhood quality may moderately reduce child disruptive and aggressive behaviors during early and middle childhood, and continue to have similar but smaller effects in adolescence. Lower levels of parental distress and family conflict would mainly mediate such positive effects. Better perceived neighborhood quality may also contribute to high school graduation, mediated by its effects in reducing externalizing behaviors and improving subjective well-being; whereas neighborhood concentrated advantage may contribute to college attendance, mediated by its effects in improving educational motivations, efforts and achievements. Collectively, the findings from the three studies in this dissertation suggest that investing in residential mobility programs that promote racial- and income-integrated neighborhoods, major improvements in poor neighborhoods and family- and school-based intervention to support healthy development may help improve children’s behavioral and educational outcomes in disadvantaged neighborhoods.


Table S.1 Children’s age by year of birth and year of family main interviews

<table>
<thead>
<tr>
<th>Year of family main interviews</th>
<th>Children’s year of birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>85 86 87 88 89 90 91 92 93 94 95 96 97</td>
</tr>
<tr>
<td>1985</td>
<td>0</td>
</tr>
<tr>
<td>1986</td>
<td>1 0</td>
</tr>
<tr>
<td>1987</td>
<td>2 1 0</td>
</tr>
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<td>1988</td>
<td>3 2 1 0</td>
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<tr>
<td>1989</td>
<td>4 3 2 1 0</td>
</tr>
<tr>
<td>1990</td>
<td>5 4 3 2 1 0</td>
</tr>
<tr>
<td>1991</td>
<td>6 5 4 3 2 1 0</td>
</tr>
<tr>
<td>1992</td>
<td>7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td>1993</td>
<td>8 7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td>1994</td>
<td>9 8 7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td>1995</td>
<td>10 9 8 7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td>1996</td>
<td>11 10 9 8 7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td>1997*</td>
<td>12 11 10 9 8 7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td>1999</td>
<td>14 13 12 11 10 9 8 7 6 5 4 3 2</td>
</tr>
<tr>
<td>2001</td>
<td>16 15 14 13 12 11 10 9 8 7 6 5 4</td>
</tr>
<tr>
<td>2003</td>
<td>17 16 15 14 13 12 11 10 9 8 7 6</td>
</tr>
<tr>
<td>2005</td>
<td>17 16 15 14 13 12 11 10 9 8</td>
</tr>
<tr>
<td>2007</td>
<td>17 16 15 14 13 12 11 10</td>
</tr>
<tr>
<td>2009</td>
<td>17 16 15 14 13 12</td>
</tr>
<tr>
<td>2011</td>
<td>17 16 15 14</td>
</tr>
</tbody>
</table>

* The sample of children was recruited for Child Development Studies (CDS) in 1997, when they were 0 to 12 years of age.
<table>
<thead>
<tr>
<th>Children's age</th>
<th>Number of observations</th>
<th>% of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<td>7.16</td>
</tr>
<tr>
<td>1</td>
<td>566</td>
<td>7.69</td>
</tr>
<tr>
<td>2</td>
<td>532</td>
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</tr>
<tr>
<td>3</td>
<td>516</td>
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</tr>
<tr>
<td>4</td>
<td>504</td>
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</tr>
<tr>
<td>5</td>
<td>477</td>
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</tr>
<tr>
<td>6</td>
<td>465</td>
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<tr>
<td>7</td>
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<tr>
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<tr>
<td>15</td>
<td>288</td>
<td>3.91</td>
</tr>
<tr>
<td>16</td>
<td>281</td>
<td>3.82</td>
</tr>
<tr>
<td>17</td>
<td>249</td>
<td>3.38</td>
</tr>
<tr>
<td>Total</td>
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</tr>
<tr>
<td>Neighborhood of birth</td>
<td>Current neighborhood of residence</td>
<td>Transitions</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Poor</td>
<td>Poor</td>
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<td></td>
<td></td>
<td></td>
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<td>Poor</td>
<td>Poor</td>
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</tr>
<tr>
<td>Non-poor</td>
<td>Poor</td>
<td>Yes</td>
</tr>
<tr>
<td>Non-poor</td>
<td>Non-poor</td>
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</tr>
<tr>
<td>Non-poor</td>
<td>Non-poor</td>
<td>No</td>
</tr>
</tbody>
</table>

Table S.3 Number of observations by cumulative patterns of exposure to poor neighborhood (N= 7,354)
Figure S.1 Proportions of children born in poor families who currently live in poor neighborhoods and in poor families by age (N = 7,354)
Figure S.2 Proportion of children born in poor families in each cumulative exposure group by age (N = 7,354)
Figure S.3 Cumulative number of years children born in poor families were exposure to poor neighborhoods by cumulative exposure patterns across age (N = 7,354)
Table S.4 Regression of ever exposure and total duration of exposure to poor neighborhoods on family conditions

