Neighborhood Effects on Children's Educational Attainment and Teenage Childbirth

Li Kuang

Submitted in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy
under the Executive Committee
of the Graduate School of Arts and Sciences

Columbia University

2014

Abstract

Neighborhood Effects on Children's Educational Attainment and Teenage Childbirth

Li Kuang

This dissertation study examines the associations between neighborhood economic conditions and children's probability of dropping out of high school before completion and female teenagers' likelihood of giving birth before age 20. This dissertation study makes two major contributions to the current literature.

First, by taking a longitudinal view of neighborhood socioeconomic situations, this research has demonstrated the advantage and importance of examining the impact of socioeconomic situations in which children are embedded during their entire childhood. Comparing the results from this study with those from using point-in-time measures of neighborhood conditions, I have found estimates of neighborhood effects using longitudinal measures are larger and more efficient.

Second, unlike prior research that has focused on neighborhood poverty, this study examines three important dimensions of neighborhood economic conditions: poverty, affluence, and economic segregation by using the index of concentration at the extremes. Each of the dimensions has different impact on children's probabilities of quitting high school early and becoming teenage mothers. Neighborhood poverty is curvilinearly related to children's likelihood of dropping out of high school while neighborhood affluence and ICE have linear impact on children's educational attainment. For teenage childbirth outcome, effects of all three

economic dimensions are linear. Substantial racial differences in response to neighborhood economic impact have been discovered. Results confirm the prior findings that white children are more responsive to neighborhood affluence. Holding constant individual and family characteristics, and influence from neighborhood racial composition, black children may fare better in their academic achievement than white children. This study fails to provide substantial support for relative deprivation and competition mechanisms of neighborhood economic influence. The neighborhood impact is mainly channeled through social isolation avenue.

Family economic conditions and the educational attainment of family heads have strong impact on both of the children's outcomes. Residential mobility has negative impact on children's school performance but not on their health risk of teenage childbirth.

Table of Contents

Acknowledgements

During my Ph.D. years at Columbia University, I was fortunate to have met and worked with many great professors. My greatest intellectual debt owes to Mary Clare Lennon. The ideas in this dissertation arise from the many years of work under the guidance of Mary Clare. During my study at Columbia University, she has been providing both intellectual and emotional support for my research and my personal life. Without her help, I would not have been able to attend so many conferences and workshops through which I have learned many cutting edge research methods. I was fortunate to know her, work with her, and become a student of hers. Without her encouragement, I would not have been able to complete this work.

Bill McAllister has always been encouraging for my study and dissertation. Without his help, I could not get the important neighborhood data for this dissertation. I thank him for his encouragement, his open-mindedness, and his help. When I first came to Columbia, I started doing research under the guidance of Peter Messeri. Much of my methodological training started from working with him. It was Peter who introduced longitudinal research methods to me which I use for my current work. Bob Wagmiller had provided enormous help to shape the thoughts of this dissertation. He was always there to help. I thank him for his intellectual generosity and his willingness to help. As a member of my committee, Julien Teitler contributed his challenging comments towards my dissertation. Being an expert in the field of neighborhood research, he had made conductive suggestions to broaden my thoughts on neighborhood research. I want to thank them for their inspiring thoughts, comments, and support.

At Columbia, I was fortunate to have benefited from an inspiring intellectual environment both at the School of Public Health and the Institute for Social and Economic Research and Policy. I benefited from attending workshops and lectures on various cutting-edge topics. I have met with many intellectually smart people there and I have learned a lot from intellectual conversation and communications with them.

Finally, I would like to thank my friends and family for their support during the Ph.D. study. I am grateful to my parents and sister who have always supported my study.

My warmest thanks go to my husband Weida and my daughter Averie for their patience, understanding, and help during the months that I worked on the dissertation. I thank them for always been there to help whenever I need them. I also thank my son, though not born yet, for his support during those nights that I worked late.

For my mother

Chapter 1 Introduction

In the past few decades, much research has focused on precursors and consequences of undesirable educational and behavioral outcomes during adolescence and early adulthood. In particular, investigators have addressed two related questions: which types of children drop out of high school; and which girls have children as teens. These two questions are particularly important as the early adulthood outcomes influence children's future social standing.

A broad literature has demonstrated the importance of children's educational attainment and teenage childbearing. Research on the effects of these events for life chances has shown that leaving high school before graduation dramatically reduces opportunities over the life course, especially among poor and minority adolescents (Ensminger, Lamkin et al. 1996). Adolescents who leave school before graduation have fewer chances of employment and lower earnings compared to those who have completed high school (Peng 1985; Pallas 1987; Rumberger 1987; Murnane, Willett et al. 1995; Corcoran 1998). They are more likely to be involved in undesirable activities such as criminal activity (Griffiths, Quinsey et al. 1989; Kasen, Cohen et al. 1998), drug use (Swain, Beauvais et al. 1997), and are more likely to have mental health problems such as depression and stress (Wehlage and Rutter 1986). Teenage childbearing, a health risk behavior for adolescent girls, has undesirable consequences as well. Teenaged single mothers usually face economic hardship before they are economically independent. As teenagers, they do not have money to pay for the necessities (such as food, clothes, toys, etc.) for raising the child (Higgenson 1998). They are unlikely to be employed since they need to take care of the baby and are more likely to be dependent upon social welfare than are their peers who delay

childbearing (Furstenberg, Brooks-Gunn et al. 1987; Corcoran 1998). When they need to go to school or work, they often cannot afford to pay for childcare (Kisker and Silverberg 2010). Therefore, teenage childbearing also hampers educational achievement for adolescent mothers who are likely to quit school before graduation to take care of their children. Almost half of the female high school dropouts attribute their quitting school to their pregnancy/or marriage (DeBolt, Pasley et al. 1990; Corcoran 1998). Since economic return of education is contingent upon the level of educational attainment (Rudd, McKenry et al. 1990), maternal high school dropouts face difficulties of obtaining high-paying jobs. Moreover, when they reach adulthood, many of them are unmarried or have unstable marriages (Furstenberg, Brooks-Gunn et al. 1987; Corcoran 1998).

Given the importance of the two childhood outcomes, much research has been devoted to exploring the predictors of children's educational attainment and teen childbearing. A broad literature has documented that both high school dropout and teen childbearing are associated with family characteristics, such as family poverty, family structure, and parental educational attainment (Furstenberg et al. 1987; Corcoran, 1998; Brooks-Gunn and Duncan 1997; Coley and Chase-Lansdale 1998; Leventhal and Brooks-Gunn 2000). These studies, however, were only able to demonstrate a modest relationship between family circumstances and children's probabilities of dropping out of high school and becoming a teenage mom. Much of the variance in children's outcomes remains unexplained after carefully accounting for a large array of family conditions. The ongoing quest for predictors of children's educational attainment and teenage childbirth, as shown in more recent works, has been extended to investigating the role of economic circumstances beyond the family, specifically, neighborhood poverty and disadvantage.

From an ecological perspective, residential neighborhood is an important areal unit besides home. Children spend a large amount of time in neighborhoods interacting with friends, neighbors, institutional facilities, which plays an important role in shaping their development especially their educational achievement and behavioral outcomes. A broad literature has suggested that neighborhood socioeconomic conditions influence children's development through availability and quality of institutional resources, culture influence, and social capital (Wilson 1987; Coleman 1988; Jencks and Mayer 1990; Massey and Denton 1993; Wodtke, Harding et al. 2011; Sampson 2012).

Despite of the fact that economic circumstances of a neighborhood consist of both affluence and poverty, much research effort has been focused on the detrimental impact of neighborhood poverty. Though Brooks-Gunn and her colleagues (1993) have suggested that the presence of affluent neighbors is more important than the absence of poor neighbors in affecting children's educational and behavioral outcomes, very few studies have paid attention to the effect of neighborhood affluence. Since the majority of the American children grow up in neighborhoods that have mixed population of the poor and the affluent, they are likely to be influenced by the presence of both affluence and poor neighbors. Though the correlation between neighborhood affluence and poverty is negative (the higher the proportion of affluent neighbors, the fewer the poor residents), with the decrease in economic segregation since 1990 in urban America (Jargowsky 2003; Yang and Jargowsky 2006), the magnitude of the correlation may be decreasing over time. Therefore, children in American cities are living in more economically mixed neighborhoods than before.

In this chapter, I first state the problems in the current studies of neighborhood influence on children's development. Then I present the theoretical guidelines for studying neighborhood effects, and the proposed argument about the mechanisms through which neighborhood socioeconomic environment influences children's educational and behavioral outcomes. After that, I examine the literature on the links between neighborhood economic circumstances and children's educational attainment and teenage childbearing. The literature review shows important inconsistencies in the findings of neighborhood effects on children's educational and behavioral outcomes. Finally, I present important gaps and questions that have long been overlooked in the neighborhood research and how the current dissertation study is going to address them**.**

Problems in the current studies of neighborhood effects.

Since the publication in 1987 of William Julius Wilson's fundamental work "The Truly Disadvantaged", there has been a regenerated interest in research on neighborhood effects. In the past two and one-half decades, a broad literature has been devoted to examining whether neighborhood socioeconomic environment influences children's development and how it affects children's later life social outcomes. From an ecological perspective, residential neighborhood is an important areal unit besides home in which a child spends a large amount of time interacting with friends, neighbors, institutional facilities, and get socialized into the culture. As argued by developmental psychology literature, the early life socialization is important for children's cognitive and behavioral development which in turn affects their later life opportunities and social standing (Sampson 2012; Coleman 1994).

Although theories on neighborhood influence have proposed that neighborhood socioeconomic environment has a strong impact on children's development, empirical studies do not provide a strong support. Current literature finds that the magnitude of the association between neighborhood economic conditions and children's outcomes varies depending on the measure of neighborhood environment, the outcome under study, the study population, and the study design. Some of the studies have demonstrated a strong neighborhood influence, others find small to moderate impact, and some studies fail to show significant neighborhood influence (Jencks and Mayer 1990; Ginther, Haveman et al. 2000; Small and Newman 2001; Sampson, Morenoff et al. 2002). Jencks and Mayer (1990) even suggested that neighborhood effects may be an artifact due to selection bias. Therefore, the question remains – does neighborhood socioeconomic environment matter for children's outcomes?

Some researchers have proposed that the inconsistency in the estimated neighborhood effects could be attributed to two major limitations in the conceptualization of how neighborhood economic conditions may have an impact on children's educational and behavioral development: 1) the inconsistent conceptualization of the important dimensions of neighborhood economic conditions that matter for children's development; 2) and how temporal effects of neighborhood economic dynamics are considered in studies of neighborhood impact.

The first limitation refers to the inconsistencies in how neighborhood economic situations are considered. Most of the current research on neighborhood effects is focused on the influence of neighborhood poverty, disadvantages, and deprivation while ignoring and important dimension of neighborhood economic condition -- neighborhood affluence, usually measured by

the presence of affluent neighbors. The few studies that considered neighborhood affluence measure it poorly and inconsistently and generally only treated it simply as a control variable (Brooks-Gunn et al. 1993; Duncan 1994) whose effect is not further explored. Some studies used the proportion of residents in the neighborhood that had managerial or professional jobs to indicate neighborhood affluence (Crane 1991), and some use the proportion of families in the neighborhood that had income over a predefined cutoff line (Brooks-Gunn et al. 1993; Duncan 1994). The cutoff lines for neighborhood affluence vary from study to study and across census years. From statistical perspective, when both neighborhood poverty and affluence are incorporated in to regression analysis, there is a potential collinearity problem as the two variables are highly correlated. This problem usually contaminates significance test results.

The second limitation refers to how time is conceptualized in the study of neighborhood effects. It relates to the limitations in the design of neighborhood effect studies and how neighborhood socioeconomic conditions are measured. Studies on neighborhood effects vary in their treatment of temporal dynamics of neighborhood effects. The temporal dynamics refer to the length of exposure to neighborhood conditions, the change in neighborhood socioeconomic environment, and the direction of such change -- whether from poor to affluence or vice versa. Some studies use cross-sectional design where neighborhood socioeconomic conditions are measured at the same time as the outcomes; some studies examine neighborhood conditions at a theoretically suggested important age of the child such as 14 or 18 years old and outcome measures are observed at a later age(Brooks-Gunn et al. 1997); some use short-term longitudinal design where neighborhood socioeconomic environment are measured over a short period time such as 3 or 5 years (Jackson and Mare 2007); and still others use longitudinal designs which

have a longer observational period (Crowder and South 1999). With cross sectional data, it is hard to tell the length of exposure to neighborhood conditions. Studies using short-term longitudinal design only capture a small fraction of neighborhood experience during childhood. Though longitudinal studies take into account neighborhood conditions over a long period of time, they might still miss some important neighborhood experience in childhood if they do not cover the whole childhood period. Jackson and Mare (1997) conducted methodological research on whether cross-sectional data, compared with longitudinal data, would be sufficed in neighborhood research. However, their results were not convincing as they use only five years data from the PSID. Neighborhood effects assessed using short term longitudinal data did not differ from that obtained by analyzing cross-sectional data. They concluded by suggesting cross-sectional design was sufficient to detect neighborhood effects.

However, as Harding (2003) suggested, neighborhood socioeconomic conditions might not have an impact on children's cognitive and behavioral development if they were not residing in the particular neighborhood long enough. Neighborhood situations did not affect children's behavioral or cognitive development upon exposure but it took time to influence children's attitude and behavior (Sampson 2012). Therefore, the temporal dynamics, especially the length of exposure to neighborhood conditions, were important for researchers to understand and assess neighborhood impact. Recent studies by Sharkey (2013) and Sampson (2012) also suggested that time plays an important role in shaping our perception, reaction, and definition of neighborhoods. The structural barriers in housing market and cultural mechanisms through which we define neighborhoods may be the cause of the enduring neighborhood economic and racial segregation and inequality.

Theoretical foundation of neighborhood effects.

The literature has given much attention to mechanisms through which neighborhood conditions, disadvantage as well as affluence, may influence children. In the following review of the literature, I focus on two competing mechanisms through which neighborhood socioeconomic conditions operate on children's educational attainment and teenage childbearing – social isolation, and the competition and relative deprivation models. Social isolation theory suggests that affluent neighborhoods are good for children's development while the competition and relative deprivation models argue that affluent neighborhoods may not be good. On the contrary, affluent residential places may have negative impact on poor children's educational and behavioral development.

As described below, social isolation theories suggest many ways that neighborhood socioeconomic environment affect individual outcomes through segregation. Research focuses on social isolation have paid attention to the impact of social isolation on neighborhood resources, social organization, and physical environment, all of which are important for children's early life socialization.

The competition and relative deprivation models emphasize the interaction effects of neighborhood conditions and individual characteristics, especially the psychological perception of neighborhood conditions upon exposure to neighborhood situation. These models suggest the neighborhood effects vary by individual's socioeconomic conditions. Poor children may be better off live in poor neighborhoods rather than affluent neighborhoods.

Social isolation.

Researchers have proposed various ways that social isolation affects individual development. As the early Chicago School suggests, spatial distance is in essence social distance (Duncan and Duncan 1955a; Duncan and Duncan 1955b). The more spatially separated individuals are from each other, the more different they will be socially. And spatial segregation reinforces social segregation. Two types of segregation are widely discussed in the literature --- economic segregation which separates the poor from the affluent geographically; and racial segregation which separates minorities, especially blacks, from whites. Whether racial discrimination or economic structure is the driving force of neighborhood segregation is still contested (Wilson 1987; Massey and Denton 1993; Wilson 1996). However, the vast difference in neighborhood socioeconomic conditions between the poor and the affluent and between the black and white populations may contribute to the different socialization experiences for children with different racial and economic background. The different experiences during childhood in turn will affect children's life chances when they reach adulthood.

Social isolation theories are based on the premise that economic conditions of a neighborhood determine the social resources in the residential area. The availability of various social and economic resources, such as quality schools, libraries, and extracurricular activities, may have an impact on individual development. Wilson, in his book The Truly Disadvantaged (1987), suggested that urban neighborhood isolation was formed due to the changes in the economic structure. He argued that with the decline of manufacturing industry in urban areas, there was a shift in jobs from urban cities to suburbs. The middle class working population left the city and they took with them the economic resources, mainstream culture and norms, and social institutions such as quality schools and health care facilities. Those left behind were the

poor, unemployed, and socioeconomically disadvantaged. With the flight of middle class working men, there was an increase in the concentration of poverty in inner city neighborhoods accompanied by various social problems such as the increasing prevalence of teenage out of wedlock birth, poor health, joblessness, poor educational attainment, and even few marriageable men in the inner city. The concentration of social disadvantage with disproportionately located low-income individuals and families gave rise to social problems such as violence and crime which in turn reinforce the neighborhood isolation and deprivation.

Massey and Denton (1993) challenged Wilson's work for ignoring the important stratification process by race and racial segregation in urban neighborhoods. They argued that due to racial discrimination in housing and lending markets, racial segregation in inner cities areas was the driving force behind the concentration of poverty. They stated that blacks were isolated from whites in inner city areas even if they had comparable or even better income than whites. Due to the constraints in residential choice, middle class blacks were trapped in poor neighborhoods while whites were able to relocate to better communities. As a result, with the blacks poor blacks moved into the neighborhoods abandoned by middle-class whites, leading formerly middle class areas to become poorer. Thus, according to Massey and Denton (1993), the high level of racial segregation created a set of structural circumstances that reinforced the effects of socioeconomic deprivation. The isolation and segregation of minorities over time causes the concentration of poverty in neighborhoods.

Despite the contested argument about the causal mechanisms of formation of concentration of poverty in inner city neighborhoods (whether due to changes in economic

structure or racial discrimination and segregation), isolation of the poor from the affluent in central cities, has resulted in a disproportional concentration of poverty which has detrimental impacts on its residents' life chances. These negative effects are long lasting as they not only affect the life chances of the current generation residents but may also take a toll on the life chances of their descents across generations (Sharkey 2013, Sampson 2012).

The concentration of neighborhood poverty and the absence of neighborhood affluence take a toll on the children's life chances through the following three mechanisms: 1) the lack of resources such as social networks, institutional resources, mainstream cultural, role models, informal supervision, and language isolation; 2) social organization in the form of social capital and collective efficacy; and 3) the unequal distribution of environmental hazards in the physical environment. These mechanisms are described below.

Resources in neighborhood have various forms – informational, institutional, and cultural resources. Residents in poor neighborhoods are isolated from social networks that provide access to information on job openings, health care facilities, social support systems, and recreational activities (Wilson 1987; Brooks-Gunn, Duncan et al. 1997; Small and Newman 2001). As a result, children growing up in poor neighborhoods may have not access to quality health care providers and are in inferior health compared with those growing up in affluent neighborhoods. Moreover, children living in poor neighborhoods enjoy fewer recreational opportunities compared with their counterparts growing up in non-poor and affluent areas. When children are old enough to work independently, those from poor neighborhoods do not have as much information on job openings as a large proportion of their neighbors are out of work force

themselves. Therefore, children in poor neighborhoods do not have as many work opportunities as those residing in non-poor neighborhoods. These children are more likely to become unemployed as when they reach adulthood.

In the U.S., many of the institutional facilities, such as schools, libraries, and playgrounds, are locally financed. More tax money from the local resident leads to better institutional facilities. Therefore, in poor neighborhoods, the number of playgrounds is few and the quality of schools is poor. Children growing up in poor neighborhoods have limited access to good quality libraries, teachers, daycare centers, grocery stores, recreational facilities, and schools which promote children's cognitive and health development (Brooks-Gunn et al. 1997; Small and Newman 2001; Wilson 1987). The lack of institutional resources, especially high quality schools and good teachers, may affect children's school performance and educational attainment. The quality of teachers and the school facilities are directly linked to children's cognitive development and their intention and aspiration for schooling (Ceci 1991). Since the effect of schools and educational resources accumulates over time, the sustained exposure to poor neighborhoods with poor quality educational resources may have a detrimental impact on children's educational attainment (Halpern-Mannersa, Warrena et al. 2009).

Besides the isolation of institutional resources, social isolation often involves the isolation of the poor from the affluent. Affluent neighbors not only bring back to the residing neighborhood mainstream culture, they also serve as role models for the neighborhood children and supervise deviant behaviors in the residential place (Coleman 1994). When exposed to affluent adults in the residing neighborhood, children are socialized into the mainstream values

regarding work and education. They are more likely to be attached to the schooling and employment (Ainsworth 2002). In contrast, children residing in disadvantaged and poverty stricken neighborhoods are often socially alienated from mainstream culture which results in the devaluation of schooling and employment. This in turn may lead to increased deviance – higher school dropout rates, higher teenage pregnancy and childbearing rates (Ensminger, Lamkin et al. 1996).

Finally, neighborhood culture also influences children's development. The linguistic isolation model proposed by Massey and Denton (1993) suggests that African American children growing up in disadvantaged neighborhoods are isolated from the standard American English. They grow up speaking Black English Vernacular which affects their school performance and job interviews because it is devalued by the mainstream institutions (Small and Newman 2001, Massey and Denton 1993; Wodtke et al. 2011). The pronunciation and expression of Black English is not as well accepted as formal English and thus hampers the school performance of black children. The limited exposure to the mainstream language in black and poverty concentrated neighborhoods constrains their residing black children's ability to use the standard English in standard tests and their educational performance.

The lack of resources – informational, institutional, and cultural – due to social isolation in residential place affects the early socialization of children and adolescents who spend much time in the neighborhoods (Coleman 1994; Vartanian and Buck 2005). The disadvantaged neighborhood environment and social isolation can socialize children into deleterious attitudinal and behavioral patterns (Leventhal and Brooks-Gunn 2000; Brody, Conger et al. 2001). The

early life socialization involves exposure to the neighborhood environment and the internalization of the local values, cultures, language, and behaviors requires sustained exposure. Neighborhood conditions and its effects do not affect individual right away upon living in the residential area. But it is a cumulative process where the child adapts to the neighborhood conditions and adopts the attributes, values, and behaviors over time (Harding 2003; Halpern-Mannersa, Warrena et al. 2009; Wodtke, Harding et al. 2011). Therefore, as suggested by Harding (2003) and Wodtke et al. (2011), the duration of exposure to neighborhood environment is an important dimension through which neighborhood effects operate to affect children's development. The longer the exposure to neighborhood disadvantage, the more detrimental the impact on children's development, as children are socialized into the culture of disadvantage neighborhoods. Thus, short term exposure to disadvantage neighborhood may not affect children much as exposure over a longer term. Therefore, in empirical research, it is important to consider the length of exposure to neighborhood socioeconomic conditions.

Social organization/collective efficacy. Rather than focusing on the negative impact of social isolation on individual development, the Chicago school (Park and Burgess 1921) proposes social organization theory which argues that neighborhood disadvantage (poverty, minority concentration, and residential instability) leads to difficulties in establishing and maintaining social order (Sampson 1997; Morenoff and Sampson 1997). Poor neighborhoods are usually characterized by the lack of economic resources, high concentration of minorities, and high turn-over rate of its residents. Each of these characteristics affects maintenance of social order by influencing the stability of social ties between neighbors, their expectations, and their norms (Harding 2003). Moreover, formal institutions such police, health care facilities, and

schools also affect the social order of the community (Morenoff and Sampson 1997; Sampson, Morenoff et al. 1999; Morenoff, Sampson et al. 2001).

Sampson expanded the Chicago School tradition by proposing the theory of *collective efficacy* which emphasizes the informal social control gained through inter-resident connections. He defined collective efficacy as "social cohesion among neighbors combined with their willingness to intervene on behalf of the common good" (P918. In Sampson, Raudenbush et al. 1997). He proposed that collective efficacy mediated the relationship between concentrated structural disadvantages and onset of crime and violence. In poverty stricken neighborhoods, the lack of social cohesion among neighbors means that crime and deviant behaviors are likely to develop (Sampson, Morenoff et al. 2002).

From the perspective of neighborhood influence on children's early life socialization, James Coleman (1994), in his study of education, used the term "social capital" to describe the close monitoring and control offered by adult neighbors against children's undesirable social behaviors in the neighborhood. This model stresses the social trust and cohesion among neighbors which help maintain community social order. Brody and colleagues (2001) examined the collective socialization process among the black teenagers and found collective socialization in neighborhood played a role in preventing teenagers' involvement in deviant behaviors especially for those living in the most disadvantaged neighborhoods. Collective socialization has been found to contribute significantly to the prevention of teen involvement in gang activities, violent argument, sexual assault, and other such anti-social behaviors.

Physical environment theories of neighborhood effects suggest that the unequal distribution of environmental hazards in residential place affects children's health and development (Evans and Kantrowitz 2002; Evans 2004; Crowder and Downey 2010). Children living in poor and disadvantaged neighborhoods are more likely to be exposed to air pollution or waste disposal areas as they live close to industrial centers (Crowder and Downey 2010). Moreover, housing environment in poor neighborhoods is problematic as well. The buildings are often dilapidated with health hazards such as allergens, toxins, lead, and mold (Evans 2004). These environmental hazards may cause health problems for children residing in poor neighborhoods. Studies have shown that children living in disadvantaged neighborhood are more likely to be exposed to air pollution which is linked to onset of asthma. Asthma, in turn, causes school absences and consequential schooling disruption (Moonie, Sterling et al. 2006; Moonie, Sterling et al. 2008; Clark, Demers et al. 2010). Moreover, the dilapidated housing environment, street graffiti, and broken window in the neighborhood are associated with stress and mental health problems, including depression, for residents (Klebanov, Brooks-Gunn et al. 1994; Wandersman and Nation 1998; Kruger, Reischl et al. 2007). Parental psychological depression has been linked to harsh parenting styles which are associated with behavioral problems in childhood and adolescence (Whitbeck, Simons et al. 1997; McLoyd 1998; Chang, Schwartz et al. 2003).

In sum, social isolation of resources, the consequential lack of collective efficacy, and the depilated physical environment due to the isolation of the poor from the affluent have detrimental impacts on children's early life socialization in their language, behavior, and health. This line of argument is based on the assumption that neighborhood disadvantage has a negative

impact on individual outcomes while affluent neighbors and neighborhood affluence has a positive influence.

Relative deprivation and competition model.

Finally, unlike models proposing a positive impact of affluent neighbors, research also suggests that affluent neighbors and neighborhoods may have negative impact for children, especially those from poor families. Furthermore, poor neighborhood may have positive effects on children who are also poor (Mayer 2002). This is because of the psychological impact when children compare their own living situation with that of their neighbors. According to relative deprivation model, because poor children growing up in affluent neighborhoods are economically disadvantage compared with their affluent peers, they may feel inferior to their more well-to-do peers. Therefore, children from poor families may develop resentment against the high living standard and adopt deviant behaviors such as dropping out of high school and getting involved in violence and crime (Mayer and Jencks 1989; Cutler and Glaeser 1997). Conversely, residing in less advantaged neighborhoods may have the opposite effect which encourages children strive for better living conditions through educational achievement and work (Mayer and Jencks 1989).

The competition model also focuses on the interaction between family socioeconomic conditions and neighborhood context. It suggests that neighbors compete for the limited resources in their neighborhoods (Jencks and Mayer 1990). In terms of educational achievement, children from well-off families generally perform better than those from poor families. Schools in affluent neighborhoods are often more academically demanding than those in poor

communities (Mayer and Jencks 1989). Therefore, children moving from poor neighborhoods to affluent neighborhoods may find it hard to perform well academically in school and rank lower in class. Since educational achievement is cumulative, affluent neighborhood may take a toll on life chances of children from poor families. Though relative deprivation and competition models are important mechanisms underlying neighborhood effects, very few empirical studies have explored these two mechanisms.

In sum, theoretical arguments on neighborhood effects mechanisms suggest the important impact of neighborhood poverty, disadvantage, and affluence on children's development. In general, neighborhood affluence is considered to positively influence children's outcomes through availability of institutional resources, high level of collective efficacy against deviant behaviors, and safe physical environment. In addition, neighborhood poverty and disadvantage have detrimental impacts on children's development. When there is a concentration of neighborhood disadvantage and poverty in residential neighborhood, there may an epidemic of social problems such as an elevated prevalence in children's dropping out of high school and teenage childbearing. Finally, neighborhood characteristics may also interact with family and individual characteristics to shape children's outcomes. The detrimental impact of neighborhood disadvantage may take a toll on children from poor families while the same neighborhood characteristics may have lesser impact for children from non-poor families. Alternatively, as relative deprivation theory suggests, neighborhood advantages may have negative impact for poor children while less affluent communities have a positive effect for the poor.

Empirical work using the three dimensions of neighborhood economic conditions.

Surrounding the discussions on whether and how neighborhood economic conditions influence children's educational attainment and behavioral outcomes, many studies have been conducted focusing on different dimensions of neighborhood economic conditions. Some focus on neighborhood poverty and disadvantage, some on neighborhood affluence, and still others test which is more important for children's development, neighborhood affluence or poverty.

Neighborhood Poverty/Disadvantage. This line of research focuses on the detrimental impact of undesirable neighborhood living environment. When neighborhood economic conditions are considered, most of the studies have been devoted to examining the impact of neighborhood poverty (Harding 2003). Since neighborhood poverty is highly correlated with many neighborhood disadvantages, researchers also use a composite measure to capture a variety of neighborhood dimensions of neighborhood deprived living conditions such as poverty, joblessness, and social cohesion. The key component of the neighborhood disadvantage index is neighborhood poverty level (Sampson, 2012).

Studies examining the effect of neighborhood poverty usually define neighborhood poverty by using the proportion of families living under the US poverty threshold. If a neighborhood has more than 30 percent of families living under the poverty line, such neighborhood is considered as a poor neighborhood. With more than 40 percent poor families, the neighborhood is considered an extremely poor neighborhood (Bureau of the Census 1970). Effects of neighborhood poverty are estimated by comparing children's educational attainment and risk for teenage childbirth for those who live in poor verses their counterparts that reside in

non-poor neighborhoods while controlling for an array of family and neighborhood characteristics.

Since neighborhood economic situation is highly correlated with several important socioeconomic dimensions of a neighborhood environment such as racial segregation, family structure, size of household, neighborhood unemployment rate, social cohesion, and health of residents, just to name a few, studies focused on the effect of neighborhood disadvantage usually construct a composite measure based on these various dimensions of neighborhood socioeconomic conditions such as poverty level and racial composition to describe neighborhood socioeconomic deprivation (see Sampson, Morenoff et al. 1999; Sampson, Morenoff et al. 2002; Sampson 2008; Sampson and Morenoff 2008). The advantage of using a composite measure is that it may better captures the neighborhood social situation (as it reflects a broad range of neighborhood characteristics) than simple measures of neighborhood poverty or minority concentration in residential area.

When children's educational attainment is considered, researchers usually find neighborhood disadvantages have a consistent detrimental impact on children's educational attainment. Crowder and South (2003) found that neighborhood disadvantage increased the likelihood that a child would drop out of high school. Their disadvantage score was constructed based on neighborhood poverty rate, proportion of families receiving public assistance, male joblessness, proportion of families without high income, proportion of residents 25 years older without college degree, and proportion of workers not in managerial or professional occupation. This effect was also depended on children's household economic conditions in that it was

pronounced for children growing up in single parent households and for those in low income families. Garner and Raudenbush (1991) developed a similar composite measure of neighborhood deprivation – deprivation score based on twelve indicators of neighborhood environment which capture the economic and demographic characteristics of neighborhood social environment. These include: family structure, size of household, elderly households, unemployment, youth unemployment, the permanently sick, low earning, amenity deficiency, overcrowding, vacant dwellings, and two indicators for housing situations in the neighborhood (percent of families with elderly people and percent of families with child under 4, that living in household on the first floor or above with no elevator for access). Using this index, they found significant detrimental impact of neighborhood deprivation on children's educational attainment, in that change in the level of deprivation from the 10^{th} to 90^{th} percentile in the study area is associated with the advance in schooling with O pass (Scotland test in order to receive university education). Their results showed that once neighborhood deprivation is controlled, the remaining unexplained variation in the regression model is no longer statistically significant.

However, the negative impact of neighborhood disadvantages is not consistent for children's behavioral outcome of teenage sexual activity and childbearing. Hogan and Kitagawa (1985) derived the measure of neighborhood quality using principle analysis using neighborhood socioeconomic and demographic information in Chicago. Based on the distribution of this measure, they categorized neighborhoods into high-risk and low risk communities. The authors found significant impact of neighborhood quality on children's sexual behavior and teenage childbearing. Similar detrimental effect of neighborhood deprivation was also found with data from Great Britain. McCulloch (2001) used data from the Great Britain 1991 census and found

neighborhood deprivation (based on the information on housing tenure, car access, the number of earner in the household, and room density) was associated with increased risk of teenage childbearing. However, neighborhood effects were less important in determining teenage nonmarital childbearing than were individual and family characteristics, such as labor force participation, household economic conditions and assets. Once individual and family characteristics were controlled, neighborhood deprivation attenuated to non-significant. Using data from the Panel Study of Income Dynamics (PSID), South and Crowder (1999) conducted a longitudinal study exploring effect of neighborhood disadvantage (neighborhood disadvantage index composed of poverty rate, % families receiving public assistance, male jobless rate, % families without high income, % age 25 or older, % workers not in managerial or professional occupation) on women's premarital childbearing and the timing of first marriage. When effects of neighborhood economic conditions were analyzed separately for blacks and whites, they found a significant nonlinear, to be specific – curve linear impact of neighborhood disadvantage on white women' premarital childbirth (the relationship between neighborhood disadvantage and white women's premarital childbirth was convex) and black women's first prebirth marriage (the relationship between neighborhood disadvantage and black women's prebirth marriage was concave). However, the difference in neighborhood quality only moderately explained the racial differences in family formation. When adolescent premarital pregnancy was considered, South and Baumer (2001) failed to find any significant evidence that residing in socioeconomic disadvantaged community increased teenagers' risk of becoming pregnant before marriage. However, this study defined neighborhood using a broader areal unit of zipcode which covers a

larger spatial area with less homogeneous population than that of census tract. The estimated impact may not be accurate due to the heterogeneity of population in the spatial unit.

As neighborhood studies have suggested that both neighborhood economic environment and racial composition are important ecological factors that help shape the life chances and resources for children, studies focusing on neighborhood effects always consider the effects of both factors, with either neighborhood economic condition or racial composition as the control variable. Seldom do researchers consider the joint effects of the two. Only one study categorized neighborhood environment into four types using a composite measure reflecting the racial and economic composition in the residing place (Sucoff and Upchurch 1998) – underclass black, working-class black, working-class racially mixed, and middle class white. The study found significant neighborhood impact on teenage childbearing. Living in a white middle class neighborhood is associated with lower rate of premarital first birth for affluent black teens but not for the less affluent black children. However, there was not any interaction effect between neighborhood condition and family economic condition. The authors suggested that the major mechanisms through which neighborhood socioeconomic conditions affected female's teenage childbirth was through racial segregation which sealed off the exposure to mainstream culture.

Neighborhood Affluence. Studies that are focused on to the effects of neighborhood affluence on children's educational or behavioral outcomes are rare. To my knowledge, only one study specifically examined the effects of neighborhood affluence on children's educational attainment (Crane 1991). In this study, Crane specifically examined the impact of the presence of affluent neighbors, measured by the proportion of residents that have professional or

managerial jobs, on children's probabilities of dropping out of high school before graduation and teenage childbirth. In addition to his focus on affluence neighbor effects, he diverted from the conventional assumption of linear impact of neighborhood conditions to examine the threshold effect of neighborhood impact.

Unlike many studies that assume the linear relationship between neighborhood socioeconomic conditions and children's well-being, Crane (1991) investigated the non-linear or "epidemic" effect of the presence of affluent neighbors, using data from the 1970 decennial Census. In this study, he used a piecewise linear logit model to estimate the pattern of neighborhood effects across the distribution of neighborhood quality. He categorized neighborhood quality (proportion of high status neighbors) by its distribution intervals (0-5, 6-10, 11-25, 26-50, 51-75, 76 – 90, and 91-100 percentile). The large increase in the slope from neighborhood effect in one category to the next indicated a sharp rise in the outcome at the particular point in the neighborhood quality distribution. Controlling for family income, parents' educational status, family head's occupational status, household structure, family size, rural origin gender and race, Crane found significantly sharp increases in high school dropout and teenage childbirth when the presence of neighbors with professional/managerial jobs fell below 5 percentile points. Such an effect was found when individuals from each racial group (Hispanics, blacks, and whites) were analyzed separately. Findings from the study supported the epidemic model suggesting a sharp increase in social problems when neighborhood quality was near the bottom of the distribution.

Neighborhood economic segregation. Very few studies have considered the joint impact of both neighborhood affluence and poverty on children's outcomes (Brooks-Gunn, Duncan et al. 1993; Duncan 1994; Carpiano, Lloyd et al. 2009). If we think both neighborhood affluence and poverty have an impact on children's educational and behavioral development, then we would expect to see both of the economic dimensions operating in residential neighborhood influencing children's likelihood of dropping out of high school and becoming a teenage parent. Solely focusing on either one misses the effect of the other. However, in current research on neighborhood effects, very few have examined the effects of both parameters in their studies. Question still remains about how the presence of both neighborhood poverty and affluent jointly affect children's growth. Knowing the impact of the spatial distribution of the affluent and the poor in residential place may shed new light on social policy targeting improving children's educational and behavioral outcome by changing their living conditions.

There are two ways that neighborhood poverty and affluence are considered in the current research on neighborhood effects. One approach is including both parameters (poverty and affluence) in regression analysis. The second approach is to create a composite measure of neighborhood economic segregation by incorporating both neighborhood affluence and poverty such as segregation indices.

Poverty and affluence. Due to the limitations of the composite measure of neighborhood disadvantage which does not distinguish the unique influence of neighborhood economic condition and other social characteristics such as racial composition, prevalence of delinquency or crime, or social cohesion, researchers have tested the distinctive impact of neighborhood

social economic conditions by including the variables into regression analysis rather than creating a composite measure. Clark (1992) used data from the 1980 census and examined the how neighborhood socioeconomic conditions affected adolescent males' high school dropping out. She examined the impact of both neighborhood poverty and neighborhood affluence while controlling for a broad range of individual and family characteristics. She found significant impact of each of the neighborhood variables. Both neighborhood poverty (measured by the proportion of individuals in poverty) and the affluence neighbors (measured by the proportion of adults who have professional jobs) affected adolescent males' dropping out of high school such that males in poor areas were more likely to drop out of high school while neighborhood affluence protect them against this undesirable outcome. Moreover, the impact of neighborhood economic circumstances varied by race. Clark reported that the presence of affluent neighbors benefited white children more than it did black youth. And, for both black and whites, the positive impact of neighborhood affluence is larger than the negative impact of neighborhood poverty.

Similar findings were reported by Brooks-Gunn and colleagues (1993). Using the PSID data and controlling for family and individual characteristics, they also demonstrated that neighborhood affluence played an important role not only for high school graduation, but also for teenage childbearing, and early cognitive development such as children's IQ at 5 years old. The influence of neighborhood poverty became insignificant after controlling for family variables. The study showed that neighborhood economic impact, presence of affluent neighbors to be specific, was stronger than individual level characteristics. A later study by Duncan (1994) paid special attention of neighborhood influence stratified by race and gender. Consistent with

Clark (1992) and Brooks-Gunn and colleagues (1993), he demonstrated the importance of neighborhood affluence for children's high school leaving. However, the presence of affluent neighbors did not prevent black males from dropping out of high school. Neighborhood poverty was seldom significantly related to children's dropping out of high school when other individual and family and neighborhood affluence were taken into account.

Neighborhood ICE. Studies by Clark (1992), Brooks-Gunn et al. (1993), and Duncan (1994) all suggested the important of positive effect of neighborhood affluence outweighed the negative impact of neighborhood poverty on children's educational and behavioral outcomes. They proposed that neighborhood affluence played a more important role affecting children's outcomes than neighborhood poverty. However, their studies have been criticized for statistical collinearity problem when both neighborhood affluence and poverty were incorporated in the regression analysis. As neighborhood affluence and poverty are highly correlated (in poor neighborhoods, there are few affluent people and vice versa), collinearity problem due to the high correlation affects the significant test results. Therefore, Massey developed a measure of Index of Concentration at the Extremes (ICE) which solved the collinearity problem.

Using this measure, Carpiano and colleagues (2009) conducted a research examining the how neighborhood ICE was related to early childhood developmental outcomes for kindergarten children. They found that increases in neighborhood affluence were associated with higher scores for school readiness. However, there was a diminishing return to neighborhood affluence. Increase in neighborhood ICE (affluence) was curvilinearly related to four out of five measures of children's developmental scores (physical, social, emotional, and communication). The

finding suggested that children living in mixed income neighborhoods might benefit from the presence of affluent neighbors and the availability of social services and institutions aimed at assisting low income residents.

Summary of the limitations in the current research on neighborhood effects.

As reviewed above, current research on neighborhood effects lacks a comprehensive consideration of neighborhood economic situations. Focusing on the effects of neighborhood poverty and disadvantage overlooked the important effect of the presence of affluent neighbors. When both effects are considered, we need a more efficient measure to capture them while avoiding collinearity problem. Moreover, time and temporal effects of neighborhood situations have not been carefully considered in the literature. Finally, though suggested by few studies that neighborhood effects may be nonlinear or curvilinear (Crowder and South 1999; Crane 1991), most of the current studies on neighborhood effects rely on regression methods which assume linear function of neighborhood impact. The linear assumption may bias the estimate of neighborhood effects.

Dimensions of neighborhood economic situations.

When neighborhood effects are the focus of study, researchers have paid much attention to the impact of neighborhood poverty and disadvantage neglecting the effect of neighborhood affluence. Though these studies have provided convincing results that neighborhood poverty and disadvantage have negative impact on children's educational attainment and positively associated with undesirable behavioral and health problems such as violence, crime, and teenage childbearing, very few have considered the beneficial impact of neighborhood affluence that may

at the same time operate in residential neighborhoods. The negligence of neighborhood affluence may contribute to the failure of finding large neighborhood effects in the current research. Moreover, demonstrating the important influence of neighborhood affluence may shed new light on the design and implementation of neighborhood policies that targeting economic segregation. Conventional policies that focusing on bringing the poor child to affluent neighborhoods may think about how to get poor children more exposure to affluent neighbors instead of relocation which has not been very effective in terms of educational and behavioral outcomes. As outlined in the next chapter, this dissertation uses a composite measure of neighborhood poverty and affluence that overcomes problems of previous approaches to studying these issues.

Considering time in neighborhood research.

In the early 1990's, most of the studies exploring how neighborhood conditions affect children's outcomes used cross-sectional data and cross-sectional design (Crane 1991), -- neighborhood conditions were measured at the same time that children's outcomes were assessed. Later studies by Brooks-Gunn et al (1993) and Duncan (1994) considered temporal effect of neighborhood conditions by measuring neighborhood socioeconomic environment when children were 14 or 18 years of age. Some studies (Jackson and Mare 2007) have been conducted using a short term longitudinal design by aggregating neighborhood information over a short period of time usually during adolescent years. Most of them claimed that neighborhood socioeconomic environment during adolescent years were more important for children's educational attainment and behavioral outcomes than early childhood. Therefore, taking into account neighborhood

situations during late adolescent would be sufficient to capture the influence of neighborhood environment. However, other studies have suggested that neighborhood social environment during early childhood is also important for children's future income as neighborhood conditions influence the early socialization of children which in turn affects their social behavioral and cognitive development as adolescents (Vartanian and Buck 2005).

As Harding (2003) pointed out, neighborhood effects were not contemporaneous. A child would not be affected by a neighborhood socioeconomic environment if he/she only spent a day there. Neighborhood influence operated only when a child had spent enough time living there. Therefore, duration of exposure to neighborhood environment is an important dimension of temporal dynamics that should be taken into account in order to assess neighborhood impact.

Reasons to carefully consider neighborhood socioeconomic situations over time are multifold. First, neighborhood itself is constantly changing. Neighborhood socioeconomic conditions change over time due to the migration of the residents, local social policy change, and the changes taking place in the macroeconomic structure (Wilson 1987; Sampson 2012). Moreover, residential mobility is high in the United States. Individuals and families are able to move to across neighborhoods. In the US, the residential mobility is pretty high especially among the children age four to nine years old (Long 1992). The changes in neighborhood economic structure and residential mobility bring about dynamics in neighborhood experiences. Children are exposed to various levels of economic wellbeing in residential area with each move or due to neighborhood improvement or deterioration over time.

The above consideration and treatment of time in studies of neighborhood effects can be referred to as "concurrent view" neighborhood circumstances. When we think of neighborhood effects, we only consider the neighborhood environment a child grows up with. Recent work on neighborhood effects conceptualizes neighborhood environment and its effects from a historical and intergenerational perspective. They probe the questions of how neighborhood environment is formed; how it transmitted across-generation; and the mechanisms through which enduring socioeconomic inequality is maintained in residential places (Sampson 2012; Sharkey 2013).

From a structural perspective, Sharkey (2013) examined the intergenerational transmission of neighborhood contextual environment using longitudinal data from the PSID. He defined contextual mobility as the ability to change of neighborhood socioeconomic environment. Contextual mobility differed from residential mobility as moving across neighborhoods might not bring about improvement in neighborhood socioeconomic situations. Using over 30 years of data from the PSID, he found that the contextual mobility of residents was low. Children, when they were old enough to choose their own residential area, were likely to live in neighborhoods bearing similar socioeconomic conditions as their parents' when they grow up. The upward contextual mobility (moving from a disadvantaged neighborhood to a socioeconomically better neighborhood) was low. Those who grew up in disadvantaged and segregated neighborhoods were also likely to reside in deprived residential areas as well. As he argued, the low contextual mobility contributed to a strong stability of neighborhood inequality over time. The stratification of people by residential context was entrenched.

Sampson (2012), not only examined the structural but also the cultural dimensions of neighborhood effects as well. His work also took into account time as an important factor for the enduring stratification by residential place. From a structural perspective, the entrenched discrimination in the housing market and social policies set up the barrier for reducing racial and economic segregation. From a cultural perspective, he suggested that persisting stratification by residential place was the result of how neighborhoods were perceived and defined over time. Each neighborhood was tied to a reputation that defined by residents and outsiders. Affluent city neighborhoods as well as city ghettos were defined by over time. Both residents and outsiders reacted to neighborhood socioeconomic differences and such reactions helped shape the perception, reaction, and definition of neighborhoods. One important point made by Sampson was that, our perceptions, reactions, and definitions of neighborhoods were not formed immediately upon exposure to the neighborhood environment, but throughout time. For example, Sampson's argument about broken windows in city neighborhoods suggested that the broken windows as we saw may not be the driving force for social problems like violence or crime and stable neighborhood inequality. Instead, the shared perception of the neighborhood as deprived, disordered, and socially disadvantaged over time shaped the socioeconomic outcomes (such as racial and economic segregation) of the neighborhoods.

In sum, time has been playing an important role in the formation of the definition of residential context which in turn shapes children's educational and behavioral outcomes. Neighborhood effects operate on children's development over time. The duration of exposure to neighborhood advantage and disadvantage matters for children's early life socialization and later life opportunities and social standing. Moreover, neighborhood characteristics are perceived and

reacted upon over time. The definition and reputation of neighborhoods plays an important role in the economic and racial segregation in residential place (Sampson 2012).

Nonlinear neighborhood effects.

Finally, current study of neighborhood effects often uses linear regression models which assume linear relationships between neighborhood characteristics and outcomes of interest. The possible curvilinear associations have not been carefully examined. The study by Crane (1991) suggested that the linear assumption neighborhood effects may be incorrect. Crane demonstrated a strong nonlinear effect of presence of affluent neighbors (measured by proportion of residents having a managerial or professional job) on children's likelihood of dropping out of high school and becoming teen parent. This study aimed to test the epidemic model of neighborhood effects. The epidemic model suggests a threshold effect --- when social condition reaches a threshold, there is a quick spread of social problems – the epidemic occurs. Using the PUMS data from 1970, Crane found that when the fraction of affluent neighbors was below 5%, there was a sharp increase in dropping out of high school among adolescents. Crowder and South (2003) also investigated the non-linear relationship between neighborhood disadvantage and premarital childbirth rate for white women and non-linear effect of neighborhood disadvantage and pre first birth marriage for black women. These results suggested detrimental consequences of concentrated socioeconomic disadvantage rather than merely high disadvantage. Therefore, the functional form of neighborhood socioeconomic impact is worth careful examination.

Hypothesis

Studies that examine only neighborhood disadvantage or only neighborhood affluence fail to capture the true neighborhood economic conditions. Examining neighborhood disadvantage only overlooks the impact of the presence of affluent neighbors. Focusing on neighborhood affluence only ignores the negative influence from the presence of poor neighbors. Even though economic segregation is high in the U.S., the complete exclusion of the poor in affluent area and the complete segregation of the affluent from the poor are not common, especially with the decrease in economic segregation since 1980. When studies include both neighborhood affluence and poverty in one equation, the results fail to accurately assess the extent of exposure to either condition as they are correlated.

In this dissertation, I draw on the measure of Index of Concentration at the Extremes (ICE) (Massey 2001) to explore how neighborhood economic conditions affect children's educational attainment and teenage childbirth. The index of ICE was proposed by Massey (2001) which conceptualizes the concentration of affluence and poverty as falling along one underlying continuum that ranges from -1 (complete concentration of poverty) to 1 (complete concentration of affluence) (Casciano and Massey 2008; Carpiano, Lloyd et al. 2009). When ICE equals zero, it indicates an equal balance of poor and affluent families in the neighborhood. Use of this measure resolves the problem of multi-collinearity when both measure of neighborhood poverty and affluence are entered into the regression equation. In addition, unlike prior studies, the majority of which use cross-sectional data or short-term longitudinal data that capture the concurrent or delayed effects of neighborhood conditions, I examine the neighborhood conditions over the entire childhood so as to examine the cumulative impact of residential place.

First, I will test the link between neighborhood ICE during childhood and educational achievement in early adulthood. In addition, because girls are more likely to become teenage mothers when they are trapped in high poverty concentrated areas and less likely to become pregnant when they reside in more affluent areas, I will examine how exposure to neighborhood poverty and affluence throughout childhood may be associated with early pregnancy. When neighborhood conditions are averaged over the childhood years, does a robust estimate of neighborhood conditions yields more accurate estimate of neighborhood impact?

Second, when I test the link between neighborhood ICE and children's outcomes, I also explore whether neighborhood effects are nonlinear. If there is a nonlinear relationship between neighborhood conditions and children's outcomes, then it is worth testing if neighborhood economic conditions are channeled through epidemic model.

Third, I test whether there is an interaction effect between neighborhood condition and family poverty. This question addresses the relative deprivation mechanisms which have long been ignored in neighborhood effect studies. By including an interaction effect between neighborhood conditions and family economic situations, I test whether exposure to family poverty in conjunction with residing in a poor neighborhood is more detrimental than exposure to either condition alone. I also examine whether the effect of neighborhood conditions varies by child's race. Since neighborhood conditions differ dramatically across the racial line, neighborhood impact may vary for blacks and whites.

Finally, to address the question of whether point-in-time measure of neighborhood economic conditions is sufficient to capture neighborhood effects, I compare the regression

results of using longitudinal measures of neighborhood economic environment with those using neighborhood economic conditions at age 14. This analysis provides a test of whether cumulative exposure throughout childhood is a more powerful predictor of outcomes than is a point-in-time exposure.

Chapter 2 Methods

Data

To examine the questions elaborated in the last chapter, I draw upon three data sets -- the Panel Study of Income Dynamics (PSID) annual family files, the PSID Geocode Match File, and the Neighborhood Change Database (NCDB) to test the hypotheses of how neighborhood economic environment affects children's development. I use these data sets to address how childhood neighborhood economic conditions affect children's educational attainment and teenage childbirth. Specifically, I test whether neighborhood economic situation measured by the Index of Concentration at Extremes (ICE) outperforms conventional measures of neighborhood poverty and affluence in capturing the neighborhood impact on children's outcomes; if the relationships between neighborhood economic conditions and child's outcomes are non-linear and test if the epidemic model operates; if the neighborhood economic impact is moderated by race and family economic situation; and if taking a longitudinal view of the cross-level interactions between neighborhood and family economic conditions and the racial difference in neighborhood impact.

The PSID is a panel survey of U.S. households collected by the Survey Research Center of the University of Michigan since 1968 (Hill 1992; Hofferth, Stafford et al. 2001). Low income sample were oversampled at the beginning and weights have been developed to adjust for the both the difference in initial sampling probabilities and for nonresponse and the sample attrition over time. The original families are re-interviewed every year till 1997 and every other year thereafter. Members from the original families are followed up and become PSID families when

they leave their home and form their own families. Rich demographic and economic information has been collected in each survey. As of 2007, the PSID data included longitudinal information on 69,263 individuals who were either members of one of the original sample families, the offspring of the original samples, or the family members of the original samples by marriage, co-residence, or adoption. The current study draws upon the longitudinal nature of the PSID to examine the impact of neighborhood condition on children's development over time.

This study also uses sensitive data, the PSID Geocode Match File, collected by the PSID, which includes the geographic information of the residential place of the respondent. Sensitive information are collected in this file on the county, census place, 5-digit zip codes, Census Tract/Block Numbering Area, and MSA for the PSID families in each interviewing year. The smallest geographic area is the Census Tract. Due to the sensitive nature of the data set, the data can only be obtained through special contract with the PSID. With the PSID Geocode Match File, I have linked the PSID families' census tract information to the U.S. Census data so as to draw information on neighborhood environment. The PSID geocode file has linked the family addresses in each year to 1970, 1980, 1990, and 2000 census boundaries that researchers can choose the appropriate census data.

For neighborhood information, I use the NCDB developed by Geolytics (Geolytics 2004). NCDB has a full range of demographic, socioeconomic, and housing information collected from the Decennial Census. This dataset integrates the 1970, 1980, 1990, and 2000 census data into one file where the Census tract boundary is adjusted to be consistent throughout those census years. For the dissertation research, almost all neighborhood characteristics are measured by the

census information based on the 2000 Census Boundaries[1]. The NCDB normalized all census information from 1970, 1980, and 1990 to the 2000 census boundaries so that census information is comparable throughout census years.

Selection criteria

To examine how neighborhood economic conditions affect children's educational attainment and risk behaviors of teenage childbirth, I focus on the impact of urban neighborhoods. All children born to PSID families between 1970 and 1980 are chosen and this cohort is followed until they are 14 years of age. Family information is also followed until children are 14 years old. Children are selected for the data analysis based on the following criteria. First, only black and white children are selected. During the early years of the PSID, there were very few immigrants. The majority of the PSID sample is black or white. As I focus on children born between 1970 and 1980 who have been followed until age 14, choosing black and white children allows availability of data over the long observational period. Second, the selected household must reside in a Metropolitan Statistical Area (MSA) when the child was born. Third, neighborhood information must be available for at least 5 data points (at least one third of the 15 data points from birth to 14 years of age to describe childhood experience of neighborhood conditions) to ensure a reliable account of neighborhood conditions.

I construct two analytic samples to examine the neighborhood effects on children's development. One sample is used for the analysis of neighborhood impact on high school dropping out. The other sample is used for the analysis of neighborhood effects on female

[1] In a few cases where geocodes cannot be linked to the 2000 census provided by the NCDB, I used the information from 1970, 1980, and 1990 Censuses.

children's teenage childbearing. Due to missing data on the outcome and covariates, the analytic sample for the study of neighborhood influence on children's educational attainment consists of 3,077 children after applying the selection criteria. The analytic sample for analyzing neighborhood influence on teenage childbearing consists of 1,045 children.

Outcome variables

The outcomes of interest are children's high school dropout status and teenage childbirth. Number of years of education for household head and wife are reported by family head in each year's survey[2]. To obtain an accurate measure of school leaving, children are followed until they are 24 years of age (when they are household heads and wives by that age) to determine if they have graduated from high school or have a GED certificate by that time. High school dropping out is determined if a child fails to obtain either a GED or graduate from high school by the time he/she reaches age 24. For teenage childbearing, I focus on the adolescent girls only. The information on childbirth is obtained by self-report. As a prior study has suggested that information on becoming a teenage parent is more reliable from teenage girls than boys (Corcoran 1998). An adolescent girl who gives birth before aged 20 is considered a teenage mother. Both high school dropout and teenage childbearing are dichotomized with 1 representing the undesirable outcome. If a child leaves school before graduating and has not get a GED or high school degree, his/her high school dropout is coded as 1 and 0 otherwise. If a

[2] There are lots of missing data on this variable. The information is only available for family head and wife of the household but not the children. Only if the child leaves home and starts his/her own family does the PSID gather the information on his/her educational attainment.

female child gives birth to a child before 20, then teenage childbirth is coded as 1 and 0 otherwise.

Neighborhood environment

Economic characteristics

In the current study, the key neighborhood economic characteristics of interest are the average exposure to neighborhood poverty, average exposure to neighborhood affluence, and an average of the index of concentration at the extremes (ICE). Each computed by aggregating information on these variables over time from birth till age 14. By doing so, these variables portray the level of childhood exposure to neighborhood economic hardship and advantage. Moreover, the average ICE measure reflects neighborhood composition of the poverty and affluence that a child has experienced during childhood.

Following prior studies, I define neighborhood poverty/ affluence by the proportion of poor /affluent families in a neighborhood. Consistent with prior studies, a poor family in a neighborhood is measured by if the family income under $4,999 in 1970 census (Brooks-Gunn, Duncan et al. 1993), under $9,999 in 1980 (Brooks-Gunn, Duncan et al. 1993) under $12,499 in 1990[3] and under $14,999 in 2000 (Casciano and Massey 2008). Similarly, neighborhood affluence is defined by the proportion of affluent families in the neighborhood. Following prior research (Brooks-Gunn, Duncan et al. 1993; Morenoff, Sampson et al. 2001; Casciano and

[3] Neighborhood poverty level for 1990 is based on the cutoffs for 1980 and 2000 poverty lines by taking the mean of the two cutoff points. Only the study by Morenoff, Sampson, and Raudenbush (2001) used the measure of the neighborhood poverty in 1990. They used the measure of neighborhood poverty from the 1990 US census. However, this information is only available in 1990 and 2000 census but not before.

Massey 2008; Sampson and Morenoff 2008), I define an affluent family as one whose annual income exceeds $14,999 in 1970, $29,999 in 1980, $49,999 in 1990, and $74,999 at 2000. Neighborhood information on poverty and affluence is linearly interpolated for years between decennial censuses using information from the most adjacent census years.

From a longitudinal perspective, to capture childhood exposure to neighborhood poverty, I calculate the average proportion of poor families in the neighborhood that a child resides in over 14 years

$$\textit{Average neighborhood poverty} = \sum_{k=0}^{n}(\%\ neighborhood\ poverty)/\ N$$

N represents the number of years that have neighborhood data. This measure of neighborhood poverty over time reflects the neighborhood poverty that a child has been embedded in during his childhood. Since this measure is constructed based on at least 5 years of neighborhood data, it is more robust than the conventional snap shot view of neighborhood condition that is taken at a pre-specified particular time point. Using the same procedure, I calculated average exposure to neighborhood affluence during childhood. This variable represents the average potential encounter of affluent families during childhood.

$$\textit{Average neighborhood affluence} = \sum_{k=0}^{n}(\%\ neighborhood\ affluence)/\ N$$

Following Massey (2001), neighborhood ICE indicates the level of inequality in the distribution of affluence and poverty in neighborhoods.