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Ever exposure (logistic regression, N = 672)</th>
<th>Total durations of exposure among the exposed (linear regression, N = 419)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>SE</td>
</tr>
<tr>
<td><strong>Survey information</strong></td>
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<td></td>
</tr>
<tr>
<td># of observation on the child</td>
<td>0.92</td>
<td>0.10</td>
</tr>
<tr>
<td>Calendar year(^a)</td>
<td>1.15</td>
<td>0.07</td>
</tr>
<tr>
<td><strong>Time unchanging variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household head nonwhite</td>
<td>16.96</td>
<td>6.80</td>
</tr>
<tr>
<td>Parental education</td>
<td>0.96</td>
<td>0.08</td>
</tr>
<tr>
<td>Child born in poor neighborhood</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Years parents spent in poor neighborhoods in the five years before birth of child</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Time changing variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child age(^a)</td>
<td>0.94</td>
<td>0.09</td>
</tr>
<tr>
<td>Household head age(^a)</td>
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<tr>
<td># of children in the household(^a)</td>
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</tr>
<tr>
<td>Household head single(^b)</td>
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<tr>
<td>Family changes(^b)</td>
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<td>Household head unemployed(^b)</td>
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<tr>
<td>Family extremely poor(^b)</td>
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<td>Family poor(^b)</td>
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<td>Family near poor(^b)</td>
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<td>0.03</td>
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<tr>
<td>Renting(^b)</td>
<td>1.11</td>
<td>0.06</td>
</tr>
</tbody>
</table>

\(^a\)The mean of all observations on the child

\(^b\)The total number of observations fulfilling the given criterion
EDUCATION

Johns Hopkins Bloomberg School of Public Health, Baltimore, MD
Ph.D., Child Health & Development, Expected March 2017
M.S., Public Health, 2011

Peking University, Beijing, China
Bachelor of Medicine, Nursing, 2009
Nursing Residency: Peking University 3rd Hospital, Beijing, China, 2008 – 2009
B.A., International Relations, 2009

PROFESSIONAL EXPERIENCE

Graduate Research Assistant, 2013 – 2016
Johns Hopkins Bloomberg School of Public Health, Baltimore, MD
Pre-/Peri-natal Risk Factors for Developmental Disabilities (PI: Dr. Xiaobin Wang)
- Established collaborations among a team of scientists and co-wrote a research proposal which was awarded a $1.5 million grant from the Maternal and Child Health Bureau.
- Analyzed longitudinal cohort data and published a first-authored paper in the *Pediatrics*.

Environment, Psychosocial Stress and Self-Regulation (PI: Dr. Sara B. Johnson)
- Analyzed data on biomarkers, and behavioral and psychological assessments.
- Published a first-authored paper in the *Journal of Developmental and Behavioral Pediatrics*.

Research Associate, 2011 – 2013
Johns Hopkins Bloomberg School of Public Health, Baltimore, MD
- Assisted in systematic literature review, analysis and manuscript preparation of the study *Estimating Global, Regional and National Causes of Child Mortality* (PI: Robert E. Black), which was published on *Lancet* with 1900+ citations.
- Managed a team of 10 interviewers in a household survey on maternal and child health.
- Primary analyst for a 7-country study on *Childhood Pneumonia Etiology* (PI: Orin Levine); implemented and refined analyses and communicated results to senior scientists.

Canadian Red Cross, Ottawa, ON, Canada
- Led the proposal development efforts which obtained two contracts to evaluate the impact of a maternal and child health intervention in two regions in Mali.
- Designed a pre-and-post evaluation using mobile-based household survey.
- Conducted onsite interviewer training; monitored and supervised the survey remotely.
• Analyzed the data and drafted evaluation reports.

Project Intern September – December, 2010
USAID | ALIANZAS Guatemala City, Guatemala
• Evaluated reproductive health services and programs among grantees.

Project Intern May – September, 2010
United Nations Population Fund Headquarter New York, NY
• Designed evidence-informed guidance on country-level reproductive health programs.

PEER-REVIEWED PUBLICATIONS


MANUSCRIPTS UNDER REVIEW


MANUSCRIPTS IN PREPARATION


REPORTS


INVITED TALKS


POSTER PRESENTATIONS


TEACHING EXPERIENCE

Teaching Assistant 2011
Johns Hopkins Bloomberg School of Public Health Baltimore, MD
Course: Comparative Evaluation for Health Policy in International Health
Instructor: Dr. Louis W. Niessen

HONORS & AWARDS

Donald A. Comely Scholar 2016
John and Alice Chenoweth-Pate Fellowship 2015
Bernard and Jane Guyer Scholar 2014
Josephine Kohn and Family Fund Award 2013
Endowed Fellowship in Family Planning and Reproductive Health 2010
Bill and Melinda Gates Institute for Population and Reproductive Health Award 2010
Four times Outstanding Medical Student 2004-2008