ICE = (Total # of affluent families – Total # of poor families) / Total number of families

The ICE succinctly captures neighborhood information about both poverty and affluence. The index ranges from -1 to + 1, from full concentration of poverty to full concentration of affluence, respectively. Values from -1 to 0 indicates neighborhood with more concentration of poverty than affluence while values from 0 to 1 indicates more affluence concentration than poverty. When the index equals zero, it indicates the equal share of affluent families and poor families in a neighborhood. ICE measures are also averaged across the childhood from birth to 14 years of age in order to capture the neighborhood economic condition that a child has been exposed to during his/her early life.

$$\textit{Average neighborhood ICE} = \sum_{k=0}^{n}(\%\ neighborhood\ ICE)/\ N$$

Statistics on the number of affluent and poor neighbors and the total number of people in the neighborhood are linearly interpolated for between census years.

In sum, average neighborhood poverty, average neighborhood affluence, and average neighborhood ICE capture the level of neighborhood economic dis/advantage and economic inequality that a child has been exposed to during childhood. By taking into account neighborhood economic conditions over fifteen data points instead of a single-point in time measure, these three aggregated measures provide a more accurate portrayal of neighborhood economic conditions than that used with cross-sectional data.

Racial composition

In the neighborhood effects literature, there has been a debate about whether neighborhood economic conditions or its racial composition is the driving force for

neighborhood effects (Massey 1981; Massey, Condran et al. 1987; Sharkey 1997; Quillian 2003). Neighborhood racial composition, especially minority concentration has been suggested to have a negative effect on children's outcomes (Lewin-Epstein 1986; Massey, Condran et al. 1987; Wilson 1987; Massey and Denton 1993; Rosenbaum 1995). I measure neighborhood minority concentration by the proportion of residents in the neighborhood that are non-white[4]. This measure does not distinguish whether the minority concentration is mainly by African Americans or Hispanics[5]. Childhood exposure to neighborhood concentration of minority is coded in a way of capturing the length of childhood exposure to neighborhood minority concentration. Following the Department of Housing and Urban development (HUD) (2005) definition of minority concentration, I code those neighborhoods having more than 50% non-white as minority concentrated neighborhoods[6]. The minority concentration variable is dichotomized with 1 indicating living in a minority concentrated neighborhood for the survey year and 0 reflecting otherwise. Then I measure the neighborhood minority concentration over time by averaging the number of years that a child resides in a minority concentrated neighborhood by the total number of years that the child has neighborhood data. This variable captures the approximate proportion of childhood that is spent in a minority concentrated area.

[4] This measure does not distinguish the ethnicity of the minority group. It does not tell if the majority minority are blacks or non-white Hispanics.

[5] Since the majority of data are collected in the 1980s and 1990s, minority concentration largely reflects the concentration of blacks.

[6] Instead of testing the linear effect of neighborhood minority concentration, I use the minority concentration cutoff to distinguish children who have lived in minority concentration neighborhood from those have not had such experience. However, in later analysis, I substitute this variable by the continuous measure of average proportion of neighborhood minority during childhood. There is not any change in the regression estimates. The results are robust.

Another way of capturing childhood neighborhood minority concentration is by averaging the proportion of neighborhood minority population from birth to 14 years of age. This measure[7] reflects the average proportion of minorities in the residing neighborhood.

Average proportion of minority in neighborhood = $\sum_{k=0}^{n}(\%\ neighborhood\ minority)/\ N$

Individual and family Covariates

Individual demographic characteristics such as gender and race are dichotomized. In the regression analysis, I include the indicator variable black (1 = black and 0 = white) and male (1 = male and 0 = female). Number of children/siblings in the family when the child in the study sample was born is also included as a control variable.

In order to parcel out the neighborhood impact on children's outcomes, it is important to control for family socioeconomic environment which also influences children's development. Prior neighborhood effects studies usually take a snapshot view of family characteristics while dynamics in the changes in family economic situation, family structure, and parental labor force participation are overlooked. As suggested by research on family income effects, family income may change over time. For example, family head may obtain a new job or become unemployed due to various reasons. Moreover, changes in family structure can also take place from two-parent household to single-parent family or vice versa. As described below, I examine the family

[7] This measure is not used in logistic regressions analyzing the associations between neighborhood economic conditions and children's outcomes. The analytical estimates using this measure do not differ from results obtained by using the measure of duration of living in minority concentrated neighborhood. The duration measure better captures the length of exposure to racial segregation than this one. The correlation between the two variables is 0.95.

environment - family economic conditions, family structure, parental employment status, from a longitudinal perspective.

Family poverty is a binary variable which is defined by families that live under federal defined poverty threshold in each year. For each year's family income, I calculate an income to needs ratio using the annual need standard provided by the PSID. The annual need standard is the Orshansky-type poverty threshold based on an annual food needs standard. All family income is adjusted by consumer price index (CPI) to take into account of inflation over time. If the income to need ratio is less than 1, then the family live under poverty for the year[8]. *Employment status of family head, family structure* of whether it is a single parent family, and number of times family move are reported in yearly survey and they are time varying variables. If the family head is unemployed during the survey year, head unemployment status is coded as 1 and 0 otherwise. If the child's family is single –parent family, the single parent family is coded as 1 and 0 otherwise. To capture family characteristics during childhood, I calculate the proportion of time children in families that the head is unemployed while the child grows up, the proportion of time the family lived in poverty, the proportion of time the family head was unemployed, the proportion of time family is a single parent household.

Finally, residential mobility is measured by counting the number of times the family moved during childhood. In PSID yearly survey, family heads reported whether they moved since last interview. In cases of missing information on this variable, I compare the household

[8] I conduct sensitivity analysis by setting the family cutoff line to 1.5. The results do not change.

census tract information across years. If the census tract has changed from one year to the next, the household is considered as has moved.

Other control variables

I took into account cohort effects by including dummy variables for birth year in the regression analysis, with those born in 1980 as the reference group. The analyses also controlled for regional differences. The regions where children grew up were categorized as northeast, north central, south, and west, with the west taken as the reference region.

Descriptive statistics

Table 2.1 presents descriptive statistics for the sample data used for high school dropout, while Table 2.3 shows the same statistics for the subsample of female children. Means and standard deviations are presented for all the variables used in the data analysis -- the outcome of interest, neighborhood situation, and control variables. These descriptive statistics are weighted by the family weight when the child was born[9]. Using logistic regression test, I compare the retained sample with those who are excluded from the analysis due to lack of neighborhood information (fewer than 5 data points on neighborhood conditions and missing data on the covariates and outcome measures). Test results are presented in Appendix Table 2.1. As indicated by the regression estimates, the retained sample for the study of high school dropping out has fewer black children, longer exposure to female headed families, higher residential mobility, lives in neighborhoods that have more poor families, fewer affluent families, and

[9] Individual weights and family weights are available in the PSID. I choose to apply the family weight as most of the covariates are associated with family characteristics.

longer exposure to minority concentration. When economic concentration of both extreme is considered, the retained sample lives in neighborhoods that have more affluent than poor families.

Table 2.1: Descriptive Statistics for high school dropout N = 3077

Variables	Description	Weighted mean	Weighted S.D.
Dependent Variables			
High school dropout	whether child is graduated from high school	0.19	1.36
Covariates			
micro-level characteristics (individual and family)			
Black	whether child is black (1 = black)	0.14	1.20
Male	gender of the child (1 = male)	0.48	1.72
Number of children in the family at birth	number of children in the family when the focal child was born	1.64	5.47
% of time family in poverty from birth to 14	proportion of years that child live in a family that is under poverty line (between birth to 14 years old)	0.13	0.80
% of time head unemployed from birth to 14	proportion of years that family head is unemployed (between birth to 14 years old)	0.14	0.76
% of time female headed household from birth to 14	proportion of years that child live in a family headed by a single woman (between birth to 14 years old)	0.16	0.97
Head education level at child birth --- less than high school	whether head had dropped from high school (1 = high school dropout when child was born)	0.28	1.54
Number of times family moves neighborhood from birth to 14	number of times that family moved to a different tract (between birth to 14 years old)	3.48	9.89
local neighborhood structural characteristics			
Average neighborhood poverty from birth to 14	average proportion of neighborhood poor families between birth to 14	0.17	0.38

Average neighborhood affluence from birth to 14	average proportion of neighborhood affluent families between birth to 14	0.26	0.50
Average ICE from birth to 14	index of concentration at extremes	0.08	0.82
% of time live in minority concentrated neighborhood	proportion of years that respondent lives in a neighborhood where more than 50% of the population are minorities (between birth to 14 years old)	0.14	1.05
Average proportion of minority in neighborhood	average proportion of neighborhood minority between birth to 14	0.17	0.84
Region			
Northeast		0.23	1.45
North central		0.31	1.59
South		0.26	1.50
West		0.20	1.38
Birth year			
1970		0.09	0.99
1971		0.09	0.98
1972		0.08	0.95
1973		0.08	0.91
1974		0.10	1.02
1975		0.10	1.03
1976		0.08	0.91
1977		0.09	0.99
1978		0.08	0.93
1979		0.12	1.12
1980		0.10	1.02

According to Table 2.1, about 20% of the sample had dropped out of high school by age 24 which is higher than the national statistics on high school dropout rate of 12% in 1990 (U.S. Department of Education 2013). When weighted, the study sample contains about 14% blacks and 48% males. Children on average are born to families that have two children and 28% of the family heads do not have a high school degree or GED. When family conditions are considered over time, on average families spend about 13% of the time in poverty, 14% of the time family heads are unemployed, and 16% of the time the family head is female. During childhood, children on average move about three to four times across neighborhoods. With regards to neighborhood environment, children grow up in neighborhoods that on average have 17% non-white populations. As the average ICE falls around 0.08, it shows that on average neighborhood residents are mixed in term of income with a slightly higher number of affluent neighbors.

Table 2.2 presents correlations among the child, family characteristics, neighborhood conditions, and high school dropout outcome. The correlations among child's gender are generally small ($r < 0.1$). Correlations among the neighborhood economic conditions are large ($r > 0.70$). Neighborhood minority concentration is high correlated with race, family poverty experience, and neighborhood poverty. It is negative correlated with neighborhood ICE ($r = -0.51$). The correlation between neighborhood affluence and poverty is high at ($r = -0.74$). Family poverty exposure is highly associated with the employment status of family head and family structure of female headed household ($r > 0.50$). The correlation between family poverty and neighborhood poverty is at ($r = 0.51$).

Table 2.2. Correlations between individual, family, neighborhood level characteristics and high school dropout outcome

		2	3	4	5	6	7	8	9	10	11	12	13
1.	High school dropout	0.08	*0.03*	0.10	0.24	0.20	0.11	0.20	0.16	0.18	-0.17	-0.19	0.12
2.	Black	---	*0.02*	0.14	0.37	0.32	0.40	0.14	0.12	0.54	-0.30	-0.43	0.83
3.	Male		---	-0.08	*0.01*	*0.03*	*0.03*	*0.01*	*0.02*	*0.02*	*0.02*	*0.00*	0.04
4.	Number of children in the family at birth			---	0.31	0.18	0.12	0.26	*-0.01*	0.22	-0.18	-0.21	0.17
5.	% of time family in poverty from birth to 14				---	0.74	0.52	0.35	0.27	0.51	-0.33	-0.44	0.43
6.	% of time family head unemployed from birth to 14					---	0.50	0.34	0.24	0.44	-0.30	-0.38	0.37
7.	% of time female headed household from birth to 14						---	0.22	0.24	0.33	-0.20	-0.27	0.40
8.	Head education level at child birth --- less than high school							---	0.18	0.34	-0.29	-0.33	0.16
9.	Number of times family moves neighborhood from birth to 14								---	0.19	-0.19	-0.20	0.14
10.	Average neighborhood poverty from birth to 14									---	-0.74	-0.91	0.64
11.	Average neighborhood affluence from birth to 14										---	0.95	-0.35
12.	Average ICE from birth to 14											---	-0.51
13.	% of time live in minority concentrated neighborhood												---

Note. Italicized correlations are not significant at $p = 0.05$. All other correlations are significant at $p < 0.05$. N = 3,077.

Similar descriptive statistics on the sample of female respondents are presented in Table 2.3. Compared with the full female sample, the retained sample has grown up in families that have more children, family heads in the retained sample are more likely to have graduated from high school when children were born, and have higher residential mobility (Results presented in Appendix Table 2.2). The selected female children do not differ from the full female population in their experience of neighborhood economic conditions and racial composition. Among the female population, teenage childbearing rate is fairly high at around 30%. The means and standard deviations of variables presented in Table 2.3 are similar to those presented in Table 2.1[10].

[10]Except that there are more children from the female sample that were born in 1972, 1974 and fewer girls born in 1979 compared with the sample for high school dropout.

Table 2.3: Descriptive Statistics for teenage female birth sample (unweighted N =1045)

Variables	Description	Weighted mean	Weighted S.D.
Dependent Variables			
Teenage birth	teenage birth of female girls	0.30	1.63
Covariates			
micro-level characteristics (individual and family)			
Black	whether child is black (1 = black)	0.16	1.30
Number of children in the family at birth	number of children in the family when the focal child was born	1.86	5.72
% of time family in poverty from birth to 14	proportion of years that child live in a family that is under poverty line (between birth to 14 years old)	0.14	0.88
% of time head unemployed from birth to 14	proportion of years that family head is unemployed (between birth to 14 years old)	0.15	0.78
% of time female headed household from birth to 14	proportion of years that child live in a family headed by a single woman (between birth to 14 years old)	0.16	1.01
Head education level at child birth --- less than high school	whether head had dropped from high school (1 = high school dropout when child was born)	0.28	1.60
Number of times family moves neighborhood from birth to 14	number of times that family moved to a different tract (between birth to 14 years old)	3.62	10.82
local neighborhood structural characteristics			
Average neighborhood poverty from birth to 14	average proportion of neighborhood poor families between birth to 14	0.18	0.41
Average neighborhood affluence from birth to 14	average proportion of neighborhood affluent families between birth to 14	0.25	0.51

Average ICE from birth to 14	index of concentration at extremes	0.07	0.85
% of time live in minority concentrated neighborhood	proportion of years that respondent lives in a neighborhood where more than 50% of the population are minorities (between birth to 14 years old)	0.14	1.09
Average proportion of minority in neighborhood	average proportion of neighborhood minority between birth to 14	0.17	0.88
Region			
Northeast		0.22	1.48
North central		0.32	1.66
South		0.24	1.53
West		0.21	1.45
Birth year			
1970		0.12	1.14
1971		0.09	1.02
1972		0.11	1.12
1973		0.08	0.95
1974		0.13	1.19
1975		0.10	1.05
1976		0.07	0.90
1977		0.09	1.01
1978		0.07	0.89
1979		0.08	0.95
1980		0.08	0.94

Table 2.4 presents correlations among the child, family characteristics, neighborhood conditions, and teenage childbearing outcome. The correlations among these variables are similar to those reported in Table 2.2.

Table 2.4. Correlations between individual, family, neighborhood level characteristics and teenage childbirth outcome

	2	3	4	5	6	7	8	9	10	11	12
1. Teenage childbirth	0.19	0.12	0.31	0.28	0.19	0.25	0.14	0.32	-0.27	-0.31	0.20
2. Black	---	0.14	0.36	0.34	0.47	0.13	0.11	0.49	-0.27	-0.40	0.83
3. Number of children in the family at birth		---	0.33	0.21	0.11	0.28	*-0.04*	0.24	-0.17	-0.21	0.19
4. % of time family in poverty from birth to 14			---	0.77	0.55	0.40	0.34	0.53	-0.34	-0.46	0.44
5. % of time family head unemployed from birth to 14				---	0.59	0.38	0.31	0.45	-0.31	-0.40	0.40
6. % of time female headed household from birth to 14					---	0.24	0.26	0.35	-0.22	-0.29	0.44
7. Head education level at child birth --- less than high school						---	0.24	0.40	-0.33	-0.39	0.16
8. Number of times family moves neighborhood from birth to 14							---	0.23	-0.21	-0.23	0.16
9. Average neighborhood poverty from birth to 14								---	-0.73	-0.91	0.60
10. Average neighborhood affluence from birth to 14									---	0.94	-0.33
11. Average ICE from birth to 14										---	-0.48
12. % of time live in minority concentrated neighborhood											---

Note. Italicized correlations are not significant at $p = 0.05$. All other correlations are significant at $p < 0.05$. N = 1,045.

Racial differences in neighborhood environment. Prior studies have suggested that whites and blacks reside in neighborhoods that are vastly different in terms of socioeconomic circumstances. Table 2.5 and Table 2.6 present summary statistics on neighborhood economic conditions and minority concentration experienced by black and white children for the high school dropout and the teenage childbirth samples respectively. The data in these tables show the level of childhood exposure to neighborhood poverty, affluence, the level of unequal distribution of the poor and affluent families, and the minority concentration for blacks and whites. Consistent with prior studies (Williams 1999; Small 2007) there are profound racial differences in neighborhood socioeconomic conditions.

Table 2.5: distribution of neighborhood economic conditions and racial composition over time for white and black children: high school dropout sample

	white (unweighted N = 1667)	**black (unweighted N = 1410)**
Average neighborhood poverty	(range 0.014 - 0.511)	(range 0.024 - 0.868)
1st quartile boundary	0.088	0.226
2nd quartile boundary	0.134	0.317
3nd quartile boundary	0.188	0.399
mean	*0.15*	*0.319*
Average neighborhood affluence	(range 0.040 - 0.822)	(range 0.003 - 0.769)
1st quartile boundary	0.170	0.090
2nd quartile boundary	0.239	0.129
3nd quartile boundary	0.354	0.188
mean	*0.283*	*0.148*
Average neighborhood ICE	(range -0.451 - 0.804)	(range -0.865 - 0.745)
1st quartile boundary	-0.013	-0.308
2nd quartile boundary	0.103	-0.187
3nd quartile boundary	0.265	-0.043
mean	*0.136*	*-0.17*

Average neighborhood minority concentration	(range 0 - 0.992)	(range 0.02 - 1)
1st quartile boundary	0.018	0.507
2nd quartile boundary	0.041	0.695
3nd quartile boundary	0.111	0.87
mean	*0.085*	*0.656*

The top panel of Table 2.5 shows the distribution of the average proportion of neighborhood poverty experienced by white and black children from birth to 14 years of age (for high school dropout sample). As prior studies demonstrated, white children experience much lower levels of neighborhood poverty and that black children. Over 50% of white children live in neighborhoods that on average have 13% poor families and 50% of black children live in neighborhoods that on average have 32% poor families. The average neighborhood poverty for a white child is less than half of the average neighborhood poverty for a black child (mean of 15% vs. 32%). Following the conventional definition of poverty concentrated neighborhood -- more than 30% of families in the neighborhood are poor (Wilson 1987; Turner 1998), black children are more likely than white children to experience neighborhood economic hardships during childhood with about half the black children having grown up in neighborhoods that are poverty concentrated. In sharp contrast, according to the distribution of neighborhood economic conditions for whites, fewer than 10% of the white children spend their childhood in neighborhoods that on average have more than 30% of poor families (as indicated by 90% boundary of 0.25. See Appendix Table 2.3).

The second panel of Table 2.5 shows the average neighborhood affluence during the first 14 years of life. The contrast between white and black children remains significant. White

children have a higher exposure to neighborhood affluence during childhood than their black counterparts. On average (over the 14 years), white children live in neighborhoods that have almost twice as many affluent families than the black children (mean of 28% vs. 15%). Half of white children's neighborhoods have 25% affluent families while half of black children spend their childhood in neighborhoods that only have 13% of affluent families. Moreover, 75% of white children live in neighborhoods that on average have more than 36% of affluent families while 75% of black children grow up in neighborhoods that on average have less than 19% affluent families.

The third panel in Table 2.5 presents the distribution of average neighborhood ICE during the first 14 years of life for white and black children. The ICE succinctly captures neighborhood information about both poverty and affluence. By combining information on neighborhood affluence and poverty together in one index, the measure reflects how well the poor are mixed with the affluent in the residential area. When the index equals zero, it indicates an equal share of affluent families and poor families in a neighborhood. For the whole sample, average ICE ranges from -0.865 to 0.804 with a mean of 0.084 suggesting that on average, children live in neighborhoods with slightly more affluent neighbors than poor neighbors. When this statistic is examined separately for blacks and whites, there is a profound racial difference in terms of the economic composition of neighborhood residents.

Compared with white children, black children on average were more likely to grow up in poor and poverty concentrated neighborhoods. The mean of neighborhood ICE over time is -0.17, suggesting that during childhood, black children live in neighborhoods that have more poor

families than affluent families. In contrast, white children grow up in neighborhoods that have more affluent families than the poor (mean ICE = 0.14). Moreover, only about a quarter of white children live in a neighborhood that has more poor families than affluent families (ICE < -0.01). In other words, around three quarters of white children have spent their childhood in areas that on average have more affluent than poor residents (as indicated by ICE > 0). In contrast, more than three quarters of the black children grow up in neighborhoods that on average have more poor families than affluent families. About 25% of black children spend their childhood in neighborhoods where the poor families outnumbers affluent families by 30% (ICE = -0.31). But fewer than 5% of white children grow up in neighborhoods that poor families outnumbers affluent families by almost 20% (ICE = -0.20 at 5 percentile boundary as shown in Appendix Table 2.3).

The last panel in Table 2.5 presents the level of neighborhood minority concentration during childhood for blacks and whites respectively. As expected, majority of black children (75%) grow up in minority concentrated neighborhoods with more than 50% of non-white residents while white children are less likely to be exposed to minority neighbors. White children, on average, live in neighborhoods that have few non-white minority neighbors. Seventy-five percent of white children grow up in neighborhoods that on average have no more than 11% of non-white residents. As indicated by the 95% boundary (average ICE falls around 0.295), only less than 5% of white children live in neighborhoods that have 30% or more minority residents.

The distributions of neighborhood economic conditions (in Table 2.5) measured during childhood for black and white children suggest striking differences in neighborhood experiences

across the racial line. Black and white children grow up in neighborhoods with very different socioeconomic situations. Compared with white children, black children on average not only faced higher level of exposure to neighborhood poverty and fewer encounters with neighborhood affluence, they also live in neighborhoods where poor families out-number the affluent. These three measures of neighborhood economic environment are the average values aggregated throughout the years from child birth to 14 years old, reflecting the average proportion of poor or affluent neighbors, and the level of concentration of neighborhood poverty and affluence. The longitudinal examination of neighborhood economic conditions suggests that many black children live with economic hardship during their childhood while white children are more likely to experience economic advantages during childhood. Moreover, consistent with the literature on racial segregation effects (Brewster 1994), these data show that black children are more likely to live in minority concentrated areas while the whites are more likely to live away from non-white neighbors.

When the sample is restricted to females at risk for teenage childbearing, the statistics on childhood exposure to neighborhood poverty, affluence, and ICE in Table 2.6 are similar to those in Table 2.5, suggesting little gender difference in neighborhood conditions in terms of community economic situations and minority concentration.

Table 2.6: distribution of neighborhood economic conditions and racial composition over time for white and black children: teenage childbirth sample

	white (unweighted N = 544)	**black (unweighted N = 501)**
Average neighborhood poverty	(range 0.019 - 0.511)	(range 0.024 - 0.792)
1st quartile boundary	0.090	0.210
2nd quartile boundary	0.139	0.286
3nd quartile boundary	0.189	0.391
mean	*0.154*	*0.309*
Average neighborhood affluence	(range 0.046 - 0.852)	(range 0.007 - 0.769)
1st quartile boundary	0.164	0.088
2nd quartile boundary	0.235	0.137
3nd quartile boundary	0.340	0.199
mean	*0.266*	*0.163*
Average neighborhood ICE	(range -0.451 - 0.831)	(range -0.765 - 0.745)
1st quartile boundary	-0.013	-0.289
2nd quartile boundary	0.097	-0.144
3nd quartile boundary	0.240	-0.009
mean	*0.112*	*-0.146*
Average neighborhood minority concentration	(range 0.000 - 0.771)	(range 0.104 - 0.999)
1st quartile boundary	0.017	0.453
2nd quartile boundary	0.038	0.681
3nd quartile boundary	0.095	0.835
mean	*0.082*	*0.638*

***Duration of exposure*.** Average neighborhood poverty, affluence, ICE, and minority concentration portray the level of exposure to neighborhood socioeconomic hardship or advantage in childhood. To explore the duration of exposure to neighborhood economic hardship or minority concentration, I calculate the proportion of time that a child is exposed to neighborhood poverty and minority concentration during childhood. These statistics are

presented Table 2.7 and Table 2.8 for the high school dropout sample and the restricted female sample, respectively.

Exposure to neighborhood poverty

To examine the duration of childhood spend in poverty concentrated neighborhood, I follow the conventional definition of poor neighborhood – where 30% of neighborhood residents are poor (Wilson 1987; Turner 1998). If the proportion of the residents in a neighborhood exceeds 30%, I code the neighborhood as a poor neighborhood. To measure the duration of exposure to neighborhood poverty, I calculate the proportion of time that a child lives in poor neighborhood by dividing the total number of poor neighborhoods where the child has lived by the total number of available neighborhood data points, from birth to age 14. In this way, the measure captures the proportion of childhood that is spent in an economically deprived community.

$$\%\ childhood\ in\ poverty\ concentrated\ neighborhood = \frac{\#\ years\ neighborhood\ has > 30\%\ poor\ families}{number\ of\ neighborhood\ data\ points}$$

Table 2.7: proportion of time spend in poverty concentrated or minority concentrated neighborhood in childhood: high school dropout sample

	Whites (unweighted N = 1667)	Blacks (unweighted N = 1410)
% childhood in poverty neighborhood		
1st quartile boundary	0	0
2nd quartile boundary	0	0.333
3nd quartile boundary	0	0.667
95 percentile boundary	0.2	1
mean	*0.032*	*0.38*
% childhood in minority neighborhood		
1st quartile boundary	0	0.583
2nd quartile boundary	0	0.933
3nd quartile boundary	0	1
95 percentile boundary	0.2	1
mean	*0.032*	*0.76*

The top panel in Table 2.7 shows the duration of living in poor neighborhoods in childhood. As indicated by the mean value of 0.38, black children spend a little more than one third of their childhood in poor areas (about 5 years), which is much longer than the average length of exposure to poor neighborhoods among white children (only 0.032 which translates into around 6 months). Moreover, the first quartile boundary for blacks is 0.33 indicating that more than 75% of the black children spend at least one third of their childhood in poor neighborhoods. The third quartile boundary of 0.67 suggests that about a quarter of the black children spend more than two thirds (10 years) of their childhood years in poor communities. In sharp contrast, only around 5% (as indicated by the 95 percentile boundary at 0.2) of white children spend one fifth of their childhood (3 years) in poor areas.

Exposure to neighborhood minority concentration. To calculate neighborhood minority concentration, I follow the HUD's definition of minority concentration of proportion of non-white residents exceeds 50% (HUD 2005). An indicator of living in a minority concentrated neighborhood is created for each year with 1 representing more than 50% of non-white residents and 0 otherwise. The proportion of time spent in a minority concentrated neighborhoods during childhood is calculated for all children by dividing the number of years in a minority concentrated community by the total number of years of observation.

$$\%\ childhood\ in\ minority\ concentrated\ neighborhood = \frac{\#\ years\ neighborhood\ has > 50\%\ minority}{number\ of\ neighborhood\ data\ points}$$

The second panel in Table 2.7 shows childhood exposure to minority concentrated neighborhoods. As indicated by the means for blacks and whites (0.76 vs. 0.03), blacks in general live in minority concentrated areas while white children live in neighborhoods that are dominated by whites. On average, black children spend two thirds (10 years) in minority concentrated neighborhoods while white children almost never reside in communities that have more minorities than whites. The distributions of the statistics show that more than 75% of the blacks spend more than half of their childhood in minority concentrated neighborhoods. In marked contrast, less than 5% of whites spend one fifth (3 years) of childhood in minority neighborhoods.

Similar statistics are presented in Table 2.8 for the sample for female teenage childbearing.

Table 2.8: proportion of time spend in poverty concentrated or minority concentrated neighborhood in childhood: teenage childbirth sample

	Whites (unweighted N = 544)	Blacks (unweighted N = 501)
% childhood in poverty neighborhood		
1st quartile boundary	0	0
2nd quartile boundary	0	0.214
3nd quartile boundary	0	0.6
95 percentile boundary	0.4	1
mean	*0.044*	*0.337*
% childhood in minority neighborhood		
1st quartile boundary	0	0.467
2nd quartile boundary	0	0.867
3nd quartile boundary	0	1
95 percentile boundary	0.2	1
mean	*0.032*	*0.725*

These statistics on childhood exposure to neighborhood socioeconomic conditions reveal the sharp difference between the social conditions within which black and white children grow up. Compared with white children, black children are more likely to live in poverty and minority concentrated neighborhoods. On average, black children spend their children in neighborhoods with more poor but fewer affluent neighbors. They are more likely to live in neighborhoods that have fewer whites. Moreover, examining neighborhood conditions over time reveal that the duration of exposure to neighborhood economic hardship is much longer for blacks than whites. And very few white children spend little time in minority concentrated areas.

Analytic Approach

For this study, I use logistic regression with robust standard error to examine how neighborhood characteristics, such as poverty, affluence, ICE and minority concentration affects

children's high school graduation and teenage childbearing. Robust standard error procedure is employed to adjust for sample non-independence in panel survey due to the clustering in family and neighborhood units. To ensure the quality of information over time, regression analyses are restricted to children who have at least 5 data points on neighborhood information. Family weight when the child was born is applied in the regression analysis. All continuous variables are centered at the mean to avoid collinearity problem and for interpretation of the statistical estimates.

The main question of interest is whether neighborhood economic situations are related to children's outcomes. To address the question, I construct logistic regression models for each of the neighborhood economic variable (average poverty, average affluence, and average ICE) controlling for individual and family covariates and neighborhood minority concentration.

Second, to test whether neighborhood economic conditions are best characterized by an epidemic model, I explore whether neighborhood economic conditions are associated in a nonlinear way with children's outcomes, I construct a squared term for each of the neighborhood economic condition and include it in each of the logistic regression equations. If the square term is significant, it suggests the nonlinear relationship between neighborhood economic situation and children's outcome. To test whether there is a threshold effect of neighborhood economic condition above which neighborhood effect accelerates, I examine the sign and strength of the linear and nonlinear coefficients.

Third, prior studies have suggested that neighborhood effects differ by race. Some studies find neighborhood economic conditions matter more for white than black children (Clark 1992;

Brooks-Gunn, Duncan et al. 1993; Sampson, Morenoff et al. 1999), while others have suggested an opposite association – neighborhood context is more important in determining black children's behavioral outcomes (Tobler, Livingston et al. 2011; Fagan, Wright et al. 2013). To test the racial differences in neighborhood impact, I include in the regression analysis an interaction term between race and neighborhood economic condition. If the interaction term is significant, it suggests the neighborhood conditions vary by race, and warrants further investigating.

Fourth, to explore the relative deprivation mechanisms of neighborhood effects, I construct an interaction term between the duration of exposure to family poverty with average neighborhood economic conditions. The literature on the deprivation mechanisms suggests that poor children may be better off living in poor neighborhoods. Poor children residing in affluent areas may feel inferior to their counterparts from affluent families and develop antisocial behaviors. They are more likely to drop out of high school when they feel depressed. If the interaction term is significant, it may suggest that relative deprivation operates in neighborhood settings.

Finally, in order to explore whether the longitudinal view of neighborhood conditions provides a more robust and accurate measure of neighborhood environment than the snap shot view of neighborhood conditions, I compare the results from the regressions using the averaged neighborhood economic and racial information during childhood years to the results from using point-in-time measures of neighborhood conditions. For the comparison, I follow the prior studies by Brooks-Gunn and colleagues (1993) which use neighborhood information when

children are 14 years of age. I compare the coefficients and standard errors of the neighborhood conditions between regressions utilizing different kinds of measures of neighborhood situations.

Chapter 3 Results of neighborhood effects on educational attainment outcome

This section presents results of estimates from logistic regressions examining the association between childhood neighborhood economic conditions and children's later life educational attainment. To parcel out the effects[11] of neighborhood economic conditions, I control for detailed information on individual and family characteristics and neighborhood racial composition, while also controlling for cohort and regional effects by taking into account children's birth year and birth region. Since I am interested in exploring two associations with two samples -- how neighborhood economic conditions are related to children's educational attainment and how they affect adolescent girls' childbearing outcome, I construct two sets of statistical analyses using each of the samples. Similar model specifications are applied to regression analyses on each dataset. I first show the results of neighborhood impact on children's school leaving.

This chapter is organized by the order of the research questions / hypotheses of interest presented earlier. I ***first*** demonstrate the link between neighborhood economic conditions and children's outcomes. I specifically examine whether neighborhood economic conditions have a significant association with the outcome after controlling for neighborhood minority segregation and family socioeconomic characteristics. I look at neighborhood poverty as well as affluence.

[11] Since this study does not aim for causal inference, the regression estimates of neighborhood affluence, poverty, and ICE reflect the association between the outcome of interest and neighborhood economic conditions. I use the words "effect", "influence", "predict", and "impact" of neighborhood or family characteristics casually without trying to make any causal claims.

These tests aim to replicate the findings from prior studies (Brooks-Gunn, Duncan et al. 1993; Duncan 1994) of a strong positive impact of neighborhood affluence on children's educational attainment; and a significant negative impact of neighborhood poverty and deprivation on children's educational attainment (Hogan and Kitagawa 1985; McCulloch 2001; Wodtke, Harding et al. 2011). Then I examine whether the measure of neighborhood index of concentration at the extreme (ICE) is a more efficient and robust measure of neighborhood condition that shapes children's development than neighborhood poverty or affluence alone. ***Second***, I explore whether impact of neighborhood economic conditions is non-linearly or curvilinearly related to children's outcome of dropping out of high school early. Most of the current studies assume linear impact of neighborhood economic conditions. Very few studies have suggested that neighborhood economic situations may have a curvilinear impact on children's developmental outcomes and teenage childbearing outcome (Carpiano et al. 2009; Crowder and South 1999). As suggested by Carpiano who studied the impact of neighborhood ICE on children's school readiness, children performed the best when they resided in mixed income neighborhood. Moreover, neighborhood ICE had a diminishing return on children's cognitive development. ***Third***, two interaction effects are examined. One is between neighborhood economic conditions and race. The other is between neighborhood economic conditions and family poverty experience. The former tests racial differences in neighborhood effects. As suggested by prior research (Brooks-Gunn et al. 1993; Duncan 1994), white children were more responsive to the impact neighborhood affluence than black children, this study aims to find if race also moderate the impact of other dimensions of neighborhood economic conditions. The latter tests whether the data support the relative deprivation and competition

mechanisms that may operate to affect children's behavior during childhood. ***Fourth,*** all logistic regressions investigating the associations between neighborhood conditions and children's outcomes control for the duration of living in a minority concentrated neighborhood. I investigate whether minority concentration is associated with children's development above and beyond the impact of neighborhood economic conditions. ***Finally***, to address the question of whether a point-in-time measure of neighborhood economic conditions sufficiently captures neighborhood effects, I use the same sample data to compare the regression results of using longitudinal measures of neighborhood economic environment with that using neighborhood economic conditions at age 14.

Linking neighborhood economic context to children's educational attainment

Logistic regression analyses are conducted to explore the associations of three dimensions of neighborhood economic conditions (neighborhood poverty, affluence, and ICE) with children's outcome of dropping out of high school before graduation. The results are presented in Table 3.1, Table 3.3, and Table 3.5. Expect for the first model in each table, logistics regression models control for individual and family characteristics, neighborhood racial composition, and regional and cohort effects. Robust standard error procedure is applied to all analyses. Logistic regression results are presented in separate table for each of the neighborhood economic measures. Continuous variables are centered at the means to prevent high correlation problems between the linear and quadratic terms and for better interpretation of the interaction terms.

Table 3.1 presents results of how neighborhood poverty experience during childhood is associated with dropping out of high school. Table 3.3 focuses on the effect of neighborhood affluence in childhood. And table 3.5 examines the relationship between neighborhood index of concentration at the extreme (ICE) during childhood and school leaving outcome.

In each table, model 1 examines the linear effect of each of the three dimensions neighborhood economic conditions on the outcome of interest. In this model, only neighborhood economic conditions and minority concentration characteristics are included without any variables on individual or family characteristics. This model reveals the crude effects of neighborhood situations on children's outcomes, some of which may be due to individual and family situations.

Model 2 includes individual and family characteristics in examining neighborhood economic impact. Comparing model 1 and model 2, we can see whether neighborhood effects exist above and beyond the important impact of family and individual characteristics.

Model 3 assesses whether effects of neighborhood economic conditions are non-linearly related to the outcome. The curvilinear effect of neighborhood economic conditions is tested by incorporating a squared term of neighborhood economic condition in the model in addition to the linear effect. If the squared term of neighborhood economic variable is significant, then it suggests neighborhood economic impact is curvilinearly related to the outcome. A positive sign for the parameter estimate suggests a convex curve while a negative sign for the parameter estimate suggests a concave curve. The impact of neighborhood economic conditions varies over the measurement scale.

As suggested by prior studies (Brooks-Gunn, Duncan et al. 1993; Duncan 1994), neighborhood effects may be contingent on race with whites more likely to respond to neighborhood affluence, I therefore add interaction terms of neighborhood economic conditions and race to test such effects. I further explore if the non-linear effects of neighborhood economic conditions are still significant once the interaction effect of neighborhood economic condition and race is controlled. The results are presented in model 4.

Model 5 examines the interaction effects between neighborhood economic experience and race, without the nonlinear effects of neighborhood economic experience. In all three tables (Table 3.1, Table 3.3, and Table 3.5), when the interaction effects of neighborhood economic conditions and race are taken into account (as shown in model 4), the nonlinear effects of economic situations (poverty, affluence, and ICE) become non-significant. This might suggest that the curvilinear effects of neighborhood economic situations on children's probability of dropping out of high school early may be because of the racial differences in neighborhood effects.

Therefore, Model 6 investigates the possible racial differences in the functional form of neighborhood impact. I test the interactions between the curvilinear terms of neighborhood economic conditions with race.

Model 7 examines the interaction between family poverty level and neighborhood economic situations. It explores whether family poverty exposure during childhood moderates the effects of neighborhood economic situations to influence children's educational and

behavioral outcomes. Model 8 investigates if effect modification by race still remains when the interaction effects between family poverty and neighborhood economic wellbeing are controlled.

Model 9 is the full model which includes all the covariates and the interaction parameters. It includes the main effect of neighborhood economic condition, its curvilinear effect, the interaction effects between neighborhood economic condition and race, the interaction effect between the curvilinear effect of neighborhood economic condition and race, the interaction effect between neighborhood economic condition and family poverty experience, neighborhood minority concentration, and all individual and family variables. All other models are nested within model 9.

Finally, model 10 in table 3.5 presents the estimates of logistic regression results that incorporate both neighborhood poverty and neighborhood affluence in the model. This model specification replicates the models used by Brooks-Gunn and colleagues (1993) and Duncan (1994) where they find stronger influence of the presence of affluent neighbors than the absence of the poor. Comparing this model to results shown for model 2 in Table 3.5 tests Massey's argument that ICE provides a more concise and efficient estimate of neighborhood economic effects than do separate measures of poverty and affluence (Massey 2001; Casciano and Massey 2008).

Experience of neighborhood poverty during childhood

Linear relationship. Model 1 and Model 2 in Table 3.1 show the association of exposure to poverty in residential neighborhood while growing up with quitting high school before graduating. In the simple logistic regression linking neighborhood poverty to high school

dropout (model 1), neighborhood poverty experience has a significant positive relationship with the probability of dropping out of high school early. The positive sign for the estimate suggests that the higher level of neighborhood poverty a child has experienced during childhood, the more likely he/she would quit school before graduation. However, the significant crude impact of neighborhood poverty experience becomes non-significant (b = -1.12, SE = 0.77) when individual and family characteristics are taken into account (as shown in Model 2).

Table 3.1: Logistic regression of neighborhood poverty and dropping out of high school (unweighted N = 3,077)

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Neighborhood economic context									
Average neighborhood poverty from birth to 14	3.75***	1.12	2.63***	2.57***	2.23***	3.07***	2.12***	2.26***	2.96***
	(0.15)	(0.77)	(1.03)	(1.01)	(0.86)	(1.11)	(0.83)	(0.86)	(1.11)
Average neighborhood poverty from birth to 14 squared	---	---	-8.26***	-2.96	---	-8.3	---	---	-7.02
			(3.46)	(4.33)		(5.86)			(5.92)
Average neighborhood poverty from birth to 14 X black	---	---	---	-3.59***	-4.34***	-7.57***	---	-3.50***	-7.17***
				(1.78)	(1.39)	(2.26)		(1.69)	(2.34)
Average neighborhood poverty from birth to 14 squared X black	---	---	---	---	---	14.49***	---	---	14.96***
						(7.14)			(7.13)
Average neighborhood poverty from birth to 14 X % of time family in poverty	---	---	---	---	---	---	-4.22***	-2.14	-2.12
							(1.74)	(2.17)	(2.22)
Neighborhood control variable									
% of time live in minority concentrated neighborhood	0.01	0.52	0.52	0.66	0.69	0.77***	0.58	0.68	0.78***
	(0.05)	(0.41)	(0.38)	(0.37)	(0.36)	(0.36)	(0.39)	(0.37)	(0.36)
Individual and family covariates									
Black	---	-0.64	-0.60	-0.29	-0.24	-0.26	-0.62	-0.30	-0.29
		(0.35)	(0.32)	(0.31)	(0.41)	(0.28)	(0.33)	(0.30)	(0.29)
Male	---	0.16	0.15	0.16	0.16	0.16	0.14	0.16	0.16

		(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Number of children in the family at birth	---	0.05	0.04	0.04	0.05	0.04	0.05	0.05	0.04
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
% of time family in poverty from birth to 14	---	1.22***	1.27***	1.28***	1.27***	1.28***	2.32***	1.45***	1.45***
		(0.45)	(0.44)	(0.45)	(0.45)	(0.44)	(0.63)	(0.47)	(0.46)
% of time family head unemployed from birth to 14	---	0.32	0.30	0.26	0.26	0.26	0.33	0.27	0.27
		(0.46)	(0.46)	(0.46)	(0.47)	(0.45)	(0.46)	(0.46)	(0.45)
% of time female headed household from birth to 14	---	-0.32	-0.34	-0.31	-0.30	-0.31	-0.32	-0.30	-0.31
		(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)
Head education level at child birth --- --- less than high school	---	0.63***	0.61***	0.61***	0.61***	0.62***	0.62***	0.61***	0.62***
		(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
Number of times family moves neighborhood from birth to 14	---	0.08***	0.07***	0.08***	0.08***	0.07***	0.08***	0.08***	0.07***
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Intercept	-1.55***	-1.73***	-1.62***	-1.68***	-1.71***	-1.62***	-1.68***	-1.68***	-1.61***
degree of freedom	3061	3053	3052	3051	3052	3050	3052	3051	3049
loglikelihood	-16969.56	-16045.18	-15988.85	-15953.72	-15958.03	-15927.34	-15991.74	-15948.23	-15918.63
Chi squared	35654.07	35812.70	35976.40	36056.56	36022.63	36126.84	35893.13	35951.21	36041.15

***$p < .05$;

Figures in parentheses are SEs.

Nonlinear impact. When the non-linear effect of neighborhood poverty is considered, as shown in model 3 (Table 3.1), childhood exposure to neighborhood poverty has a significant non-linear impact on quitting high school. The negative coefficient (b = -8.26, SE = 3.26) for the squared term of average neighborhood poverty indicates a concave relationship between neighborhood poverty and leaving high school. In general, with the increase of neighborhood poverty exposure, children are more likely to quit high school early. However, there is a turning point (when there is a concentration of neighborhood poverty) at which the increasing trend levels off and diminishes as the children's exposure to neighborhood poverty increases. For black children growing up in high poverty residential areas (more than 40% poor), their probability of dropping out of high school before completion is lower than those children at the turning point. However, for white children, since few of them live in high poverty concentrated neighborhood, their likelihood of dropping out of high school, in general, increases with the increase in neighborhood poverty exposure.

This finding of significant curvilinear effect of neighborhood poverty contradicts the hypothesis of a steadily increasing rate of quitting high school when neighborhood is more economically deprived. I further explore whether the nonlinear effect of neighborhood poverty is driven by the interaction effect between neighborhood poverty and race.

Interaction effect (by race). Model 4, model 5, and model 6 (Table 3.1) examine the interaction effect between neighborhood poverty and race. In this part of the analysis, I examine two questions. First is whether impact of neighborhood poverty experience differs by race.

Second is to explore the functional form of such impact, linear or curvilinear. Model 4, model 5, and model 6 present the results.

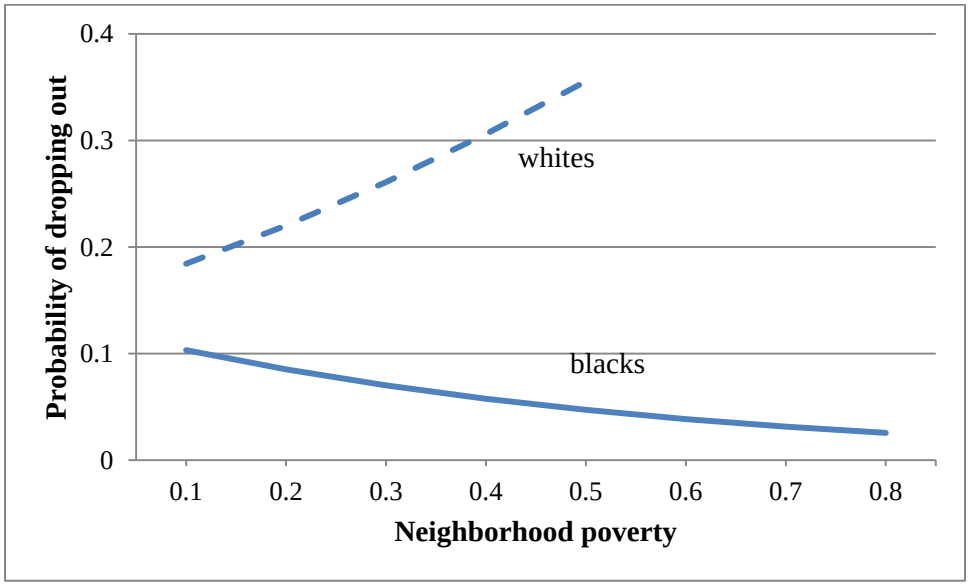
Model 4 (Table 3.1) tests whether the nonlinear effect of neighborhood poverty persists after taking into account the interaction effect between neighborhood poverty and race. The results show that after controlling for the interaction between neighborhood poverty and race, the nonlinear effect of neighborhood poverty is not no longer significant (b= -2.96, SE = 4.33). Therefore, the curvilinear impact of neighborhood poverty on children's school-leaving behavior may reflect the racial differences in response to neighborhood poverty.

Table 3.1 model 5 shows a significant interaction effect between neighborhood poverty and race in predicting dropping out of high school. The coefficient of the interaction term suggests that for black children, increase in neighborhood poverty does not increase but decrease their chance of dropping out of high school (b = -4.34, SE = 1.39). As neighborhood poverty increases, black children have a lower likelihood of dropping out of high school than white children when individual and family characteristics, and neighborhood minority concentration are controlled for. A unit increase in neighborhood poverty is associated with (2.23 – 4.34 = -2.11) decrease in the log odds of dropping out of high school. The main effect of neighborhood poverty remains significant (b = 2.23, SE = 0.86). This coefficient (b = 2.23) shows that for white children, with the increase in neighborhood poverty, there is an increase in the risk of quitting school early.

Figure 3.1 depicts the probability of school leaving for blacks and whites once the interaction effect of race and neighborhood poverty is taken into account. For both races, the

probability of dropping out of high school is calculated within the range of available data on neighborhood poverty. For blacks, their neighborhood poverty ranges in (0.02, 0.87). Whites' neighborhood poverty level falls into the range of (0.01, 0.51).

Figure 3.1. Interaction effect between neighborhood poverty and race



Interaction between neighborhood poverty and race projected within the range of actual neighborhood poverty data. For this graph, I choose the common range of neighborhood poverty data for blacks and whites. (Continuous variables are centered at the grand mean. Head has graduated from high school. Only for female children.)

This significant interaction term suggests that neighborhood poverty effects differ for black and whites. Were blacks and whites to have the same level of individual and family characteristics, an increase in neighborhood poverty does not result in an increase in the rate of school quitting for blacks but does so for whites. For blacks, as Figure 3.1 shows, their risks of quitting school decreases with the increase in neighborhood poverty.

As existing literature has demonstrated, neighborhood effects are contingent on race. Some studies have found a significant neighborhood effect for whites (Clark 1992; Brooks-Gunn, Duncan et al. 1993; Sampson, Morenoff et al. 1999) while others have demonstrated a significant neighborhood effect for blacks (Fagan, Wright et al. 2013). To further examine the differential impact of neighborhood poverty on children's chance of dropping out of high school across the racial line and to test if the declining probability of high school dropout for blacks is significantly different from zero, I run separate analysis testing such associations by blacks and whites. The results are presented in Table 3.2. The negative coefficient for neighborhood poverty effect is not significant (from zero) for blacks (b = -0.96, SE = 1.10), suggesting neighborhood poverty does not have an impact on black children's chance of dropping out of high school after taking into account the covariates. However, for white children, neighborhood poverty has a marginally significant positive impact on children's school leaving (b = 1.72, SE = 0.93, p = 0.06). With the increase in neighborhood poverty, there is an increase in the likelihood of dropping out of high school before graduation for whites. Therefore, the results are consistent with Brooks-Gunn and colleagues' (1993) finding of neighborhood economic conditions matters more for whites than blacks.

Table 3.2: Logistic regression of neighborhood poverty and dropping out of high school by race

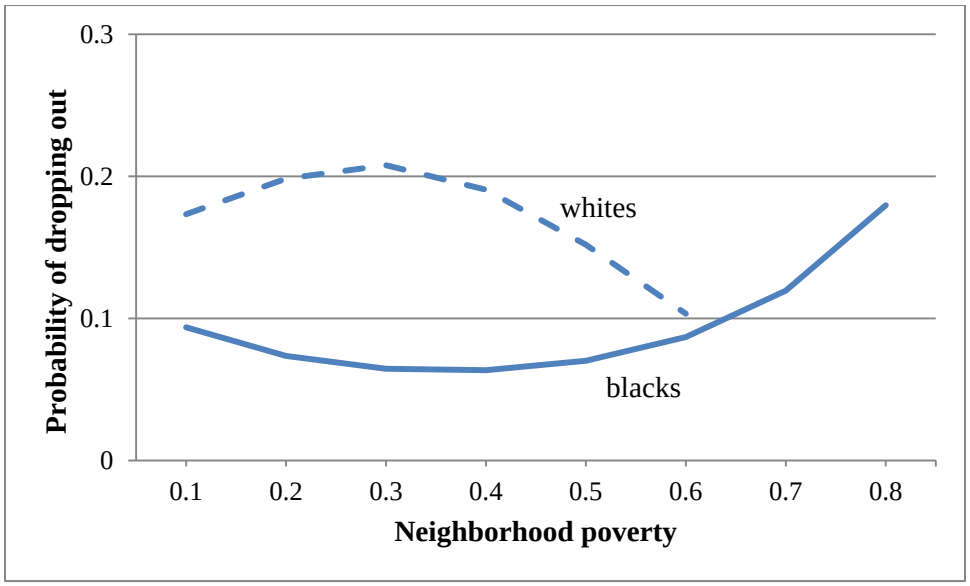
Independent variables	blacks (unweighted N = 1410)	whites (unweighted N = 1667)
Neighborhood economic context		
Average neighborhood poverty from birth to 14	-0.96	1.72
	(1.10)	(0.93)
Neighborhood control variable		
% of time live in minority concentrated neighborhood	0.14	1.13***

	(0.40)	(0.50)
Individual and family covariates		
Male	0.06	0.19
	(0.18)	(0.15)
Number of children in the family at birth	-0.05	0.07
	(0.04)	(0.06)
% of time family in poverty from birth to 14	1.55***	1.19***
	(0.49)	(0.59)
% of time family head unemployed from birth to 14	0.17	0.43
	(0.46)	(0.64)
% of time female headed household from birth to 14	-0.01	-0.42
	(0.31)	(0.41)
Head education level at child birth --- less than high school	0.12	0.71***
	(0.21)	(0.19)
Number of times family moves neighborhood from birth to 14	-0.03	0.11***
	(0.04)	(0.03)
Intercept	-1.55***	-1.84***
loglikelihood	-2764.14	-12979.44
Chi squared	5194.64	30996.18

***$p < .05$;
Figures in parentheses are SEs.

As suggested by model 3, neighborhood poverty may be curvilinearly related to children's probability of quitting school early. Moreover, model 4 and model 5 indicate race moderates the effect of neighborhood poverty impact. Therefore, in model 6, I examine whether the functional form of the effect of neighborhood poverty on children's likelihood of quitting school early vary by race. To do this, I incorporate in the model an interaction term between the squared term of neighborhood poverty effect and race. The interaction coefficient is significant (b = 14.49, SE = 7.14), indicating the curvilinear effect of neighborhood poverty differs for whites and blacks. Figure 3.2 presents the graph for the different curvilinear effects.

Figure 3.2 Interaction effect between race and curvilinear function of neighborhood poverty on high school dropout



Interaction between squared term of neighborhood poverty and race projected within the range of actual neighborhood poverty data. For this graph, I choose the common range of neighborhood poverty data for blacks and whites. (Continuous variables are centered at the grand mean. Head has graduated from high school. Only for female children.)

As shown in the graph, neighborhood poverty effects on whites and blacks follow vastly different patterns. For blacks, the effect of neighborhood poverty is convex. With moderate level of neighborhood poverty, blacks do not have a high probability of dropping school early. Their probabilities of dropping out of school diminish a little until children live in neighborhoods with average proportion of poor neighbors over 40 percent. When living in poor neighborhoods with more than 40% poor people, blacks' likelihood of leaving school before graduation increases. Impact of neighborhood poverty exposure, on the contrary, is concave for white children. At each data point on neighborhood poverty exposure, their likelihood of dropping out of school

remains higher than that of the blacks. The probability of school leaving for white children keeps going up until they live in poverty concentrated neighborhoods (neighborhood with more than 30% poor families). When they live in poverty stricken neighborhoods, their chance of becoming high school dropouts diminishes with the increase in neighborhood poverty.

Interaction effect (by family poverty duration). Finally, model 7 and model 8 in Table 3.1examine the interaction effect between neighborhood poverty and family poverty. In model 7 (Table 3.1), I examine the main effect of the neighborhood poverty and the interaction effect of neighborhood poverty and family poverty exposure controlling for individual and family characteristics and neighborhood minority concentration. Both neighborhood poverty (b = 2.12, SE = 0.83) and duration of exposure to family poverty (b= 2.32, SE = 0.63) are positively associated with dropping out of high school early, suggesting residing in high poverty neighborhood during childhood and longer exposure to family poverty have detrimental impact on children's educational attainment. Moreover, effects of neighborhood poverty vary by family poverty status. The significant negative coefficient (b = -4.22, SE = 1.74) of the interaction term suggests that effect of neighborhood poverty is contingent on the family poverty experience. Since both variables are continuous, to explain the interaction effect, I need to hold constant one variable. Therefore, for those children growing up in non-poor families, they have higher probabilities of dropping out of high school early with the increase of neighborhood poverty exposure. However, for those children growing up in continuously poor families, increase in neighborhood poverty diminishes their likelihood of becoming high school dropouts.

However, when the interaction effect of neighborhood poverty and race is taken into account (model 8), there is no evidence of a significant interaction effect of cross-level interaction in economic conditions (neighborhood poverty and family poverty exposure) (b =-2.14, SE = 2.17). The main effect of neighborhood poverty and the interaction effect of neighborhood poverty and race remain statistically significant in predicting early high school leaving. Neighborhood poverty during childhood is positively related to the likelihood of dropping out of high school before graduation (b = 2.26, SE = 0.86). The interaction effect of neighborhood poverty and race remains statistically significant (b = -3.50, SE = 1.69) but with attenuated magnitude. Therefore, the differential impact of neighborhood poverty by family poverty exposure is mainly channeled through the racial differences in response to the exposure of neighborhood poverty.

Model 9 is the full model with all the covariates and interaction effect parameters. It investigates when interaction effects between neighborhood poverty exposure and race, changes in neighborhood poverty exposure (the squared term) and race, and family poverty and neighborhood poverty are taken into account, whether the model best explains the influence of neighborhood poverty experience on children's quitting school before graduation. Parameter estimates for this model are similar to those in model 6. Coefficients for the main effect of neighborhood characteristics and interaction terms in model 9 do not change much from those in model 6.

Model comparison. For nested models, loglikelihood ratio test can be applied to examine model fit and select the best model that fit the data. Comparing model 1 (the crude

model with neighborhood poverty information only) to model 2 (the model with both neighborhood poverty situation and individual and family information), I observe a significant improvement in loglikelihood (LR = 2(-16045.18 - (-16969.56)) = 1848.76, df = 8). When the curvilinear term of neighborhood poverty is included in the model (model 3), the improvement in the loglikelihood, compared with model 2, is significant (LR = 2(-15988.85-(-16045.18)) = 112.66, df = 1). Furthermore, compared with model 2, adding the interaction term between neighborhood poverty experience and race (model 4) improves the model fit by an increase in loglikelihood of 70.26 at the cost of losing 1 degree of freedom. Since the squared term of neighborhood poverty in model 4 is muted to insignificant when the interaction of neighborhood poverty and race is accounted for, I omit the squared term parameter in model 5. Model 5 is more parsimonious than model 4 with 1 degree of freedom difference. However, as suggested by model 3, model 4, and model 5, neighborhood poverty may be curvilinearly related to children's dropping out high school early and its effect may be moderated by race, I include an interaction term between the curvilinear term of neighborhood poverty effect and race in model 6 while retaining the main effects of neighborhood poverty and the squared term. Compare model 6 to model 2, there is a large improvement in model fit with only 3 degree of freedom difference.

Model 7 examines the interaction effect between neighborhood poverty and family poverty experience. As suggested by relative deprivation and competition models, family economic conditions may moderate the effects of neighborhood economic situations. Children from poor families residing in affluent neighborhoods may fare worse than if they live in poor neighborhoods. However, conventional wisdom suggests that poor children may perform better in terms of their educational and behavioral outcomes when they reside in affluent

neighborhoods. In accordance with the social isolation models, the suggestions assume that exposure to affluent neighbors, better schools and teachers, quality institutions, and main stream culture may better socialize children. The significant parameter estimate for the interaction term suggests that neighborhood poverty impact is contingent on the level of family poverty exposure. For those children growing up in always poor families, spending less time in poverty stricken neighborhoods may have a more positive impact on their likelihood of quitting school early than if they reside in poor neighborhoods. However, for those non-poor children, residing in less poor area appears to protect them from dropping out of high school. This finding may suggest that relative deprivation and competition mechanisms operate in neighborhood settings for those very poor children. However, this effect is estimated without accounting for the interaction effect between neighborhood poverty and race.

When the interaction effects between neighborhood poverty and race and the interaction effect of neighborhood poverty and the curvilinear effect of neighborhood poverty and race are taken into account in model 8 and 9 respectively, the cross level interaction effect between family and neighborhood poverty is no longer significant. This finding suggests that the cross level poverty interaction effect may reflect racial differences in response to neighborhood poverty effects. When the interaction between neighborhood poverty and race is considered (model 8), the interaction effect between neighborhood poverty and family poverty becomes non-significant.

It is easy to see that model 9 has the highest loglikelihood as it includes all parameters. However, comparisons between model 5, model 7, and model 8 indicate, the interaction effect

between family and neighborhood poverty does not significantly predict the outcome of high school dropout while the interaction effect between race and neighborhood poverty is taken into account. Model 6 and model 9 do not differ much in terms of parameter estimates and model fit. But model 6 is a more parsimonious model than model 9. I would choose model 6 as the best fitting model. The model suggests that race plays an important role in moderating neighborhood poverty impact.

In sum, logistic regression analysis fails to find linear but curvilinear association between neighborhood poverty and children's likelihood of dropping out of high school before graduation. The curvilinear functional forms of neighborhood poverty impact differ by race. Neighborhood poverty is concavely related to white children's likelihood of quitting school. When neighborhood poverty exposure is not very high (over 30% poor), white children have an increasing probability of leaving school early before graduation. However, when they are stuck in the most poverty stricken neighborhoods (over 30% poor), their chance of leaving school diminishes with the increase of neighborhood poverty.

Black children, however, follow a very different path of neighborhood impact. The convex trajectory shows that their probability of quitting high school early keeps leveling down when they do not reside in high poverty places (less than 40% poor). However, probability of quitting school goes up quickly when high concentration of neighborhood poverty increases beyond 40%.

In general, holding constant all continuous variables at the mean and binary variables at 0, at the same neighborhood poverty levels, white children have a higher probability of dropping

out of school than black children. The depicted probabilities are calculated within the range of available data on the level of neighborhood poverty in childhood for whites and blacks. Therefore, neighborhood poverty influence is contingent on race. The study results support prior findings by Brooks-Gunn and colleagues (1993) that neighborhood economic effects matter more for whites than for blacks. When individual and family characteristics and neighborhood minority concentration are controlled, blacks have a lower estimated probability of dropping out of high school than whites. The results suggest that were the blacks have similar individual and family conditions and exposed to similar level of minority concentration, they have a lower rate of school dropout. Finally, the significant interaction effect of neighborhood poverty and family poverty exposure diminishes to non-significant once the interaction effect of neighborhood poverty and race is taken into account. Racial differences in neighborhood poverty impact persist to be significant in all model specifications. Compared across all models, the models (model 6 and model 9) that specify the racial differences in the functional form of neighborhood poverty impact best fit the data. Model 6 is more parsimonious than model 9, though the loglikelihood of model 9 is significantly better than model 6 ($LR = 16.38$, $df = 1$).

Experience of neighborhood affluence during childhood

Effects of exposure to affluent neighbors during childhood on children's probability of school-leaving are presented in Table 3.3. Except model 1 which examines the crude effect (the upper bound of impact) of neighborhood affluence, all logistic regression equations adjust for individual and family characteristics during childhood. All continuous variables are centered at the mean.

Table 3.3: Logistic regression of neighborhood affluence and dropping out of high school (unweighted N = 3,077)

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Neighborhood economic context									
Average neighborhood affluence from birth to 14	-3.31***	-1.79***	-1.41***	-1.77***	-2.03***	-1.81***	-2.15***	-1.86***	-1.75***
	(0.60)	(0.57)	(0.71)	(0.75)	(0.60)	(0.76)	(0.61)	(0.64)	(0.76)
Average neighborhood affluence from birth to 14 squared	---	---	-3.76	-2.37	---	-1.89	---	---	-1.19
			(3.17)	(3.13)		(3.21)			(3.26)
Average neighborhood affluence from birth to 14 X black	---	---	---	3.55***	3.92***	2.96	---	3.15	2.57
				(1.77)	(1.67)	(1.82)		(1.87)	(1.94)
Average neighborhood affluence from birth to 14 squared X black	---	---	---	---	---	-7.83	---	---	-6.02
						(11.31)			(11.59)
Average neighborhood affluence from birth to 14 X % of time family in poverty	---	---	---	---	---	---	4.20	2.97	2.43
							(2.40)	(2.58)	(2.82)
Neighborhood control variable									
% of time live in minority concentrated neighborhood	0.40***	0.55	0.60	0.75***	0.74***	0.74***	0.60	0.74***	0.74***
	(0.18)	(0.38)	(0.38)	(0.37)	(0.37)	(0.37)	(0.37)	(0.37)	(0.36)
Individual and family covariates									
Black	---	-0.64	-0.63	-0.38	-1.36***	-0.29	-0.63	-0.40	-0.34
		(0.35)	(0.34)	(0.30)	(0.49)	(0.34)	(0.33)	(0.31)	(0.35)

Male	---	0.17	0.16	0.17	0.17	0.17	0.16	0.16	0.16
		(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Number of children in the family at birth	---	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
% of time family in poverty from birth to 14	---	1.19***	1.25***	1.27***	1.23***	1.29***	0.53	1.52***	1.50***
		(0.43)	(0.44)	(0.44)	(0.43)	(0.44)	(0.58)	(0.49)	(0.49)
% of time family head unemployed from birth to 14	---	0.32	0.32	0.30	0.30	0.29	0.29	0.28	0.28
		(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)
% of time female headed household from birth to 14	---	-0.30	-0.32	-0.30	-0.29	-0.31	-0.32	-0.30	-0.31
		(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)
Head education level at child birth --- less than high school	---	0.60***	0.61***	0.61***	0.60***	0.61***	0.61***	0.61***	0.61***
		(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
Number of times family moves neighborhood from birth to 14	---	0.08***	0.08***	0.07***	0.08***	0.07***	0.08***	0.08***	0.08***
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Intercept	-1.59***	-1.73***	-1.67***	-1.68***	-1.72***	-1.69***	-1.70***	-1.70***	-1.68***
degree of freedom	3061	3053	3052	3051	3052	3050	3052	3051	3049
loglikelihood	-16869.09	-15962.97	-15948.26	-15920.82	-15926.43	-15917.29	-15934.70	-15913.94	-15909.91
Chi squared	36016.84	35742.33	35846.81	35976.65	35910.49	36019.71	35776.23	35869.39	35932.35

***$p < .05$;

Figures in parentheses are SEs.

Linear relationship. As indicated by model 1, neighborhood affluence has a significantly negative relationship with dropping out of high school (b = -3.31, SE = 0.60). After controlling for individual and family characteristics in model 2, such a linear effect remains (b = -1.79, SE = 0.57). These models suggest that exposure to affluent neighbors has a protective effect against dropping out of high school. The more affluent neighbors in the residential place, the less likely the child drops from high school before completion.

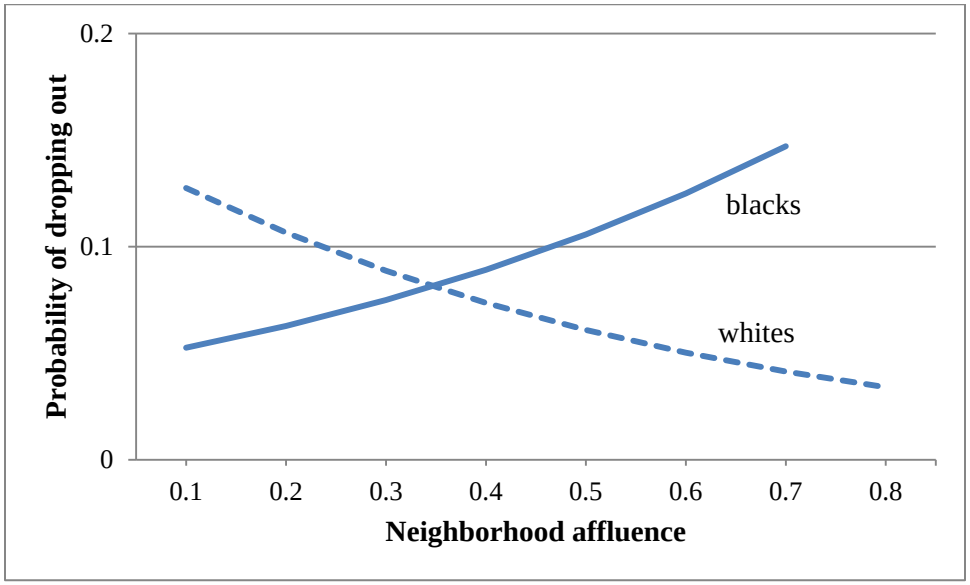
Non-linear relationship. There is no evidence of nonlinear effect of neighborhood affluence on children's educational attainment (Table 3.3, model 3). The linear effects of neighborhood affluence remain significant (b = -1.41, SE = 0.71).

Suggested by Crane (1991), the exposure to affluent neighbors, measured by the proportion of neighbors with managerial or professional jobs, has an epidemic impact on children's dropout probability. When the proportion of affluent neighbors is below 5%, there is a sharp increase in children's dropout probability. Following his measure, I test whether living in neighborhoods with less than 5% of affluent neighbors has a significant negative impact in children's educational achievement than neighborhoods that have more affluent neighbors. I created a dummy variable for neighborhood affluence level with 1 indicating living in neighborhoods with less than 5% affluent neighbors and 0 otherwise. The results are presented in Appendix Table 3.1. The study fails to support Crane's finding of epidemic effect of neighborhood affluence. Residing in neighborhoods with few affluent neighbors has a positive impact on children's probability of dropout. But it does not sharply increase (b = 0.35, SE = 0.28)

children's likelihood of dropping out of high school early than living in areas with more affluent neighbors.

Interaction effect (by race). Model 4 in Table 3.3 tests the interaction effect between race and neighborhood affluence while taking into account the nonlinear effects of neighborhood affluence. Since the coefficient for the nonlinear effect is not significant, the squared term of neighborhood affluence is dropped in model 5 when I examine whether effects of neighborhood affluence are contingent on race. The coefficient (b = - 2.03, SE = 0.60) for average neighborhood affluence in model 5 is the estimated neighborhood effect for white children. The negative coefficient for the linear effects of neighborhood affluence shows that with the increase in neighborhood affluence, there is a decrease in the likelihood of dropping out of high school for whites. The positive coefficient of the interaction term (b = 3.92, SE = 1.67) reflects the increment to the log odds of quitting school for blacks. With the increase in neighborhood affluent, there is an increase in the probability of dropping out for blacks. Using these estimates, I plot the probability of leaving high school before graduation for blacks and whites in Figure 3.3. For blacks, neighborhood affluence ranges from -0.003 to 0.77 and for whites, neighborhood affluence ranges from 0.04 to 0.82. Probability of dropping out of high school is presented within the range of data points on neighborhood affluence for both races.

Figure 3.3. Interaction between neighborhood affluence and race



Interaction between neighborhood affluence and race projected within the range of actual neighborhood affluence data. (Continuous variables are centered at the grand mean. Head has graduated from high school. Only for female children).

Decreasing probability of quitting school for white children is consistent with findings from prior studies showing the protective effect of neighborhood affluent against undesirable outcomes (Crane 1991; Brooks-Gunn, Duncan et al. 1993; Duncan 1994)). However, as indicated in Figure 3.3, black children do not appear to benefit from exposure to affluent neighbors. I conduct further analysis to investigate the interaction effect between neighborhood affluence and race.

Statistical analysis for blacks and whites are conducted separately aiming to find whether impact of neighborhood affluence differ by race. The results are presented in Table 3.4. As indicated by the coefficients, neighborhood affluence is negatively associated with dropping out

of high school for whites (*b* = -1.75, *SE* = 0.63) but not related to that of blacks (*b* = -0.31, *SE* = 1.47). Moreover, neighborhood minority concentration is significantly related to leaving high school early for whites (*b* = 1.28, *SE* = 0.48) above and beyond the significant protective effect of neighborhood affluence. This indicates that longer exposure to minority concentrated neighborhood has negative impact on white children's likelihood of graduating from high school. No such effect is seen for blacks.

Table 3.4: Logistic regression of neighborhood affluence and dropping out of high school by race

Independent variables	black (unweighted N = 1410)	white (unweighted N = 1667)
Neighborhood economic context		
Average neighborhood affluence from birth to 14	-0.31	-1.75***
	(1.47)	(0.63)
Neighborhood control variable		
% of time live in minority concentrated neighborhood	-0.07	1.28***
	(0.38)	(0.48)
Individual and family covariates		
Male	0.07	0.19
	(0.18)	(0.15)
Number of children in the family at birth	-0.05	0.07
	(0.04)	(0.06)
% of time family in poverty from birth to 14	1.40***	1.18***
	(0.46)	(0.57)
% of time family head unemployed from birth to 14	0.16	0.46
	(0.46)	(0.63)
% of time female headed household from birth to 14	-0.01	-0.42
	(0.30)	(0.42)
Head education level at child birth --- less than high school	0.09	0.70***
	(0.22)	(0.19)
Number of times family moves neighborhood from birth to 14	-0.03	0.10***
	(0.04)	(0.03)

Intercept	-1.53***	-1.84***
loglikelihood	-2767.89	-12927.79
Chi squared	5190.83	30919.36

***$p < .05$;
Figures in parentheses are SEs.

Model 6 examines whether neighborhood affluence is curvilinearly associated with children's leaving school and if that effect is contingent on race. This study fails find such a curvilinear effect (b = -7.83, SE = 11.31) or the interaction effect by race.

Interaction effect (by duration family poverty). Model 7 and model 8 (in Table 3.3) examine the interaction effect of neighborhood affluence and family poverty exposure. Model 7 tests the main effects of neighborhood affluence and whether neighborhood affluence is moderated by family poverty experience. There is not any evidence that neighborhood affluence interacts with family poverty exposure (b = 4.20, SE = 2.40) in affecting children's probability of dropping out of high school. Model 8 examines the interaction effect by including the interaction term of neighborhood affluence and race. When both interaction terms (neighborhood affluence and race, neighborhood affluence and family poverty) included in the regression equation, there is no support for interaction effects between neighborhood affluence and race or family poverty exposure. Neither of the two interaction effect terms is statistically significant in predicting dropping out of high school.

Model 9 is the full model which includes all the covariates and the interaction effect parameters. In this model, the main effect of neighborhood affluence has a protective effect

against dropping out of high school. None of the variables on neighborhood affluence or interaction effects are statistically significant.

Model comparison. Loglikelihood ratio test is used to compare across nested models to select the best model that fit the data. Comparing model 1 with model 2, the improvement in model fit suggests that neighborhood affluence has a significant protective effect against dropping out of high school above and beyond the effects of individual and family characteristics. Adding a squared term of neighborhood affluence effect (model 3) improves the model fit but the curvilinear term is not statistically significant.

Model 4 and model 5 examines the interaction effect between neighborhood affluence and race. Model 5 is nested within model 4 without the curvilinear term for neighborhood poverty effect. Comparing the two models, model 4 fits the model better than model 5 (LR = 11.22, df = 1).

When the interaction effect between the curvilinear term of neighborhood affluence and race is taken into account in model 6, none of the interaction effect estimates are significant. Loglikelihood ratio test comparing model 4 and model 6 suggests no significant improvement in model fit for model 6 (LR = 7.06, df = 1).

Model 7 and model 8 examine the interaction effect of neighborhood affluence and family poverty exposure. The interaction terms in both models are not statistically significant, suggesting impact of neighborhood affluence does not depend on family poverty experience.

Comparing across all models, model 4 is more parsimonious with reasonably good model fit. Neighborhood affluence has a protective impact on dropping out of high school but only for whites. For this group, the more affluent the neighborhood, the less likely they are to drop out of high school early. For blacks, no such effect is detected

Experience of neighborhood ICE during childhood

Table 3.5 presents the results of regression estimates of neighborhood ICE effects during childhood on children's probability of school-leaving before graduation. Except for model 1 which examines the crude effect of neighborhood ICE, all other logistic regression equations adjust for individual and family characteristics in childhood. Continuous variables are centered at the means to prevent high correlation problems between the linear and quadratic terms and for better interpretation of the interaction terms.

Table 3.5: Logistic regression of neighborhood ICE and dropping out of high school (unweighted N = 3,077)

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Neighborhood economic context										
Average neighborhood poverty from birth to 14	---	---	---	---	---	---	---	---	---	-1.02
										(1.06)
Average neighborhood affluence from birth to 14	---	---	---	---	---	---	---	---	---	-2.29***
										(0.77)
Average ICE from birth to 14	-2.05***	-0.95***	-1.00***	-1.21***	-1.24***	-1.20***	-1.27***	-1.19***	-1.17***	---
	(0.35)	(0.35)	(0.41)	(0.40)	(0.38)	(0.40)	(0.37)	(0.38)	(0.40)	
Average ICE squared	---	---	-1.96***	-0.96	---	-1.18	---	---	-0.90	---
			(0.92)	(1.00)		(1.15)			(1.16)	
Average ICE X black	---	---	---	1.97***	2.41***	2.47***	---	1.91***	2.35***	---
				(0.93)	(0.80)	(1.02)		(0.95)	(1.06)	
Average ICE from birth to 14 squared X black	---	---	---	---	---	1.28	---	---	1.72	---
						(2.06)			(2.11)	
Average ICE X % of time family in poverty from birth to 14	---	---	---	---	---	---	2.41***	1.37	1.24	---
							(1.04)	(1.22)	(1.33)	

Neighborhood control variable										
% of time live in minority concentrated neighborhood	0.11	0.46	0.59	0.73***	0.72	0.76***	0.56	0.72	0.76***	0.68
	(0.21)	(0.39)	(0.38)	(0.37)	(0.37)	(0.37)	(0.38)	(0.37)	(0.36)	(0.41)
Individual and family covariates										
Black	---	-0.64	-0.62	-0.30	-0.24	-0.32	-0.62	-0.31	-0.36	-0.64
		(0.35)	(0.33)	(0.30)	(0.28)	(0.30)	(0.33)	(0.30)	(0.31)	(0.34)
Male	---	0.16	0.16	0.16	0.17	0.16	0.15	0.16	0.16	0.17
		(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.13)	(0.12)
Number of children in the family at birth	---	0.04	0.04	0.04	0.04	0.04	0.05	0.04	0.04	0.04
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
% of time family in poverty from birth to 14	---	1.17***	1.28***	1.28***	1.24***	1.27***	1.43***	1.49***	1.48***	1.26***
		(0.44)	(0.44)	(0.44)	(0.44)	(0.44)	(0.45)	(0.48)	(0.48)	(0.44)
% of time family head unemployed from birth to 14	---	0.30	0.31	0.27	0.26	0.28	0.30	0.27	0.28	0.35
		(0.47)	(0.46)	(0.46)	(0.47)	(0.46)	(0.46)	(0.46)	(0.46)	(0.46)
% of time female headed household from birth to 14	---	-0.29	-0.33	-0.30	-0.28	-0.30	-0.31	-0.29	-0.30	-0.32
		(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.29)	(0.30)	(0.29)
Head education level at child birth --- less	---	0.60***	0.60***	0.60***	0.60***	0.61***	0.60***	0.60***	0.61***	0.60***

than high school										
		(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
Number of times family moves neighborhood from birth to 14	---	0.08***	0.08***	0.07***	0.08***	0.07***	0.08***	0.08***	0.07***	0.08***
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Intercept	-1.56***	-1.72***	-1.64***	-1.67***	-1.71***	-1.66***	-1.67***	-1.68***	-1.65***	-1.74***
degree of freedom	3061	3053	3052	3051	3052	3050	3052	3051	3049	3052
loglikelihood	-16852.26	-15993.26	-15947.06	-15911.07	-15919.76	-15908.89	-15944.46	-15907.71	-15900.43	-15953.55
Chi squared	35755.81	35692.54	35905.66	36026.30	35934.70	36022.33	35773.13	35873.14	35917.31	35820.84

***$p < .05$;

Figures in parentheses are SEs.

Linear relationship. The associations between neighborhood ICE during childhood and children's educational outcomes are shown in Table 3.5. Model 1 shows the upper bound of neighborhood ICE impact. Without adjusting for individual and family characteristics, neighborhood ICE has a protective effect against dropping out of high school early (b = -2.05, SE = 0.35). When individual, and family characteristics are taken into account, average neighborhood ICE experienced during childhood (model 2) is still linearly associated with children's school-leaving (b = -0.95, SE = 0.35). One unit increase in neighborhood ICE is associated with 0.95 unit decrease in the log odds of leaving high school before graduation. With the increase in the proportion of affluent neighbors relative to the proportion of poor neighbor, there is a decrease in dropping out of high school among the adolescents in the neighborhood.

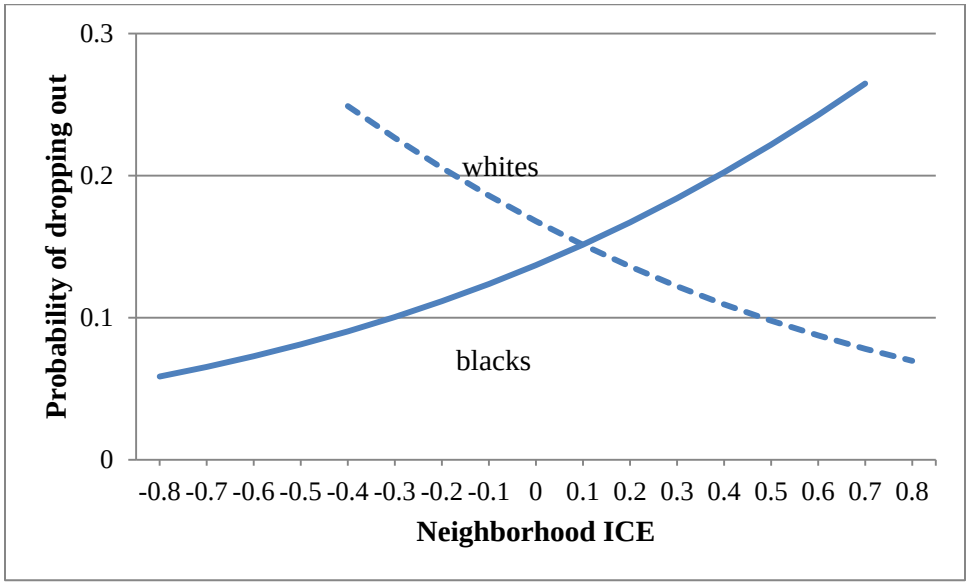
Nonlinear relationship. When the curvilinear relationship (model 3, Table 3.5) of neighborhood effect is considered, average neighborhood ICE has a concave and negative relationship with dropping out of high school (b = -1.96, SE = 0.92), indicating that there is a curvilinear effect of average neighborhood ICE on children's school-leaving behavior. In general, the probability of dropping out of high school declines with the increase in neighborhood ICE (more affluent neighbors than the poor). However, when I plot the nonlinear trend of likelihood of quitting school early for blacks, they do not have a high probability of quitting when residing in poverty concentrated neighborhoods. Their dropout rate increases when they have increasing exposure to mixed income neighborhoods (when ICE increases towards zero). The rate of quitting school levels off and decreases when there are more affluent neighbors than the poor in the residential areas. For white children, they follow the general trend of decreasing probability

of quitting school early with the increase in neighborhood affluence. The patterns are plotted based on the available data for the blacks and whites in the study.

However, when I control for the interaction effect of ICE and race in model 4 (Table 3.5), the nonlinear impact of ICE is no longer significant. The results show that when interaction between ICE and race is taken into account, the nonlinear impact of neighborhood ICE diminishes to nonsignificance. Thus, the nonlinear effect appears to be a reflection of effect moderation by race.

Interaction effect (by race). Model 5 in Table 3.5 estimates the interaction effect between neighborhood ICE and race. The coefficient for ICE (b = -1.24, SE = 0.38) is significant, reflecting the protective effect of neighborhood ICE on white children's probability of dropping out of high school. With a unit increase in neighborhood ICE, there is a 1.24 decrease in the log odds of quitting school for white children. The interaction term (b = 2.41, SE = 0.8) reflects the increase in the log odds of quitting school for the black children with a unit increase in neighborhood ICE. Controlling for individual, family characteristics, and neighborhood minority concentration level, there is a 1.17 (= 2.41 – 1.24) unit increase in black children's log odds of quitting school with the unit increase in neighborhood ICE. Figure 3.4 depicts the interactive relationship between neighborhood ICE and race. Since whites' neighborhood ICE exposure falls in the range of -0.45 to 0.80 and blacks' neighborhood ICE falls in the range of -0.86 to 0.74, the school dropout probabilities are estimated based on the actual data of neighborhood ICE by race.

Figure 3.4. Interaction effect between neighborhood ICE and race



Interaction between neighborhood ICE and race projected within the range of actual neighborhood affluence data. (Continuous variables are centered at the grand mean. Head has graduated from high school. Only for female children).

The graph shows that for blacks, there is a positive relationship between neighborhood ICE and school leaving. Increases in ICE are associated with increased likelihood of dropping out of high school for the blacks. However, for white children, reverse association is discovered. Within the range of the possible data, whites have a diminishing likelihood of dropping out with the increase in ICE. When blacks are living in poverty concentrated neighborhoods (lower end of ICE distribution), they do not have a high rate of quitting school. However, for white children, if they live in poverty concentrated neighborhoods (ICE around -0.4), they have a higher likelihood of dropping out of high school than blacks.

I conduct logistic regressions for black and white children separately to explore how neighborhood ICE differentially affects children's dropping out of high school by race. Results

are presented in Table 3.6. There is not any notable evidence that neighborhood ICE is associated with blacks' educational achievement (b = 0.34, SE = 0.71). However, neighborhood ICE has a significant protective effect against quitting school for white children (b = - 1.05, SE = 0.39).. Consistent with prior findings by Brooks-Gunn and colleagues (1993), neighborhood economic conditions appears to matter more for whites than for blacks. Further, neighborhood minority concentration (b= 1.16, SE = 0.49) is positively related to school leaving for white children above and beyond the effect of neighborhood ICE.

Table 3.6: Logistic regression of neighborhood ICE and dropping out of high school by race

Independent variables	black (unweighted N = 1,410)	white (unweighted N = 1,667)
Average ICE from birth to 14	0.34	-1.05***
	(0.71)	(0.39)
Neighborhood control variable		
% of time live in minority concentrated neighborhood	0.07	1.16***
	(0.41)	(0.49)
Individual and family covariates		
Male	0.06	0.19
	(0.18)	(0.15)
Number of children in the family at birth	-0.05	0.07
	(0.04)	(0.06)
% of time family in poverty from birth to 14	1.48***	1.15***
	(0.48)	(0.58)
% of time family head unemployed from birth to 14	0.17	0.42
	(0.46)	(0.63)
% of time female headed household from birth to 14	-0.00	-0.41
	(0.30)	(0.42)
Head education level at child birth --- less than high school	0.11	0.69***
	(0.22)	(0.19)
Number of times family moves neighborhood from birth to 14	-0.03	0.10***
	(0.04)	(0.03)

Intercept	-1.61***	-2.51***
loglikelihood	-2766.91	-12940.66
Chi squared	5191.47	30914.91

***$p < .05$;
Figures in parentheses are SEs.

Since neighborhood ICE is curvilinearly related to children's probability of quitting school early and race is an effect modifier for ICE impact, I test whether there are racial differences in the nonlinear/curvilinear relationship between neighborhood ICE and probabilities of dropping out of high school before graduation using Model 6 in Table 3.5. The study fails to find significant interaction effect between race and nonlinear effects of neighborhood ICE (b= 1.28, SE = 2.06).

Interaction effect (by family poverty). Model 7 in Table 3.5 examine the interaction effect between neighborhood ICE and proportion of time during childhood that the family is poor. Model7 takes in to account the interaction effect of neighborhood ICE and family poverty experience while ignoring the interaction impact between neighborhood ICE and race. Logistic regression results in model 7 demonstrate that both the main effect of neighborhood ICE (b = -1.27, SE = 0.37) and family poverty exposure (b = 1.43, SE = 0.45) are significantly associated with educational attainment. Neighborhood ICE is protective against quitting school. Longer duration in poor families increases the chance that a child drops out of high school before completion. The significant interaction effect between neighborhood ICE and family poverty exposure (b = 2.41, SE = 1.04) indicates that effect of neighborhood ICE varies by the duration of exposure to family poverty. Since both variables are continuous, interpreting the interaction

effect should consider holding one variable constant. For those children spending more than twelve years in poor families, increases in neighborhood ICE (more affluent than poor neighbors) does not protect children from dropping out of high school early. However, for those children that have no exposure to family poverty, increases in neighborhood ICE has a protective effect against school-leaving before completion.

However, when the interaction effect of neighborhood ICE and race is taken into account in model 8, the interaction effect between neighborhood ICE and family poverty exposure is reduced to nonsignificance (b = 1.37, SE = 1.22). Race remains a significant effect modifier of neighborhood ICE (b = 1.91, SE = 0.95).

Model 9 is the full model where all covariates and interaction effects are included. Neighborhood ICE has a negative impact on children's likelihood of quitting school and its impact is moderated by race.

Finally, model 10 in Table 3.5 incorporates both measures of neighborhood affluence and poverty in the equation. This model setup aims to replicate prior studies by Brooks-Gunn et al. (1993) and Duncan (1994) where they find significant protective effect of neighborhood affluence against quitting school when controlling for neighborhood poverty in the same equation. Neighborhood affluence is still negatively associated with the likelihood of dropping out of high school (b = -2.29, SE = 0.77). There is not any evidence of the effect of neighborhood poverty (b = - 1.02, SE = 1.06) once affluence is controlled.

Model comparison. Loglikelihood ratio tests are applied comparing model fit among nested models. Model 1 shows that neighborhood ICE has a significant protective effect against

children's probability of dropping out of high school. This effect remains significant after adjusting for neighborhood individual, and family characteristics (model 2). Adding individual and family characteristics in model 2 largely improves the model fit. When the curvilinear effect of neighborhood ICE is examined in model 3, there is an improvement in model fit, compared with model 2, as suggested by the increase in the loglikelihood. However, as further tests shown (model 4 and model 5), the curvilinear impact of ICE may just reflect the racial differences in response to neighborhood ICE. Increases in neighborhood ICE have a positive impact on black children's likelihood of quitting school. Nevertheless, for white children, the increasing exposure to affluent neighbors (increase in ICE) appears to prevents leaving school before completion. Comparing the model fit for model 4 and model 5, loglikelihood ratio test shows that model 4 is a better fitting model ($LR = 17.38$, $df = 1$).

Model 6 aims to examine whether neighborhood ICE has a curvilinear impact on blacks and whites educational attainment and whether such and effect differ by race. The non-significant interaction term between the squared term of neighborhood ICE and race suggests that neighborhood ICE effect is linear. However, comparing model 6 with model 4, the improvement in model fit is not statistically significant, suggesting adding the interaction effect between the curvilinear effect of neighborhood ICE and race does not explain the variance in the outcome.

Model 7 and model 8 test the interaction effect of neighborhood ICE exposure and family poverty experience. The significant interaction term of cross-level poverty (model 7 $b = 2.41$, $SE = 1.04$) is muted to non-significance when the racial differences in neighborhood ICE is taken

into account (model 8). This suggests that race, as an effect modifier for neighborhood ICE, explains more variance in the likelihood of dropping out of high school than family poverty condition does. Once the interaction between neighborhood ICE and race is considered, the interaction between neighborhood ICE and family poverty exposure is no longer significant.

Therefore, despite the non-significant parameter estimate for the curvilinear effect of neighborhood ICE, model 4 fits the data better than the other models.

In sum, neighborhood ICE is negatively associated with dropping out of high school before completion. The more concentration of affluent neighbors in residential place, relative to the concentration of the poor, the less likely children would drop out of high school before graduation. Moreover, the effect of neighborhood ICE varies by race. When the association is examined separately by race, neighborhood ICE does not significantly associated with quitting high school for blacks. However, neighborhood ICE is significantly associated with educational attainment for white children. Furthermore, though model 7 shows that neighborhood ICE interacts with family poverty exposure, the cross-level interaction (neighborhood and family) effect in economic conditions diminishes to nonsignificance once the interaction effect of neighborhood ICE and race is considered (model 8). This finding suggests effects of neighborhood ICE vary across the racial line. Effect modification by family poverty exposure is channeled through the racial differences in ICE impact.

Effects of family characteristics

Consistent across all models, family poverty experience, family head's educational status and residential mobility are significantly associated with children's likelihood of quitting school

early. The longer the duration of living in poor families and the more times children move across neighborhoods, children are more likely to quit school before graduation. If family heads do not have a high school degree or GED, children are also likely to leave high school early. Moreover, the more times children move across neighborhoods over time, the more likely they would quit school before completion.

These findings suggest that family poverty experience and educational status of family head are important predictors for children's educational attainment. As suggested by studies (Brooks-Gunn and Duncan 1997) on family economic impact, family economic situation may directly or indirectly influence on children's educational attainment. Growing up in poor families, children have less access to nutritious food, quality learning experiences, stable residence, and quality schools. The lack of these health facilitating and cognitive stimulating resources may have a direct impact on children's intellectual development and their future educational achievement. Moreover, family poverty may indirectly influence children's outcomes via parenting style. Poor parents are likely to experience stress when confronting economic hardships. When confronting income loss, unemployment, and family poverty, parents are less likely to respond to children's needs and are less likely to monitor children's behaviors. They are more likely to adopt a harsh parenting style toward their children which in turn has a negative impact on children's cognitive and behavioral development. Harsh parenting style has been suggested in many studies as an important mechanism through which family poverty affects children's intellectual development and educational attainment (Conger, Conger, and Elder 1997; Conger, Ge, Elder, Lorenz, and Simons 1994; Guo and Harris 2000; McLoyd 1998; Sampson and Laub 1994).

Prior research (Mayer and Jencks 1991) has suggested that neighborhood economic situations may interact with family economic conditions in shaping children's educational and behavioral outcomes. Mayer and Jencks (1991) proposed that children from poor families might perform worse in affluent neighborhoods than if they grew up in less affluent neighborhoods because they would feel despaired when exposed to affluent neighbors. The current study fails to demonstrate the interaction effect of family and neighborhood economic conditions. Therefore, the findings do not support the relative deprivation theory.

Parental educational status also has important influence on children's educational attainment. If family heads have not finished high school, they are less likely to have a high expectation for their children to complete high school too. They may not monitor their children's educational development closely. They are less likely to be involved in children's study. When children need help with their school work, parents without high school degree are less likely to provide academic help (Astone and McLanahan 1991).

Finally, there is substantial evidence that family residential mobility influences children's educational attainment. The significant positive coefficient of number of times family moves neighborhood during childhood reflects the negative impact of residential mobility on children's schooling. The more time families moves across neighborhood, the more likely children dropping out of high school. Since in the US, there is a large overlap between residential neighborhoods and school district, moving across neighborhoods may entail moving across schools and school districts. Changes in residential place and schools entail negative impact on children's educational achievement because first, children often change schools may have to

spend time adjusting to new school environment, teachers, classmates, and educational materials which may affect their school performance. Second, compared with children who live in the same place for a long time, children who are new to the community have less information about the school system such as good teachers and good classes. Third, teachers may not know the children well when they just move in. Finally, those newly moved-in children often feel socially marginalized in school and are likely to disengage in schooling (Astone and McLanahan 1994).

This study fails to provide evidence that gender, family structure and composition, and head employment status are associated with children's future behavioral and educational outcomes[12]. Moreover, there is not any regional effect. Children growing up in the north east, north central, or south do not differ in terms of their outcomes with those children growing up in the west. Children born in 1973 and 1979 are different from those born in 1980 in terms of educational attainment.

Effect of neighborhood minority concentration

Though there is a debate on whether racial segregation or economic segregation determines children's development, the study provide some evidence of the negative impact of growing up in minority concentrated neighborhood once individual, family, and neighborhood economic characteristics are controlled. Living in minority concentrated neighborhood increases the likelihood of dropping out of high school early, especially for whites. However,

[12] These family level covariates have been found associated with children's educational and behavioral outcomes in prior studies. However, in the current research, when robust standard error procedure is employed in logistic regression analysis, these variables do not have significant association with the probability of high school dropout and teenage childbirth. If standard logistic regression is used, these variables are significantly associated with both outcomes.

neighborhood affluence and economic inequality remain statistically significantly associated with the probability of dropping out of high school after neighborhood minority concentration is controlled.

Racial differences

When logistic regressions are conducted for whites and blacks separately to examine the impact of neighborhood economic situations on children's dropping out of high school, family poverty experience is a significant predictor of quitting high school early for both blacks and whites. However, educational attainment of family head and family residential mobility only matter for whites' but not blacks' educational outcome. Moreover, neighborhood minority concentration plays an important role for white children's school leaving outcome but not for that of the blacks. Therefore, the longer the time spent in minority concentrated neighborhoods, the more likely that a white child would drop out of high school before graduation. The study fails to find such effect for black children.

Longitudinal vs. point-in-time measure of neighborhood economic conditions

The current debate of whether point-in-time measure of neighborhood socioeconomic environment sufficiently captures neighborhood effect can be approached by comparing statistical estimates of neighborhood poverty, affluence, and ICE when children are age 14[13] versus the estimates from regression analyses using aggregated measure of neighborhood economic conditions that takes into account neighborhood environment from birth to 14 years of

[13] I choose to measure neighborhood economic conditions at age 14 to be consistent with prior studies by Brooks-Gunn et al. (1993) and Duncan (1994) that measure neighborhood environment when children are 14 years old.

age. The results from regression analyses comparing using point-in-time vs. longitudinal measures of neighborhood economic conditions on school-leaving are presented in Table 3.7. The logistic regressions focus on the linear effects of neighborhood economic conditions only.

Table 3.7: Logistic regression results compare point-in-time vs. longitudinal measures of neighborhood effect high school dropout sample (unweighted N = 2,428)

Neighborhood economic context	Average neighborhood poverty	Neighborhood poverty at age 14	Average neighborhood affluence	Neighborhood affluence at age 14	Average neighborhood ICE	Neighborhood ICE at age 14
	1.26	0.47	-1.76***	-1.32***	-0.97***	-0.67***
	(0.89)	(0.84)	(0.67)	(0.51)	(0.41)	(0.34)
Neighborhood control variable						
% of time live in minority concentrated neighborhood	0.74	0.88***	0.81***	0.84****	0.71	0.80***
	(0.42)	(0.41)	(0.39)	(0.39)	(0.40)	(0.39)
Individual and family covariates						
Black	-0.75***	-0.73***	-0.76***	-0.74***	-0.76***	-0.73***
	(0.36)	(0.35)	(0.35)	(0.35)	(0.36)	(0.35)
Male	0.26	0.26	0.26	0.27	0.26	0.27
	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
Number of children in the family at birth	0.00	0.00	-0.00	-0.00	0.00	0.00
	(0.05)	(0.05)	(0.05)	(0..05)	(0.05)	(0.05)
% of time family in poverty from birth to 14	1.62***	1.70***	1.61***	1.61***	1.57***	1.59***
	(0.50)	(0.50)	(0.48)	(0.48)	(0.49)	(0.49)
% of time family head unemployed from birth to 14	-0.03	0.01	-0.02	-0.03	-0.05	-0.03
	(0.50)	(0.49)	(0.50)	(0.49)	(0.50)	(0.50)
% of time female headed household from birth to 14	-0.36	-0.39	-0.34	-0.35	-0.33	-0.35

	(0.32)	(0.32)	(0.32)	(0.32)	(0.32)	(0.32)
Head education level at child birth --- less than high school	0.62***	0.65***	0.59***	0.61***	0.59***	0.61***
	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)	(0.18)
Number of times family moves neighborhood from birth to 14	0.09***	0.09***	0.08***	0.08***	0.08***	0.08***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Intercept	-2.59***	-2.49***	-1.92***	-2.01***	-2.26***	-2.27***
loglikelihood	-12068.74	-12085.55	-12014.59	-12017.61	-12031.81	-12046.98
Chi squared	28097.74	28195.18	28071.38	28097.18	28000.24	28019.76

***$p < .05$;

Figures in parentheses are SEs.

The first two columns in the both Table 3.7 compare the results using aggregated measure of neighborhood poverty over 14 years vs. neighborhood poverty at age 14. The middle two columns explore the longitudinal and point-in-time measure of neighborhood affluence. The last two columns test the differences using neighborhood ICE.

Using point-in-time measure or longitudinal measure of neighborhood economic conditions results in similar statistical estimates from logistics regressions. Comparing each pair of models, the regression coefficients for the aggregated measures of neighborhood conditions are larger than that from using the point-in-time measure of neighborhood condition at age 14. This finding supports the argument that examining neighborhood conditions over time reveals a stronger neighborhood effect than that found in cross-sectional studies.

Chapter 4 Results of neighborhood effects on teenage childbearing outcome

Logistic regression analyses are conducted using robust standard error procedure to examine the effects of neighborhood economic conditions (poverty, affluence, and ICE) during childhood on adolescents' girls' likelihood of becoming teenage mothers. The results are presented in Table 4.1 (effects of neighborhood poverty), Table 4.2 (effects of neighborhood affluence), and Table 4.3 (effects of neighborhood ICE). All continuous variables are centered at the mean.

Model 1 in each table examines the crude linear effects of neighborhood economic situation on the probability of teenage childbirth. This model specification does not include any of the individual or family characteristics. Therefore, it gives the upper bound of the effects of neighborhood economic conditions. Model 2 also test the linear effect of neighborhood economic situation but include family and individual information. By doing do, it shows whether there is neighborhood economic impact above and beyond the effects of individual and family conditions. Model 3 tests whether there are curvilinear effects of neighborhood economic conditions. The square terms of neighborhood poverty, affluence, and ICE explore whether they have non-linear impact on children's likelihood of becoming teenage mothers. Model 4 explores the interaction effect of neighborhood economic situation with race. Model 5 examines whether neighborhood economic conditions interact with family poverty experience in affecting adolescent girl's probability of becoming a teenage mother. The last model (model 6) in Table 4.3 explores whether the measure of ICE outperforms the conventional method of inputting both neighborhood poverty and affluence in the logistic regression. By comparing this model with

model 2 (in Table 4.3), we can see that using ICE measure improves model fit. Except for model 1, all regressions control for individual and family characteristics and neighborhood minority concentration.

Linking neighborhood economic context to children's teenage childbirth

Experience of neighborhood poverty during childhood

Table 4.1 presents logistic regression results of the associations between childhood exposure to neighborhood poverty and female children's risk of becoming teenage mothers.

Table 4.1: Logistic regression of neighborhood poverty and teenage childbearing (unweighted N = 1,045)

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5
Neighborhood economic context					
Average neighborhood poverty from birth to 14	6.39***	4.19***	8.35***	5.15***	4.33***
	(1.09)	(1.16)	(3.00)	(1.39)	(1.19)
Average neighborhood poverty from birth to 14 squared	---	---	-7.76	---	---
			(4.88)		
Average neighborhood poverty from birth to 14 X black	---	---	---	-3.20	---
				(2.20)	
Average neighborhood poverty from birth to 14 X % of time family in poverty	---	---	---	---	-1.93
					(3.04)
Neighborhood control variable					
% of time live in minority concentrated neighborhood	-0.01	-0.61	-0.62	-0.47	-0.58
	(0.31)	(0.49)	(0.49)	(0.51)	(0.49)
Individual and family covariates					
Black	---	0.56	0.56	1.32	0.55
		(0.45)	(0.45)	(0.07)	(0.45)
Number of children in the family at birth	---	-0.02	-0.02	-0.01	-0.01
		(0.06)	(0.06)	(0.06)	(0.06)
% of time family in poverty from birth to 14	---	1.21***	1.30***	1.20***	1.40***
		(0.58)	(0.57)	(0.58)	(0.62)
% of time family head unemployed from birth to 14	---	0.29	0.22	0.23	0.28
		(0.64)	(0.64)	(0.64)	(0.64)
% of time female headed household from birth to 14	---	-0.11	-0.11	-0.03	-0.15

		(0.42)	(0.42)	(0.42)	(0.42)
Head education level at child birth --- less than high school	---	0.57***	0.55***	0.55***	0.57***
		(0.24)	(0.25)	(0.25)	(0.25)
Number of times family moves neighborhood from birth to 14	---	0.00	-0.01	-0.01	-0.00
		(0.04)	(0.04)	(0.04)	(0.04)
Intercept	-1.34***	-1.57***	-1.50***	-1.54***	-1.56***
degree of freedom	1029	1022	1021	1021	1021
loglikelihood	-7270.53	-7034.11	-7012.86	-7010.15	-7029.73
Chi squared	13135.74	13100.49	13106.59	13056.32	13082.21

***$p < .05$;

Figures in parentheses are SEs.

Linear relationship. Model 1 in Table 4.1 suggests that experience of neighborhood poverty during childhood has a significant positive impact (b = 6.39, SE = 1.09) on teenage childbearing. Such a positive effect remains significant (b = 4.19, SE = 1.16) after controlling for individual and family conditions in Model 2. It suggests that effects of neighborhood poverty exposure on teenage childbearing exist above and beyond the individual and family experience during childhood. Holding constant individual and family characteristics, and controlling for neighborhood minority concentration, increase in neighborhood poverty is associated with an increasing likelihood of giving birth to a child as a teenager.

Nonlinear relationship. Model 3 in Table 4.1 explores the nonlinear effects of neighborhood poverty on the risk of teenage childbirth. There is no evidence of nonlinear effect as the squared term of neighborhood poverty is not statistically significant (b = -7.76, SE = 4.88).

Interaction effect (race). Model 4 in Table 4.1 tests whether the effect of neighborhood poverty experience differ by race. The main effect of neighborhood poverty remains significant (b = 5.15, SE = 1.39) but there is not any support for the significant interaction effect between neighborhood poverty and race. Neighborhood poverty exposure during childhood has similar linear impact for both blacks and whites. Therefore, I refrain from further testing if the race moderates the nonlinear relationship between neighborhood poverty and the outcome.

Interaction effect (family poverty). Model 5 in Table 4.1 aims to address the question of whether neighborhood poverty influence differ by family poverty experiences during childhood. Logistic regression analysis fails to provide any evidence of such an interaction effect.

The coefficient of the interaction term is -1.93 (*SE* = 3.04). However, the main effect of neighborhood poverty is still significant (*b* = 4.33, *SE* = 1.19).

Model comparison. Model 1 is nested within model 2 and model 2 is nested with in model 3, model 4, and model 5. Comparing nested models tests whether adding more covariates into the model significantly improves model fit.

Improvement in model fit is usually achieved with the increase of number of covariates included in the model. When individual and family characteristics are taken into account in model 2, there is a large improvement in the loglikelihood of the model. Adding the curvilinear term of neighborhood poverty (model 3) and including the interaction term between neighborhood poverty and race (model 4) both improves the model fit of -7034.11 in model 2 to loglikelihood of -7012.86 in model 3 and loglikelihood of -7010.15 in model 4. The curvilinear model suggests that effect of neighborhood poverty have a concave relationship with the risk of teenage childbearing. However, the standard errors for the main effect and the curvilinear effect of neighborhood poverty are inflated suggesting a non-robust model fitting.

Model 4, where the interaction effect of neighborhood poverty and race is considered, has the best model fit (as indicted by the loglikelihood). Though the interaction term is not significant, the inclusion of the interaction term yields better model fit. It suggests that all else being equal, neighborhood poverty experience is not as detrimental for black adolescent girls than for white teenagers. Residing in equally poor neighborhoods, adolescent black girls have a lower risk of becoming teenage mothers than white teenage girls.

Model 5 takes into account the interaction effect of neighborhood poverty and family poverty exposure. The interaction term is not statistically significant (b = -1.93, SE = 3.04). Moreover, adding this interaction term does not improve much model fit (LL = -7029.73).

In sum, neighborhood poverty appears to have a positive influence on adolescent girl's likelihood of becoming a teenage mother. The study fails to provide any support for the nonlinear effect of neighborhood poverty. Nor there is any evidence of the interaction effect between neighborhood poverty with race or family poverty condition. However, as indicated by model comparison, the model that include the interaction effect of neighborhood poverty and race best fit the data suggesting neighborhood poverty effects differ by race. Holding constant neighborhood minority concentration, individual and family characteristics, exposure to neighborhood poverty may not have a detrimental effect for black teenagers than for white teenage girls on their risk of teenage childbirth. Future work should pay attention to the interaction effect between neighborhood poverty exposure and race as this study fails to detect such an effect.

Experience of neighborhood affluence during childhood

Table 4.2 shows regression results of the relationships between neighborhood affluence and female children's risk of teenage childbirth.

Table 4.2: Logistic regression of neighborhood affluence and teenage childbearing (unweighted N = 1,045)

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5
Neighborhood economic context					
Average neighborhood affluence from birth to 14	-4.69***	-3.27***	-3.81***	-3.50***	-3.04***
	(1.06)	(1.03)	(1.09)	(1.08)	(1.12)
Average neighborhood affluence from birth to 14 squared	---	---	4.58	---	---
			(3.70)		
Average neighborhood affluence from birth to 14 X black	---	---	---	1.81	---
				(3.42)	
Average neighborhood affluence from birth to 14 X % of time family in poverty	---	---	---	---	-2.64
					(3.84)
Neighborhood control variable					
% of time live in minority concentrated neighborhood	0.72	-0.24	-0.30	-0.12	-0.28
	(0.27)	(0.50)	(0.49)	(0.51)	(0.50)
Individual and family covariates					
Black	---	0.59	0.59	0.20	0.60
		(0.47)	(0.47)	(0.79)	(0.47)
Number of children in the family at birth	---	-0.02	-0.03	-0.02	-0.03
		(0.06)	(0.06)	(0.06)	(0.06)
% of time family in poverty from birth to 14	---	1.46***	1.39***	1.44***	1.21***
		(0.58)	(0.58)	(0.58)	(0.65)
% of time family head unemployed from birth to 14	---	0.30	0.32	0.29	0.34
		(0.65)	(0.66)	(0.65)	(0.66)
% of time female headed household from birth to 14	---	-0.16	-0.14	-0.12	-0.14
		(0.43)	(0.43)	(0.43)	(0.43)
Head education level at child birth --- less than high school	---	0.60***	0.57***	0.60***	0.59***

		(0.24)	(0.24)	(0.24)	(0.24)
Number of times family moves neighborhood from birth to 14	---	0.00	-0.00	-0.01	-0.00
		(0.04)	(0.04)	(0.04)	(0.04)
Intercept	-1.39***	-1.62***	-1.69***	-1.60***	-1.62***
degree of freedom	1029	1022	1021	1021	1021
loglikelihood	-7350.21	-7028.78	-7015.37	-7023.43	-7024.39
Chi squared	13254.00	13037.95	13023.54	13026.71	12983.12

***$p < .05$;

Figures in parentheses are SEs.

Linear relationship. Model 1 in Table 4.2 presents the upper bound of the preventive effect of neighborhood affluence on female teenagers likelihood of childbearing (b = -4.69, SE = 1.06). Model 2 in Table 4.2 shows significant preventive effect (b = -3.27, SE = 1.03) of neighborhood affluence persists after controlling for individual and family characteristics. The more affluent neighbors in the residential place, the less likely that female teenagers become teen mothers. Growing up in neighborhoods with more affluent neighbors decreases the chance of teenage childbirth.

Nonlinear relationship. Model 3 in Table 4.2 explores whether neighborhood affluence is nonlinearly related to teenage childbearing outcome. The main effect of neighborhood affluence is still significant (b = -3.81, SE = 1.09) but the squared term is not statistically significant (b = 4.58, SE = 3.70). The estimates indicate that there is not any notable evidence of nonlinear effect of neighborhood affluent.

Crane (1991) found that exposure to affluent neighbors has an epidemic impact on female teenager's probability of childbearing. When the proportion of affluent neighbors is below 5%, there is a sharp increase in children's likelihood of becoming teenage mothers. Following his measure, I test whether living in neighborhoods with less than 5% of affluent neighbors significantly increases the children's probability of teenage childbearing than if they living in neighborhoods with more presence of affluent neighbors. I created a dummy variable for neighborhood affluence level with 1 indicating living in neighborhoods with less than 5% affluent neighbors and 0 otherwise. The results are presented in Appendix Table 3.1. The study supports Crane's finding of sharp increase in teenage childbirth in neighborhoods with few

affluent neighbors (b = 0.97, SE = 0.46). When the proportion of affluent neighbors is below 5%, the rate of teenage childbirth escalates.

Though nonlinear effect of neighborhood affluence is not detected in the study, the finding of significant increase in the probability of teenage childbearing in places where affluent neighbors are suggests that in extreme situations, such as living in places lacking neighborhood affluence, there may be an epidemic of social problems as suggested by Crane (1991). This finding also highlights the importance of the presence of affluent neighbors against the prevalence of health risk behavior of teenage childbirth.

Interaction effect (by race). Model 4 in Table 4.2 tests the interaction effect between neighborhood affluence and race. The main effect of neighborhood affluence remains significant (b = - 3.50, SE = 1.08). The study fails to find significant interaction effect between neighborhood affluence and race (b = 1.81, SE = 3.42). The influence of neighborhood affluence on teenage childbearing does not differ by race. Since there is not any interaction effect between neighborhood affluence and race and neighborhood affluent is linearly related to female children's probability of childbearing, I do not test whether race moderates the nonlinear impact of neighborhood affluence.

Interaction effect (by family poverty). Model 5 in Table 4.2 presents results of exploring the interaction between neighborhood affluence and family poverty exposure. There is not any support for interaction effect (b = -2.64, SE = 3.84). The main effect of neighborhood affluence remains significant (b = -3.04, SE = 1.12). Therefore, the impact of neighborhood affluence is not contingent on family poverty conditions.

Model comparison. Comparing across all models in Table 4.2 reveals that neighborhood affluence has a strong protective effect against teenage childbearing. Model 1 is nested within model 2 and model 2 is nested within model 3, model 4, and model 5 respectively. By comparing the model fit between nested models, I can select the best model that fits the data.

The protective effect of neighborhood affluence persists after adjusting for individual and family characteristics (model 2). Adding the individual and family characteristics significantly improves the model fit as indicated by the increase in loglikelihood associated with model 2. Though the curvilinear term of neighborhood affluence effect is not statistically significant in model 3, adding the term improve the model fit as suggested by the increase in loglikelihood from -7028.78 in model 2 to -7015.37 in model 3. The positive sign for the curvilinear term suggests a convex relationship between neighborhood affluence and teenage childbearing.

Model 4 and model 5 examine the interaction effects between neighborhood affluence and race and family poverty experience respectively. Compared with model 2, adding the interaction term between neighborhood affluence and race in model 4 and the interaction term between neighborhood affluence and family poverty experience does significantly improve model fit but not as much as the model with the curvilinear term (model 3). Indicated by model 4, the protective effect of the neighborhood affluence against teenage childbearing is more pronounced for whites than blacks (b = 1.81, SE = 3.42), though the parameter estimate is not statistically significant.

In sum, childhood experience of neighborhood affluence has a preventive effect against undesirable outcome of bearing a child as a teen for female children. Increases in neighborhood

affluence decrease the chance of teenage childbirth. The regression results fail to support the nonlinear, and interaction effect of neighborhood affluence with both race and family poverty exposure. However, when the curvilinear term of neighborhood affluence is added to the model, it improves the model fit.

Experience of neighborhood ICE during childhood

Table 4.3 shows regression estimates of the impact of neighborhood ICE on female children's risk of teenage childbirth. Consistent with the prior tables, model 1 in Table 4.3 does not control for individual and family characteristics while other models do.

Table 4.3: Logistic regression of neighborhood ICE and teenage childbearing (unweighted N = 1,045)

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Neighborhood economic context						
Average neighborhood poverty from birth to 14	---	---	---	---	---	2.39
						(1.59)
Average neighborhood affluence from birth to 14	---	---	---	---	---	-2.00
						(1.32)
Average ICE from birth to 14	-3.13***	-2.17***	-2.16***	-2.43***	-2.17***	---
	(0.56)	(0.58)	(0.57)	(0.64)	(0.57)	
Average ICE squared	---	---	0.26	---	---	---
			(1.37)			
Average ICE X black	---	---	---	1.35	---	---
				(1.39)		
Average ICE X % of time family in poverty	---	---	---	---	0.00	---
					(1.77)	
Neighborhood control variable						
% of time live in minority concentrated neighborhood	0.27	-0.50	-0.51	-0.34	-0.50	-0.52
	(0.29)	(0.49)	(0.49)	(0.50)	(0.49)	(0.51)
Individual and family covariates						
Black	---	0.58	0.58	0.61	0.58	0.58
		(0.46)	(0.46)	(0.45)	(0.46)	(0.45)
Number of children in the family at birth	---	-0.02	-0.02	-0.02	-0.02	-0.02
		(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
% of time family in poverty from birth to 14	---	1.30***	1.29***	1.30***	1.30***	1.29***
		(0.58)	(0.58)	(0.58)	(0.59)	(0.58)

% of time family head unemployed from birth to 14	---	0.28	0.29	0.25	0.28	0.28
		(0.64)	(0.65)	(0.65)	(0.65)	(0.65)
% of time female headed household from birth to 14	---	-0.13	-0.13	-0.07	-0.13	-0.13
		(0.42)	(0.42)	(0.43)	(0.42)	(0.42)
Head education level at child birth --- less than high school	---	0.55***	0.55***	0.54***	0.55***	0.55***
		(0.25)	(0.25)	(0.25)	(0.25)	(0.25)
Number of times family moves neighborhood from birth to 14	---	-0.00	-0.00	-0.01	-0.00	-0.00
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Intercept	-1.38***	-1.59***	-1.60***	-1.57***	-1.59***	-1.59***
degree of freedom	1029	1022	1021	1021	1021	1021
loglikelihood	-7252.48	-7003.08	-7002.69	-6989.91	-7003.08	-7002.87
Chi squared	13166.19	13033.97	13030.25	13026.27	13034.00	13032.54

***$p < .05$;

Figures in parentheses are SEs.

Linear relationship. The upper bound of neighborhood ICE is -3.13 (*SE* = 0.56), as indicated in model 1. Model 2 in Table 4.3 demonstrates a significant linear effect of neighborhood ICE on children's teenage childbearing risk (*b* = -2.17, *SE* = 0.58) after taking into account individual and family characteristics. The negative coefficient of neighborhood ICE reflects the protective effects of neighborhood ICE on teenage childbirth. The higher the neighborhood ICE (more affluent but fewer poor neighbors), the lower the probability of teenage childbearing for adolescent girls.

Nonlinear relationship. Model 3 in Table 4.3 shows the test results of whether neighborhood ICE is nonlinearly or curvilinearly related to the risk of teenage childbirth. There is not any support for such an effect (*b* = 0.26, *SE* = 1.37). The functional form of neighborhood ICE impact on teenage childbirth is linear.

Interaction effect (by race). Model 4 in Table 4.3 explores whether effect of neighborhood ICE is moderated by race. The regression estimates fail to provide any notable evidence of such an interaction effect (*b* = 1.35, *SE* = 1.39). Effects of neighborhood ICE do not differ by race. There is not any support for testing whether there is an interaction effect between the curvilinear effect neighborhood ICE and race as well.

Interaction effect (by family poverty). Model 5 in Table 4.3 tests the interaction effect of neighborhood ICE and family poverty exposure. This study fails to find any support for the interaction effect between neighborhood ICE and family poverty conditions (*b* = 0, *SE* = 1.77).

Model 6 in Table 4.3 try to replicate results from prior studies of effects of neighborhood conditions (Brooks-Gunn et al. 1993, Duncan 1994) by including both the measure of

neighborhood poverty and neighborhood affluence in the model. Though neighborhood affluence has a preventive effect (b = 2.00, SE = 1.32) against the risk of teenage childbearing, and neighborhood poverty has a positive effect (b = 2.39, SE = 1.59), neither of them has a statistically significant association with the outcome when both of them are included in the regression equation.

Model comparison. Model 1 is nested within model 2 to model 5. Model 2 is nested within model 3 to model 5. By comparing the loglikelihood of the nested models using loglikelihood ratio test, we can select the model that best fits the data.

When individual and family characteristics are taken into account in model 2, there is a large improvement in model fit. The loglikelihood increases from -7252.48 to -7003.08 at the cost of losing 7 degrees of freedom. However, adding the squared term of neighborhood ICE (model 3) does not improve model fit. The loglikelihood for model 3, compared with model 2, only improves by 1 point. Nevertheless, taking into account of the interaction effect between neighborhood ICE and race (model 4) improves model fit by a significant amount (LR = 2(-6989.91+ 7003.08), df = 1). Though the study fails to demonstrate significant interaction effect between neighborhood ICE and race, it is still worth considering the racial differences in ICE impact. The positive sign for the interaction term suggests that benefits of neighborhood ICE for blacks is less strong than that for whites (-2.43+1.35=-1.08) But for white teenage girls, increase in neighborhood ICE reduces their chance of teenage childbearing (b=-2.43).

Considering the interaction effect between neighborhood ICE and family poverty experience does not improve model fit. The loglikelihood does not change from model 2 to

model 5 while there is a 1 degree of freedom difference. Therefore, the model suggests that family poverty experience does not moderate the effect of neighborhood ICE. They both independently influence teenage girls' probability of childbearing behavior.

Model 6 is a more complex model compared with model 2 as it considers the effects of neighborhood affluence and poverty separately. The model does not improve the model fit compared with model 2.

In sum, neighborhood ICE during childhood has a significant preventive effect against teenage childbirth for female adolescents. The relationship is linear rather than nonlinear. Though the study fails to demonstrate significant interaction effect between neighborhood ICE and race, the model (model 4) where the interaction term is included improves that model fit suggesting that the protective effect of neighborhood ICE is more pronounced for white rather than for black teenage girls. There is not any support for the interaction effect between neighborhood ICE and family poverty experience. Finally, as reflected in the standard error estimates (Table 4.3), models that use neighborhood ICE measure yield more efficient results than the model that includes both the measure of neighborhood poverty and affluence. Standard errors for neighborhood poverty and affluence in Model 6 (Table 4.3) are much larger than the standard error estimates of ICE in other models.

Analyzing the associations between neighborhood economic conditions and female children's risk of becoming teenage mother shows that neighborhood poverty during childhood is positively related to the probability of teenage childbirth while neighborhood affluence and ICE is negatively related to teenage childbearing behavior. However, the study fails to reveal any

significant nonlinear effects of neighborhood conditions. Neighborhood poverty, affluence, and ICE do not interact with race or family poverty exposure to influence female girls' risk of teenage childbirth.

Effects of family characteristics

Similar to the results reported in the last chapter, family poverty experience and the educational status of family head also play an important role in predicting teenage girls' risk of childbearing. The longer the child lives in a poor family, the more likely she becomes a teenage mother. Girls growing up in families where the family heads do not have a GED or high school diploma, they are more likely to give birth as teenagers than their counterparts whose parents have graduated from high school.

These findings suggest that family poverty experience and educational status of family head are also important predictors for children's behavioral outcomes. Suggested by the literature, family socioeconomic disadvantage, especially family poverty is positively associated with teenage childbearing outcome (An, Haveman, and Wolfe 1993). Growing up in families lacking economic resources and social connections to workplace, children may lack the aspiration to work and devalue the opportunities in the labor force. Young women are likely to seek opportunities other than work to adulthood such as having children early and becoming parents. Moreover, as suggested by the literature, parental educational status is also associated with early teenage childbearing (Woodward, Fergusson, and Horwood 2001). As stated earlier, parents who are high school dropouts are may not have high expectation for their children in regards to educational attainment. They may not monitor their children's educational or

behavioral development closely. Therefore, children are more likely to develop deviant behaviors such as teenage childbearing, without close monitoring from parents.

For teenage childbirth outcome, this dissertation fails to provide any evidence of interaction effect of family and neighborhood economic conditions.

Unlike the finding of significant effect of residential mobility on children's educational attainment, residential movement is not significantly associated with teenage childbearing. This maybe because moving across neighborhoods breaks up the social networks that children have had and reduce their risk of getting pregnant.

Other individual and family level covariates such as gender, family structure and composition, and head employment status are associated with teenage girls' likelihood of becoming teenage mothers. Moreover, there is not any regional effect. Children growing up in the north east, north central, or south do not differ in terms of their outcomes with those children growing up in the west. There is not cohort effect when teenage childbirth is considered.

Effect of neighborhood minority concentration

Although neighborhood minority concentration has an effect on white children's educational achievement, it is not significantly associated with teenage childbirth.

Racial differences

Unlike findings of racial differences in response to neighborhood, family, and individual level characteristics when school leaving outcome is considered, this study fails to provide support for racial differences in teenage childbearing outcome.

Longitudinal vs. point-in-time measure of neighborhood economic conditions

As reported in the last chapter, I examine whether using longitudinal measure of neighborhood economic situations outperform the point-in-time measure of neighborhood socioeconomic environment for teenage childbirth outcome. Regression results using aggregated measures of neighborhood poverty, affluence, and ICE (from birth to 14 years of age) are compared with statistical estimates of neighborhood poverty, affluence, and ICE when children are age 14. The results are presented in Table 4.4.

Table 4.4: Logistic regression results compare point-in-time vs. longitudinal measures of neighborhood effect teenage childbirth sample (unweighted N = 828)

Neighborhood economic context	Average neighborhood poverty	Neighborhood poverty at age 14	Average neighborhood affluence	Neighborhood affluence at age 14	Average neighborhood ICE	Neighborhood ICE at age 14
	3.79***	1.32	-3.18***	-2.49***	-2.06***	-1.27***
	(1.31)	(1.20)	(1.23)	(0.83)	(0.67)	(0.50)
Neighborhood control variable						
% of time live in minority concentrated neighborhood	-0.80	-0.41	-0.43	-0.34	-0.67	-0.46
	(0.55)	(0.59)	(0.57)	(0.57)	(0.55)	().57)
Individual and family covariates						
Black	1.00	1.02	0.99	0.95	0.99	0.98
	(0.51)	(0.54)	(0.55)	(0.55)	(0.53)	(0.54)
Number of children in the Family at birth	-0.01	-0.01	-0.02	-0.03	-0.02	-0.02
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
% of time family in poverty from birth to 14	1.79***	1.99***	1.99***	2.02***	1.85***	1.92***
	(0.67)	(0.67)	(0.66)	(0.66)	(0.67)	(0.66)
% of time family head unemployed from birth to 14	-0.02	0.05	-0.05	-0.07	-0.06	-0.01
	(0.76)	(0.77)	(0.77)	(0.77)	(0.76)	(0.77)
% of time female headed household from birth to 14	-0.38	-0.45	-0.39	-0.38	-0.37	-0.40
	(0.48)	(0.50)	(0.49)	(0.50)	(0.49)	(0.49)

Head education level at child birth --- less than high school	-0.39	0.51	0.39	0.41	0.36	0.42
	(0.28)	(0.29)	(0.28)	(0.29)	(0.29)	(0.29)
Number of times family moves neighborhood from birth to 14	-0.02	-0.02	-0.02	-0.03	-0.02	-0.02
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Intercept	-2.49***	-2.09***	-1.13	-1.19***	-1.70***	-1.67***
loglikelihood	-5579.54	-5660.66	-5570.97	-5568.50	-5554.79	-5605.78
Chi squared	10337.25	10285.11	10263.74	10076.59	10280.74	10176.27

***$p < .05$;

Figures in parentheses are SEs.

Table 4.4 shows that similar regression results are found for regressions using point-in-time measures and the aggregated measures. The only disagreement between statistical estimates is when neighborhood poverty is examined to predict teenage childbirth. Exposure to neighborhood poverty over time has a significance and positive relationship with the onset of teenage childbirth. However, the point-in-time measure of neighborhood poverty at age 14 fails to produce significant result. Similar to what has been reported in the last chapter, the regression coefficients for the aggregated measures of neighborhood conditions are larger than that from using the point-in-time measure of neighborhood condition at age 14. This finding provides evidence that studies using longitudinal measures of neighborhood socioeconomic conditions yield stronger neighborhood effects than what has been reported in cross-sectional studies.

Chapter 5 Discussion

This study aims to examine the unsettled question of whether and how neighborhood economic conditions are associated with children's outcomes of dropping out of high school before completion and becoming teenage mother. Using longitudinal data from the Panel Study of Income Dynamics (PSID), the Geocode Match File, and Neighborhood Change Database (NCDB), I explore whether each neighborhood economic dimension (poverty, affluence, and index of concentration at the extremes) measured over childhood is associated with the two undesirable developmental outcomes. Furthermore, I examine whether the association between neighborhood economic situations and children's outcomes are nonlinear or curvilinear, as suggested in the prior literature. Then I explore how neighborhood experiences interact with race and family economic condition, family poverty experience in particular to affect children's educational attainment and teenage child birth. Finally, I test whether longitudinal view of neighborhood conditions over time better captures neighborhood effects than the conventional point-in-time analysis (Jackson and Mare 2007).

The main contributions of this dissertation are twofold. First, the measure of neighborhood ICE succinctly and efficiently captures neighborhood economic conditions. Rather than focusing on either neighborhood poverty or affluence, the measure reflects the differential distribution between the two extreme dimensions in residential place, both of which has been suggested in prior studies (Crane 1991; Brooks-Gunn, Duncan et al. 1993; Duncan 1994; Duncan, Brooks-Gunn et al. 1994; South and Crowder 1999; Crowder and South 2011) to affect children's dropping out of high school and teenage childbearing. Using the measure of ICE, the

study demonstrates the importance of economic conditions in residential place in shaping children's development above and beyond the family and individual characteristics. Second, rather than measuring neighborhood economic conditions at a particular point-in-time, this study uses aggregated measures of neighborhood economic situations by averaging neighborhood poverty, affluence, and ICE over the entire period from birth to fourteen years of age. Moreover, family characteristics such as family poverty status, unemployment status of family head, family structure, and residential mobility are also examined over time by taking into account duration of exposure to these family situations in childhood. The mean values of neighborhood economic situations and family characteristics provide robust estimates of neighborhood situation and family conditions during childhood.

Results from my dissertation support some of the findings in the existing literature on neighborhood effects (Crane 1991; Brooks-Gunn, Duncan et al. 1993; Duncan 1994; Duncan, Brooks-Gunn et al. 1994). They also depart from some of the literature linking neighborhood economic conditions to children's educational attainment and risky health behavior of teenage child birth (Crane 1991). I elaborate the findings below.

Linkage between neighborhood economic conditions and children's development

Using logistic regressions, with the inclusion of diverse controls for individual and family characteristics, and the duration of exposure to neighborhood minority concentration, the study finds neighborhood poverty, affluence, and ICE are significantly associated with both of children's risks of dropping out of high school before graduation and becoming teen mothers. Neighborhood affluence and ICE have a significant linear impact on children's probability of

dropping out of high school before graduation and teenage childbearing. Neighborhood poverty has a curvilinear impact on children's probability of dropping out of high school. However, neighborhood poverty has a linear impact on teenage childbirth.

The finding of strong protective effects of neighborhood affluence and ICE against dropping out of school and teenage childbearing is consistent with the expectation of preventive impact of neighborhood affluence on children's outcomes. As theories on social isolation suggest, the presence of affluent neighbors (reflected in the measure of neighborhood affluence) and the concentration of affluence (reflected in the measure of ICE) in the residential place are associated with desirable developmental outcomes to the residents. The institutional model proposes that because many of the community facilities, such as libraries, schools, and playgrounds, are locally financed, a higher proportion of affluent neighbors is associated with an increase in the availability of these institutional resources which facilitate children's educational attainment (Mayer 2002). Moreover, affluent neighbors serve as role models for children in the neighborhoods. Children frequently exposed to affluent neighbors are more likely to be socialized into the mainstream culture which emphasizes that success could only be gained through hard work and education which are important for life chances and future social standing. Such neighborhood experience gives children more incentive to stay in school and avoid pregnancy (Crane 1991). Furthermore, affluent neighbors may be able to supervise against deviant behaviors such as violence and crime and teenage childbearing (Sampson 2012).

Neighborhood poverty, on the other hand, is positively associated with school-leaving behavior and female children's risk of childbearing as a teen. This finding is in accordance with

social isolation theory elaborated above, suggesting in poor neighborhoods where institutional resources are lacking, children may quit school early. Moreover, the finding of positive relationship between neighborhood poverty and the risk of teenage childbirth support what has been proposed by the social disorganization theory and collective efficacy theory. These theories suggest that in poverty-stricken neighborhoods, where there is a lack of social cohesion, it is difficult to maintain social order essential for preventing onset of deviant behaviors (Sampson 2012).

The functional form of the linkage between neighborhood economic conditions and children's outcomes

This study finds curvilinear effect of neighborhood poverty on children's risk of dropping out of high school. The curvilinear effect of neighborhood poverty differs by race. However, the study fails to find significant curvilinear or nonlinear effects of neighborhood affluence or ICE on either of children's outcome. Neighborhood poverty is also linearly related to the risk of teenage childbearing. Findings from the study depart from the important findings by Crane (1991) of a sharp increase in the probability of dropping out of high school when neighborhood economic condition drops to the worst situation (proportion of neighbors with managerial or professional occupation is less than 5 percentile). However, when the outcome of teenage childbirth is considered, the study provides evidence of a sharp increase in the probability of becoming teenage mothers for children living in areas with few affluent neighbors.

First, this study provides mixed evidence for significant nonlinear impact of neighborhood affluence, a measure that Crane (1991) used in his analysis. The relationships

between neighborhood affluence and children's outcomes appear to be linear. Second, departing from findings by Carpiano et al. (2009), there is no evidence of curvilinear impact of neighborhood ICE on children's outcomes. The nonlinear relationship suggested by model 3 in Table 3.5 between neighborhood ICE and children's dropout probability seems to be an artifact of effect modification by race. As shown in the results section, the nonlinear effects of neighborhood poverty and ICE on children's school leaving behavior become nonsignificant when the interaction effects of neighborhood economic conditions and race is taken into account. These findings suggest that nonlinearity in the effects of neighborhood ICE may be attributed to the racial difference in the exposure to neighborhood ICE during childhood. Once the interaction effect of race is accounted for, neighborhood ICE is linearly related to children's educational attainment. The racial differences in neighborhood effects are discussed below.

In sum, only neighborhood poverty is curvilinearly associated with the probability of school leaving. Such a curvilinear effect differs by race. As figure 3.2 suggests, whites and blacks have different response to neighborhood poverty. Compared with blacks, whites have a higher probability of school leaving than that of blacks. White children's likelihood of dropping out of high school early follows a concave trend – with the increase in neighborhood poverty, their chance of quitting school early increases to a point where it diminishes. For blacks, their chance of dropping out of high school follows a convex trend. When neighborhood poverty is relatively low (less than 30%), their likelihood of quitting school decreases a little. When neighborhood poverty concentration increases, the probability of leaving school early gradually increases. Neighborhood affluence and ICE are linearly related to both outcomes and neighborhood poverty is linearly associated with the probability of teenage childbearing. This

study fails to replicate curvilinear impact of neighborhood ICE as suggested by Carpiano et al. (2009) and fails to support Crane's finding of sharp increase in the probability of dropping out of high school when the proportion of affluent neighbors was under 5 percent. However, the results support Crane's finding of sharp increase in the probability of teenage childbirth when the prevalence affluent neighbors was under 5 percent. Logistic regression analysis is applied to compare the probability of dropping out of high school and teenage childbirth for children living in neighborhoods with few affluent neighbors verses those living in areas with more exposure to neighborhood affluence. Since this study use sampling weights, I cannot use a piece-wise linear logit regression as Crane did, and future studies should probe the threshold effects more closely using Crane's methods.

Do effects of neighborhood economic conditions differ by race?

Racial differences in neighborhood effects have been extensively discussed in the current literature (Brooks-Gunn, Duncan et al. 1993; Duncan 1994). There are inconsistent findings about for whom neighborhood economic conditions matter. Some studies find neighborhood effects matter more for whites than for blacks (Clark 1992; Brooks-Gunn, Duncan et al. 1993; Sampson, Morenoff et al. 1999) while others find that neighborhood environment is important for blacks but not whites (Fagan, Wright et al. 2013). Still others find neighborhood conditions matter for both racial groups (Wodtke, Harding et al. 2011).

In the current study, the estimated interaction effects between all three measures of neighborhood economic situation (poverty, affluence, and ICE) and race are statistically significant in predicting dropping out of high school. The findings reveal the differential impact

of neighborhood conditions across the racial line. When the relationships are depicted in Figure 3.3 and Figure 3.4, we can see that when individual demographic information, family characteristics, and neighborhood minority concentration are accounted for, blacks may have a lower chance of quitting school than whites. These estimated probabilities in the graphs are based on the assumption that black children could have similar experiences of family socioeconomic conditions (such as head unemployment experience, similar length of exposure to female headed families) as white children. Were the black children having similar family endowment and residing in neighborhoods with similar proportion of minorities as white children, they may perform better than whites. However, as indicated by the descriptive statistics in chapter two, blacks have a vast different family and neighborhood experiences than that of whites.

Further investigations are needed to explore racial difference in neighborhood impact. Future work should examine the racial differences by analyzing neighborhood effects separately for blacks and whites. Logistic regression results in the current study show that the educational attainment of white children is more strongly associated with neighborhood affluence and ICE than is that of black children. With an increase in neighborhood affluence and ICE, white children have a lower likelihood of quitting school early than blacks. The findings are consistent with what has been reported from the study by Brooks-Gunn and colleagues (1993). However, neighborhood effects do not differ by race when the outcome of teenage childbirth is considered. When neighborhood economic impact is considered for blacks and whites separately, the study fails to find significant associations between neighborhood poverty, affluence, and ICE and the probability of becoming a teenaged mother. This finding is inconsistent from the results reported

by Brooks-Gunn and colleagues (1993) who found that neighborhood effects matter more for white children than for blacks in terms of teenage births as well.

The question remains of why neighborhood affluence and concentration of affluence fail to play a significant protective role against black children's chance of dropping out of high school after controlling for family and individual characteristics. This question can only be addressed upon consideration of the profound socioeconomic difference in neighborhoods occupied by black and white children. Compared with whites, blacks are more likely to live in neighborhood with high concentration of poverty (where ICE is low). The distributions of ICE and affluence are more clustered around the lower end than are the distributions for whites. Fewer blacks than whites grew up in areas with high proportion of affluent neighbors and where ICE is over 0 (indicating more affluent neighbors than the poor). Since the blacks are less likely to be exposed to affluent neighbors, the effects of neighborhood affluence may not be assessed for them due to restriction in range of exposure. With sparse data on school-leaving when neighborhood affluence is high, logistic regression may not be able to yield positive effects of neighborhood affluence for blacks. Since black children and white children reside in neighborhoods of vast different socioeconomic conditions, it may be problematic to compare the neighborhood effects for them in one sample. There are two ways that future research can take to address the problem. One is to use better data such as selecting more black children from affluent neighborhoods to see if they are have significant higher educational attainment and lower chance of teenage childbearing than their counterparts growing up in non-affluent neighborhoods. The other is to conducting neighborhood research for white children and black children separately.

Do effects of neighborhood economic conditions differ by family economic conditions?

The current study tries to bridge the gap in the neighborhood effects literature by considering the interaction effects between family poverty experiences and neighborhood economic situations during childhood. The interaction effects are meaningful as suggested by the relative deprivation theory and the competition theory. From a psychological perspective, the relative deprivation theory proposes that poor children maybe better off living in poor neighborhoods than in affluent neighborhoods. Poor children live in affluent neighborhood tend to adopt deviant behaviors such as dropping out of high school or becoming teenage mothers when they see that they do not have the resources and opportunities that their counterpart affluent children are entitled to in the affluent neighborhoods. Similarly, competition theory argues that children from poor families compete with their counterparts from affluent families for the limited resources in the neighborhood. Poor children who move from poor neighborhoods to affluent neighborhoods may find it hard to outperform affluent children academically and rank lower in their class. The inferior ranking may have negative impact on their future educational and employment opportunities.

On the contrary, as socialization model suggests, if a family is poor with few available resources, children may benefit from living in an affluent neighborhood as they can utilize resources from institutional facilities in the local community such as borrowing books, toys, and videos from the public library. Moreover, living in affluent neighborhoods with quality social infrastructure such as schools and health care facilities, poor children may benefit from the better educational and health facilities. They might perform better than living in poor neighborhoods.

Therefore, questions remain about whether poor children benefit from affluent neighborhood and to whom affluent neighborhood has a beneficial impact.

Logistic regression results from the current work however, do not provide much evidence of the interaction effects between neighborhood economic conditions and family poverty experience. Much of the cross-level interaction impact on high school dropout probability is muted once the interaction of neighborhood condition and race is accounted for. This finding suggests that the cross-level interaction effects of economic conditions are channeled through the racial differences in family and neighborhood economic conditions.

Longitudinal vs. point-in-time measure of neighborhood conditions

Table 3.10 and 3.11suggest that taking into account neighborhood economic conditions over time better capture the impact of neighborhood conditions than point-in-time measure. Coefficient estimates for longitudinal measures of neighborhood impact are larger than the coefficients for point-in- time measures. Using longitudinal measure of neighborhood poverty, a significant effect is found for teenage childbearing. Such an effect is not found using the cross-sectional measure. The standard errors are comparable between longitudinal and cross-sectional measures.

Contrary to Jackson and Mare's (2007) argument of point-in-time measure may yield similar results as that from longitudinal measures, this study finds stronger neighborhood influence when neighborhood conditions are measured over time. This finding is consistent with Winship and Morgan (1999)'s finding of larger impact of neighborhood conditions if they are measured over time.

Strength of the dissertation study

This research uses data from the PSID which provides longitudinal information on family and neighborhood environment in which a national representative sample of children live. The analysis focuses on a fairly large sample of children (3,077 children for high school dropout outcome and 1,045 female children for teen childbirth outcome) who are followed over a long time – from birth to 14 years of age. Neighborhood and family measures that account for childhood history provide robust estimates of the effects of neighborhood economic situations and family socioeconomic conditions which are subject to change over time. Moreover, the longitudinal measures allow researchers to distinguish the effects of sustained exposure to neighborhood advantage or disadvantage from the short-term exposure to neighborhood poverty or affluence. In sum, the population based study sample and the longitudinal information on neighborhood and family social environment help to overcome some of the important limitations in the current literature on neighborhood effects studies. These limitations includes unstable estimates of neighborhood effects due to small sample of children, focusing on a particular developmental stage of children, and attending to children growing up in a particular metropolitan area such as New York City or Chicago.

Another important strength of this research is the utilization of ICE which allows for a precise estimation of the competing effects of neighborhood affluence and poverty. The ICE efficiently captures neighborhood economic conditions by accounting for both neighborhood affluence and poverty. Using this measure avoids the collinearity problem in regression analysis when neighborhood affluence and poverty are highly correlated. Regression analysis using ICE

measure demonstrates a strong impact of neighborhood economic conditions on children's educational and behavioral outcomes.

Finally, robust standard error methods have been employed in all logistic regressions to adjust for non-independent sample in this longitudinal complex sample survey. The regression results are more stringent estimates of neighborhood effects than those reported from the classic standard error regressions.

Limitations

This study presents an alternative measure of neighborhood economic conditions, ICE, which captures neighborhood economic situation by taking into account both poverty and affluence in one measure. Moreover, measuring neighborhood conditions over the entire childhood yield stronger neighborhood effects than those reported from studies using point-in-time measures. Despite the analytic strengths, several limitations should be noted.

Omitted variable bias refers to variables that are not included in the study but are related to the outcome. This problem results in over- or under-estimates of study results. For example, study has shown that child's educational expectation is related to educational attainment which is not measured by the PSID. However, studies have also shown that child's educational aspiration is highly related to parental educational attainment (Sewell and Shah 1968). By including the variable of parental educational attainment in the model, this study partially takes care of the direct effect of children's educational aspiration. Moreover, this study also controls for other variables that influence child educational aspiration such as race, family income, and neighborhood economic conditions. Effects of schools are also important for child's educational

attainment. The quality of teachers, school, and students influences the educational achievement through peer influence, educational resources, and aspiration. However, studies have shown that school quality is highly related to neighborhood economic conditions. Wealthy neighborhoods have the best quality schools (Holme 2009). Therefore, by controlling for neighborhood economic conditions, this study indirectly controls for school effects.

Measurement error: There is not any consensus on how to define a neighborhood and how to set neighborhood boundaries. In this dissertation, I follow previous neighborhood research by defining neighborhoods using census tracts. By doing so, the study results can be compared with the effects reported in prior studies. Though census tract may not be the perfect measure of neighborhood unit, it allows researchers to examine the influence of socioeconomic context in the residential area beyond the impact of families. According to the US Census Bureau (2010), census tracts consist of economically homogenous population of around 4,000. Since information on social demographic characteristics of the residing areas is only available from decennial censuses, studies on neighborhood effects have to rely on census tract units for neighborhood information. As census tract covers a fairly large geographic area in which the focus family resides, regression estimates based on census tract units may result in a conservative estimate of neighborhood effects.

Clustering effect: Clustering of sample in neighborhoods needs to be considered in neighborhood studies. The clustering of samples in neighborhood violates the independent assumption for linear regression. Therefore, statistical methods such as multilevel modeling or general linear models are used to arrive at the unbiased statistical estimate. However, according

to previous studies, the level of clustering of individual PSID respondents within neighborhoods (defined by census tract) is very low (see Duncan, Connell et al. 1997; Crowder and Teachman 2004). The low level of clustering reduces the potential bias in the estimated standard errors. Moreover, logistic regressions used in this analysis use robust standard error which takes into account the clustering in survey samples.

Selection bias. Studies using observational data are often criticized for selection bias. This is because children who grow up in poor and poverty concentrated neighborhoods are more likely to be from poor families than children residing in non-poor neighborhoods (Duncan, Brooks-Gunn et al. 1994; O'Hare and Mather 2003; Leventhal and Brooks-Gunn 2004). Moreover, other individual and family level characteristics of parents may also affect neighborhood choice and at the same time influence children's educational and behavioral outcomes as well. Parental expectation for the child, parents' educational level, parents' labor force participation, and family structure all influence the decision of residential place. And these factors influence children's likelihood of dropping out of high school early and becoming teen mothers. Parents who have high expectation for children's educational attainment and who themselves are high school graduates may choose to live in neighborhoods with better schools and better teachers. Divorced parents may have to move to a poor neighborhood where the rental and housing prices are low as they cannot afford expensive housing. At the same time, all these family characteristics may also have direct or indirect impacts on children's development. For instance, parents' expectation for children has a positive impact on educational attainment and keeps children in school. In addition, changes in family structure, such as divorce, may have a negative influence children's desire to stay in school and concentrate on their study.

Disentangling the effects of family socioeconomic conditions and neighborhood economic conditions is difficult. Moreover, as the selection process through which families choose the residing neighborhoods is sometimes unobserved, researchers cannot control for factors leading to residence in neighborhoods with varying economic conditions. Therefore, current neighborhood effects research has been criticized for selection bias. Statistical methods such as propensity score matching, inverse probability matching, marginal effects models have been utilized to address the problem so as to make causal inference of neighborhood effects using observational data. These methods are based on the assumption of controlling for all important covariates. Therefore, they incorporate in their model a large number of family and neighborhood measures. However, these methods are also vulnerable to criticisms of overlooking important covariates. In this study, I try to examine the associations between neighborhood economic characteristics and children's outcomes without making any causal claims. To achieve this goal, I account for important individual, family characteristics, and neighborhood minority concentration. These variables are potential confounders for neighborhood selection and children's outcomes. By controlling them, the reported regression coefficients in this study reflect the link between neighborhood economic situations to children's outcomes. The study provides estimates of how different dimensions of neighborhood economic conditions are associated with children's educational attainment and teenage childbearing outcome. It informs neighborhood effects research on the directions of the linkages. However, it does not provide causal estimates of neighborhood economic impact. Future research need to consider the selection processes in order to make causal claims of neighborhood poverty,

affluence, and ICE influence on children's probability of dropping out of high school early and becoming teenage mothers.

Policy implication

First, although neighborhood factors have been cited as important, family characteristics also matter for children's development. Family economic conditions, parents' educational attainment, and residential mobility are important factors shaping children's educational attainment and teenage childbearing. Family poverty and whether family head has dropped out of high school are significantly associated with both outcomes. The longer the child lives in a poor family, the more likely he/she will leave high school early and the more likely she will become a teen mother. Moreover, if family head has dropped out of high school before graduation, the child also have a higher risk of dropping school and bearing a child as a teen than those children whose family head has graduated from high schools. These effects are consistent with different model specifications. Residential mobility is associated with school-leaving but teenage childbearing. The more times family moves during childhood, the more likely children drop out of high school. Therefore, if social policies are designed to improve neighborhood conditions, efforts to influence family conditions should not be neglected (Brooks-Gunn, Duncan et al. 1993).

Second, much of the social policy efforts have been devoted to improve individual socioeconomic outcomes by decreasing socioeconomic segregation assuming that moving the poor to non-poor areas would bring about improvement in individual social outcomes. As Duncan and Zuberi (2006) pointed out in his review of the MTO study, lowering neighborhood

poverty but not increasing the exposure to neighborhood affluence does not bring about improvement in children's educational achievement nor lower their risk of onset of deviant behaviors. The MTO study did not pay attention to the importance of neighborhood affluence on children's development. The presence of affluent neighbors was not required for the receiving neighborhoods. Therefore, most of the neighborhoods that MTO children moved to were non-poor but without increased exposure to affluent neighbors. This study and prior research have highlighted that neighborhood affluence is more important than the absence of neighborhood poverty in shaping children's early life socialization. Exposure to neighborhood poverty does have a negative impact on children's educational and behavioral outcomes. However, exposure to neighborhood affluence has a protective effect against dropping out of high school early and becoming teenage mothers. When both economic conditions in residential neighborhood are taken into account using ICE measure, the study has demonstrated that increases in ICE (by either increasing the proportion of the affluent in the neighborhood or decreasing the poor) improve children's desirable outcomes. Therefore, social policies should also direct their focus to bring about neighborhood affluence while focusing on eliminating neighborhood poverty.

Finally, the study demonstrates that neighborhood economic conditions impart important influence on children's educational and behavioral outcomes. One of the mechanisms through which neighborhood economic conditions operate on children's development is opportunity of exposure to neighborhood affluence. The profound difference in neighborhood effects across the racial line also reflects the problem of unequal opportunity of exposure to neighborhood advantages. Therefore, social policies should target equalizing neighborhood opportunities and resources through structural changes to promote both racial integration and economic integration.

Future research

This study attempts to examine the impact of childhood neighborhood economic condition on children's developmental outcomes. Based on the findings from this study, future research could evolve based on the following unanswered questions on neighborhood effects.

Racial difference in neighborhood effects. Findings from the analyses reveal racial gaps in regards to neighborhood economic impact. As prior studies have suggested, blacks and whites do not share similar response to their neighborhood economic environment. White children are more responsive to exposure to neighborhood economic disadvantage than blacks. The question remains about why neighborhood economic situations have a differential impact across the racial line. To address this question, researchers need to conduct further investigations to explore how culture, racial discrimination in residential place, and structural constraints may interact with race to affect blacks' and whites' exposure to neighborhood opportunities, resources, and disadvantages.

Conceptualizing neighborhood effect over space. This study draws up the conventional definition of neighborhood by using census tract. There is an ongoing debate about whether census tract is a good approximation of a neighborhood. Using census tract, researchers assume that neighborhoods, defined by census tract boundaries, are independent unit of analysis. Neighborhood effects are constrained by neighborhood boundaries where there is not any interaction between neighborhoods. This assumption implies that the socioeconomic conditions of one neighborhood are not related to those in the adjacent neighborhoods. Moreover, neighborhood effects are uniformly distributed within the census tract.

These assumptions are subject to challenges. First, neighborhoods are not isolated from each other. They share boundaries and are interconnected in areal space. Moreover, neighborhood effects are not bounded by the census tract boundaries. On the contrary, socioeconomic conditions in a neighborhood can influence the social conditions in the adjacent areas. Sampson and colleagues (Morenoff and Sampson 1997; Sampson, Morenoff et al. 1999; Morenoff, Sampson et al. 2001) have conducted several important studies investigating whether onset of violence and crime in the primary neighborhood affects the onset of crime and violence in the adjacent neighborhood. Using spatial lag model, they have demonstrated that social diffusion process operates in neighborhood setting. The onset of homicide in one neighborhood has important impact on the onset of crime in the adjacent neighborhoods (Morenoff, Sampson et al. 2001).

Therefore, how to conceptualize the interactive relationships across neighborhoods and how to model the interactive processes are important questions to be addressed in future studies on neighborhood effects.

Conceptualizing neighborhood effects over time. Though this study examines the neighborhood economic conditions over time by aggregating such information over the entire childhood from birth to 14 years of age, this measure only captures the level/duration of neighborhood poverty, affluence, and ICE over time but fails to capture the other important dimensions of temporal dynamics in neighborhood economic environment. The temporal dynamics associated with neighborhood conditions such as the effects of timing and sequencing of exposure to various kinds of neighborhood economic circumstances are not explored.

Duration effects capture the cumulative impact of neighborhood condition. Timing effects suggest that neighborhood impact may vary depending on the developmental stage. Earlier research has suggested that neighborhood socioeconomic environment matters more for adolescents than during early childhood. However, more recently Vartanian and Buck (2005) have find that neighborhood conditions have an important influence on cognitive development even for young children. Sequencing effects propose that the trend of change in neighborhood conditions matter. Trajectory of improving neighborhood economic conditions has a different impact than a trajectory of deteriorating neighborhood situation. Exposure to ups and downs in neighborhood economic conditions may have a different impact than living in a neighborhood with stable /unchanging economic environment. This dissertation only captures the duration impact of neighborhood socioeconomic conditions on children's educational and behavioral outcomes. Therefore, in order to understand neighborhood effects, it is important to examine how timing and sequencing of exposure to neighborhood poverty, affluence and ICE over time shape individual development.

Recent research by Sharkey (2013) and Sampson (2012) have stressed the importance of time while considering neighborhood effects. They suggest that considering time in neighborhood research is fundamental for understanding enduring neighborhood socioeconomic inequality. In their works, they examine neighborhood context from an historical perspective which reveals the origin of racial and economic segregation in the American urban neighborhood and examined how structural and cultural barriers (such as economic barriers, social policy implementation, barriers in the financial and housing market, and the shared perception of urban neighborhood) that shaped the American city neighborhoods over time. Sharkey's work

demonstrated the enduring neighborhood segregation and inequality in the cities during the civil rights era. Despite the social policies that had been implemented to mitigate social inequality, there seemed to be no increased residential upward mobility for the poor to move out of poor neighborhoods. Moreover, neighborhood advantages and disadvantages have been passed on across generations, from parents to children. Sampson (2012) examined the neighborhood inequality from both structural and cultural perspective. He proposed that the enduring neighborhood inequality could be traced back through historical time. One of the missing mechanisms in the current neighborhood research was the social psychological interaction with neighborhood culture, which shaped the enduring neighborhood inequality. In his work, Sampson argued that the shared perception of disorder and neighborhood disadvantage contributed to the stable neighborhood inequality in urban areas. It was not the disorder, such as broken windows, that contributed to shared perceptions of disorder but rather the observed disorder appears to be a mechanism of durable inequality. Sampson showed that disorder is rooted in intersubjectively shared historical assessment, rather than simply in the current neighborhood conditions. The historically shared perception, definition, and judgment of neighborhood environment influence the view of neighborhoods from the current residents and outsiders. Moreover, they have a stronger predictive power than the current observed neighborhood conditions in predicting neighborhood disorder such as violence and crime.

Therefore, future research examining neighborhood effects on children's outcomes needs to pay attention not only the neighborhood socioeconomic environment during childhood, but also to the histories of the neighborhoods that children live in as well as the parental neighborhoods living conditions. Only by probing the neighborhood histories and the living

conditions of parental residential place, can we measure important neighborhood conditions are and accurately assess their impact.

Understanding selection processes. Although researchers often criticize studies on neighborhood effects for the lack of control for selection bias, researchers have suggested that instead of finding ways to control for selection bias, we need to understand selection processes in order to understand the neighborhood impact. As Sampson argued in his recent book on the enduring neighborhood socioeconomic inequality in great American cities, the selection process is not something that we can manipulate. Rather we need to understand how people and families select their residential place. Adopting Coleman's multilevel structural model which shows the cross-level (macro and micro) interactions and the within level influences, Sampson (2012) suggested that individuals chose the place where to reside and their choice was based on the socioeconomic environment of the neighborhoods and individual attributes. The selection or sorting process made by individuals was usually nonrandom. Many socioeconomic factors may such as neighborhood racial composition, location, housing market situation, affordable housing, and ease to commute to work, may affect the sorting processes. As individuals sort themselves into the varying kinds of neighborhoods, the neighborhood effects on social outcomes may be confounded. In the prior research, the sorting processes have been considered selection bias which is controlled away as statistical nuisance. However, as suggested by Sampson (2012) and Heckman (2005), the sorting processes are of substantive interest. The dynamic inter-level and intra-level interactions need to be understood in order to understand the enduring social inequality of American neighborhoods and individual outcomes. Therefore, future studies on

neighborhood effects in urban neighborhoods must model the neighborhood selection processes in order to better understand neighborhood influence.

References

Ainsworth, James W. . 2002. "Why Does It Take a Village? The Mediation of Neighborhood Effects on EducationalAchievement." *Social Forces* 81:117-152.

An, Chong-Bum , Robert Haveman, and Barbara Wolfe. 1993. "Teen out-of-wedlock births and welfare receipt: The role of childhood events and economic circumstances." *The Review of Economics and Statistics* 75:195-208.

Astone, Nan Marie and Sara S. McLanahan. 1994. "Family structure, residential mobility, and school dropout: A research note." *Demography* 31:575-584.

Astone, Nan Marie and Sara S. McLanahan. 1991. "Family structure, parental practices and high school completion." *American sociological review* 56:309-320.

Brewster, Karin L. 1994. "Race differences in sexual activity among adolescent women: the role of neighborhood characteristics." *American Sociological Review* 59:408-424.

Brody, Gene H. , Rand Conger, Frederick X. Gibbons, Xiaojia Ge, Velma McBride Murry, Meg Gerrard, and Ronald L. Simons. 2001. "The Influence of Neighborhood Disadvantage, Collective Socialization, and Parenting on African American Children's Affiliation with Deviant Peers." *Child Development* 72:1231–1246.

Brooks-Gunn, Jeanne and Greg J. Duncan. 1997. "The Effects of Poverty on Children." *The Future of Children* 7:55-71.

Brooks-Gunn, Jeanne, Greg J. Duncan, and J. Lawrance Aber. 1997. *Neighborhood poverty. Vol. 1, Context and consequences for children*. New York: Russell Sage.

Brooks-Gunn, Jeanne, Greg J. Duncan, Pamela Kato Klebanov, and Naomi Sealand. 1993. "Do Neighborhoods Influence Child and Adolescent Development?" *American Journal of Sociology* 99:353-95.

Bureau of the Census. 1970 "Low-Income Areas in Large Cities." U.S. Department of Commerce, Washington D.C.

Burgess, Earnest W. 1928. "Residential Segregation in American Cities." *Annals of the American Academy of Political and Social Science* 140:105 -115.

Burt, Martha R. . 1986. "Estimating the public costs of teenage childbearing." *Family Planning Perspectives* 18:221-226.

Carpiano, Richard M., Jennifer E. V. Lloyd, and Clyde Hertzman. 2009. "Concentrated afflunce, concentrated disadvantage, and children's readiness for school: a population -based, multi-level investigation." *Social science & medicine* 69:420-32.

Casciano, Rebecca and Douglas Massey. 2008. "Neighborhoods, employment, and wefare use: Assessing the influence of neighborhood socioeconomic compositon." *Social Science Research* 37:544-558.

Ceci, Stephen J. 1991. "How much does schooling influence general intelligence and its cognitive components? A reassessment of the evidence. ." *Developmental Psychology* 27:703-722.

Chang, Lei, David Schwartz, Kenneth A. Dodge, and Catherine McBride-Chang. 2003. "Harsh Parenting in Relation to Child Emotion Regulation and Aggression." *Journal of Family Psychology* 17:598-606.

Clark, Nina Annika , Paul A. Demers, Catherine J. Karr, Mieke Koehoorn, Cornel Lencar, Lillian Tamburic, and Michael Brauer. 2010. "Effect of Early Life Exposure to Air Pollution on Development of Childhood Asthma." *Environmental Health Perspective* 118:284-90.

Clark, Rebecca L. . 1992. "Neighborhood Effects on Dropping Out of School among Teenage Boys." Washington, DC: Urban Institute.

Coleman, James. 1994. *Foundations of social theory*. Boston, MA: Belknap Press of Harvard University Press.

Coleman, James S. 1988. "Social capital in the creation of human capital." *American Journal of Sociology* 94:S95-S120.

Coley, Rebekah Levine and P. Lindsay Chase-Lansdale. 1998. "Adolescent pregnancy and parenthood: Recent evidence and future directions." *American Psychologist* 53:152-166.

Conger, Rand D., Katherine Jewsbury Conger, and Glen H. Elder. 1997. "Family economic hardship and adolescent adjustment: Mediating and moderating processes." Pp. 288-310 in *Consequences of growing up poor*, edited by G. J. Duncan and J. Brooks-Gunn. New York: Russell Sage Foundation.

Conger, Rand D., Xiaojia Ge, Glen H. Elder, Frederick O. Lorenz, and Ronald L. Simons. 1994. "Economic stress, coercive family process, and developmental problems of adolescents." *Child development* 65:541-561.

Corcoran, Jacqueline. 1998. "Consequences of adolescent pregnancy/parenting: A revie wof the literature." *Social Work in Health Care* 27:49 -67.

Crane, Jonathan. 1991. "The epidemic theory of ghettos and neighborhood effects on dropping out and teenage childbearing." *American Journal of Sociology* 96:1226 -1259.

Crowder, Kyle and Jay Teachman. 2004. "Do Residential Conditions Explain the Relationship Between Living Arrangements and Adolescent Behavior?" *Journal of Marriage and Family* 66:721-38.

Crowder, Kyle and Liam Downey. 2010. "Interneighborhood migration, race, and environmental hazards: modeling microlevel processes of environmental inequality." *American Journal of Sociology* 115:1110-49.

Crowder, Kyle and Scott J. South. 2003. "Neighborhood distress and school dropout: the variable significance of community context." *Social Science Research* 32:659–698.

—. 2011. "Spatial and temporal dimentions of neighborhood effects on high school graduation." *Social Science Research* 40:87-106.

Cutler, David M and Edward L Glaeser. 1997. "Are Ghettos Good or Bad?" *The Quarterly Journal of Economics* 112:827-72.

DeBolt, M. Elaine, B. Kay Pasley, and Jill Kreutzer. 1990. "Factors affecting the probability of school dropout: A study of pregnant and parenting adolescent females." *Journal of adolescent Research* 5:190-205.

Dietz, Robert D. 2002. "The estimation of neighborhood effects in the social sciences: An interdisciplinary review." *Social Science Research* 31:539-575.

Duncan, Greg J. . 1994. "Families and Neighbors as Sources of Disadvantage in the Schooling Decisions of White and Black Adolescents." *American Journal of Education* 103:20-53.

Duncan, Greg J., Jeanne Brooks-Gunn, and Pamela Kato Klebanov. 1994. "Economic deprivation and early childhood development." *Child Development* 65:296-318.

Duncan, Greg J., James P. Connell, and Pamela K. Klebanov. 1997. "Conceptual and methodological issues in estimating causal effects of neighborhoods and family conditions on individual development." Pp. 219-250 in *Neighborhood poverty: Context and consequences for children*, vol. Vol. I, edited by J. Brooks‐Gunn, G. Duncan, and J. L. Aber. New York: Russell Sage Press.

Duncan, Greg J. and Anita Zuberi. 2006. "Mobility Lessons from Gautreaux and Moving to Opportunity " Pp. http://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?article=1007&context=njlsp in *Northwestern Journal of Law and Social Policy*, vol. 1.

Duncan, Otis Dudley and Beverly Duncan. 1955a. "A methodologial analysis of segregation indexes." *American Sociological Review* 20:210-17.

Duncan, Otis Dudley and Beverly Duncan. 1955b. "Residential Distribution and Occupational Stratification." *American Journal of Sociology* 60:493-503.

Ellen, Ingrid Gould and Margery Austin Turner. 1997. "Does neighborhood matter? Assessing recent evidence." *Housing Policy Debate* 8:833- 66.

Ensminger, Margaret E. , Rebecca P. Lamkin, and Nora Jacobson. 1996. "School Leaving: A Longitudinal Perspective Including Neighborhood Effects." *Child Development* Vol. 67:2400-2416

Evans, Gary W. . 2004. "The Environment of Childhood Poverty." *American Psychologist* 59:77-92.

Evans, Gary W. and Elyse Kantrowitz. 2002. "Socioeconomic status and health: The Potential Role of Environmental Risk Exposure." *Annual Review of Public Health* 23:303-331.

Fagan, Abigail A. , Emily M. Wright, and Gillian M. Pinchevsky. 2013. "Racial/Ethnic Differences in the Relationship Between Neighborhood Disadvantage and Adolescent Substance Use." *Journal of Drug Issues* 43: 69-84

Furstenberg, Frank F., Jeanne. Brooks-Gunn, and S. Philip. Morgan. 1987. *Adolescent mothers in later life*. Cambridge: Cambridge University Press.

Garner, Catherine L. and Stephen W. Raudenbush. 1991. "Neighborhood Effects on Educational Attainment: A Multilevel Analysis." *Sociology of Education* 64:251-262.

Geolytics. 2004. "Neighborhood Change Database [NCDB] Tract Data from 1970-2000." New Brunswick, NJ.

Ginther, Donna, Robert Haveman, and Barbara Wolfe. 2000. "Neighborhood attributes as determinants of children's outcomes: how robust are the relationships?" *Journal of Human Resources* 35:603-642.

Goering, John and Judith D. Feins. 2003. *Choosing a better life? Evaluating the Moving to Opportunities social experiment*, Edited by J. Goering and J. D. Feins. Washington, DC.: Urban Institute.

Griffiths, Dorothy M., Vernon L. Quinsey, and David Hingsburge. 1989. *Changing inappropriate sexual behavior: A community based approach for persons with developmental disabilities.* Baltimore: Brookes.

Guo, Guang and Kathleen Mullan Harris. 2000. "The mechanisms mediating the effects of poverty on children's intellectual development." *Demography* 37:431-447.

Halpern-Mannersa, Andrew , John Robert Warrena, and Jennie E. Brand. 2009. "Dynamic measures of primary and secondary school characteristics: Implications for school effects research." *Social Science Research* 38:397–411.

Harding, David J. 2003. "Counterfactual Models of Neighborhood Effects: The Effect of Neighborhood Poverty on Dropout and Teenage Pregnancy." *American Journal of Sociology* 109:676-719.

Heckman, James J. 2005. "The scientific model of causality." *Sociological Methodology* 35:1-97.

Higgenson, Joanna Gregson. 1998. "Competitive parenting: the culture of teen mothers." *Journal of Marriage and Family* 60:135-149.

Hill, Martha S. . 1992. *The Panel Study of Income Dynamics: A User's Guide*. Newbury Park, Calif: Sage.

Hofferth, Sandra, Frank P. Stafford, Wei-Jun J. Yeung, Greg J. Duncan, Martha S. Hill, James Lepkowski, and James N. Morgan. 2001. "Panel Study of Income Dynamics, 1968-1999: Annual Core Data " in *ICPSR version*: Ann Arbor, MI: University of Michigan, Survey Research Center.

Hogan, Dennis P. and Evelyn M. Kitagawa. 1985. "The Impact of Social Status, Family Structure, and Neighborhood on the Fertility of Black Adolescents." *American Journal of Sociology* 90:825-855.

Holme, Jennifer Jellison 2009. "Buying Homes, Buying Schools: School Choice and the Social Construction of School Quality " *Harvard Educational Review* 72:177-206.

HUD. 2005. "FY 2005 HOPE VI Revitalization NOFA Frequently Asked Questions (FAQ)."

Jackson, Margot and Robert D. Mare. 2007. "Cross-sectional and longitudinal measurements of neighborhood experience and their effects on children." *Social Science Research* 36:590-610.

Jargowsky, Paul A. 2003. "Stunning progress, hidden problems: The dramatic decline of concentrated poverty in the 1990s." Living cities census series, metropolitan policy program.

Jencks, Christopher and Susan E. Mayer. 1990. "The social consequences of growing up in a poor neighborhood." Pp. 111-86 in *Inner City Poverty in the United States*, edited by L. Lynn and M. McGeary. Washington, D. C.: National Academies Press.

Kasen, Stephanie , Patricia Cohen, and Judith S. Brook. 1998. "Adolescent School Experiencesand Dropout, Adolescent Pregnancy, and Young Adult Deviant Behavior." *Journal of Adolescent Research* 13:49-72.

Kisker, Ellen Eliason and Marsha Silverberg. 2010. "Child Care Utilization by Disadvantaged Teenage Mothers." *Journal of Social Issues* 47:159-177.

Klebanov, Pamela Kato , Jeanne Brooks-Gunn, and Greg J. Duncan. 1994. "Does Neighborhood and Family Poverty Affect Mothers' Parenting, Mental Health, and Social Support?" *Journal of Marriage and Family* 56:441-455.

Kling, Jeffrey R. , Jeffrey B. Liebman, and Lawrence F. Katz. 2007. "Experimental Analysis of Neighborhood Effects." *Econometrica* 75:83–119.

Kruger, Daniel J. , Thomas M. Reischl, and Gilbert C. Gee. 2007. "Neighborhood Social Conditions Mediate the Association Between Physical Deterioration and Mental Health." *American Journal of Community Psychology* 40:261-271.

Leventhal, Tama and Jeanne Brooks-Gunn. 2000. "The neighborhoods they live in: the effects of neighborhood residence on child and adolescent outcomes." *Psychological bulletin* 126:309-337.

—. 2004. "A randomized study of neighborhood effects on low-income children's educational outcomes." *Developmental Psychology* 40:488-507.

Lewin-Epstein, Noah. 1986. "Effects of residential segregation and neighborhood opportunity structure on the employment of black and white youth." *The Sociological Quarterly* 27:559–570.

Long, Larry. 1992. "International perspectives on the residential mobility of America's children." *Journal of Marriage and the Family* 54:861.

Massey, Douglas. 2001. "The Prodigal Paradigm Returns: Ecology Comes Back to Sociology." Pp. 41–48 in *Does it Take a Village? Community Effects on Children, Adolescents, and Families,* edited by Alan Booth and C. A. C. Mahwah, N.J: Lawrence Erlbaum Associates.

Massey, Douglas and Nancy Denton. 1993. *American Apartheid: Segregation and the Making of the Underclass*. Boston: Harvard University Press.

Massey, Douglas S. 1981. "Social class and ethnic segregation: a reconsideration of methods and conclusions." *American Sociological Review* 46:641-650.

Massey, Douglas S., Gretchen A. Condran, and Nancy A. Denton. 1987. "The effect of residential segregation on black social and economic well-being." *Social Forces* 66:29-56.

Mayer, Susan E. 2002. "How economic segreation affects children's educational attainment." *Social Forces* 81:153-176.

Mayer, Susan E. and Christopher Jencks. 1989. "Growing up in poor neighborhoods: how much does it matter?" *Science* 243:1441-1445.

McCulloch, Andrew. 2001. "Teenage childbearing in Great Britain and the spatial concentration of poverty households." *Journal of Epidemiology and Community Health* 55:16-23.

McLoyd, Vonnie C. . 1998a. "Socioeconomic disadvantage and child development." *American Psychologist* 53:185-204.

—. 1998b. "Socioeconomic disadvantage and child development. ." *American Psychologist* 53:185-204.

Moonie, Sheniz A., David A. Sterling, Larry Figgs, and Mario Castro. 2006. "Asthma Status and Severity Affects Missed School Days." *Journal of School Health* 76:18–24.

—. 2008. "The Relationship Between School Absence, Academic Performance, and Asthma Status." *Journal of School Health* 78:140–148.

Morenoff, Jeffrey D. and Robert J. Sampson. 1997. "Violent crime and the spatial dynamics of neighborhood transition: Chicago, 1970 - 1990." *Social Forces* 76:747-74.

Morenoff, Jeffrey D., Robert J. Sampson, and Stephen W. Raudenbush. 2001. "Neighborhood inequality, collective efficacy, and the spatial dynamics of urban violence." *Criminology* 39:517-560.

Murnane, Richard J. , John B. Willett, and Frank Levy. 1995. "The growing importance of cognitive skills in wage determination." *Review of Economics and Statistics* 78:251–266.

O'Hare, William and Mark Mather. 2003. *The growing number of kids in severely distressed neighborhoods: Evidence from the 2000 census*. Washington, DC: Anne E. Casey Foundation.

Pallas, Aaron M. . 1987. "School dropouts in the United States." Pp. 23-39 in *Dropouts, pushouts and other casualties*, edited by W. T. Denton. Bloomington, IN: Phi Delta Kappa.

Park, Robert E. and Ernest W. Burgess. 1921. *Introduction to the Science of Sociology* Chicago: The University of Chicago Press.

Peng, Samuel S. 1985. *High school dropouts: A na- tional concern.* Washington, DC: National Center for Education Statistics.

Pickett, Kate E. and M Pearl. 2001. "Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review." *Journal of Epidemiology and Community Health* 55:111-122.

Quillian, Lincoln. 2003. "The decline of male employment in low-income black neighborhood, 1950-1990." *Social Science Research* 32:220-250.

Rosenbaum, James E. . 1995. "Changing the geography of opportunity by expanding residential choice: Lessons from the Gautreaux program." *Housing Policy Debate* 6:231-269.

Rubin, Donald B. 1974. "Estimating Causal Effects of Treatments in Randomized and Nonrandomized Studies." *Journal of Educational Psychology* 66:688–701.

Rubin, Donald B. . 2005. "Causal Inference Using Potential Outcomes: Design, Modeling, Decisions." *Journal of the American Statistical Association* 100:322-331.

Rudd, Nancy M., Patrick C. McKenry, and Myungkyun Nah. 1990. "Welfare receipt among black and white adolescent mothers: A longitudinal perspective." *Journal of Family Issues* 11:334-352.

Rumberger, Russell W. 1987. "High School Dropouts: A Review of Issues and Evidence." *Review of Educational Research* 57:101-121.

Sampson, Robert J. 1997. "Collective regulation of adolescent misbehavior: Validation results from eighty Chicago neighborhoods." *Journal of Adolescent Research* 22:227 - 244.

—. 2008. "Moving to inequality: neighborhood effects and experiements meet social structure." *American Journal of Sociology* 114:189-231.

—. 2012. *Great American City: Chicago and the Enduring Neighborhood Effect*. Chicago: The University of Chicago Press.

Sampson, Robert J. and John H. Laub. 1994. "Urban poverty and the family context of delinquency: A new look at structure and process in a classic study." *Child Development* 65:523-540.

Sampson, Robert J. and Jeffrey D. Morenoff. 2008. "Durable Effects of Concentrated Disadvantage on Verbal Ability among African-American Children." *Proceedings of the National Academy of Sciences* 105:845-853.

Sampson, Robert J., Jeffrey D. Morenoff, and F. Earls. 1999. "Beyond social captial: Spatial dynamics of collective efficacy for children." *American Sociological Review* 64:633-660.

Sampson, Robert J., Jeffrey D. Morenoff, and Thomas Gannon-Rowley. 2002. "Assessing "neighborhood effects": social proecesses and new directions in research." *Annual review of sociology* 28:443-78.

Sampson, Robert J., Stephen W. Raudenbush, and Felton Earls. 1997. "Neighborhoods and violent crime: a multilevel study of collective efficacy." *Science* 277:918-24.

Sewell, William H. and Vimal P. Shah. 1968. "Parents' education and children's educational aspirations and achievements." *American Sociological Review* 33:191-209.

Sharkey, Patrick. 2013. *Stuck in Place: Urban Neighborhoods and the End of Progress toward Racial Equality*. Chicago: The University of Chicago Press.

Sharkey, Patrick Thomas. 1997. *The enduring inequality of race and place: Racial inequality in the neighborhood environment over the life course and across generations*: UMI Dissertations Publishing.

Small, Mario Luis 2007. "Racial Differences in Networks: Do Neighborhood Conditions Matter?" *Social Science Quarterly* 88:320–343.

Small, Mario Luis and Katherine Newman. 2001. "Urban Poverty after The Truly Disadvantaged: The Rediscovery of the Family, the Neighborhood, and Culture." *Annual Review of Sociology* 27:23-45.

South, Scott J. and Eric P. Baumer. 2001. "Community Effects on the Resolution of Adolescent Premarital Pregnancy." *Journal of Family Issues* 22:1025-1043

South, Scott J. and Kyle Crowder. 1999. "Neighborhood effects on family formation: Concentrated poverty and beyond." *American Sociological Review* 64:113-132.

—. 2010. "Neighborhood poverty and nonmarital fertility: spatial and temporal dimensions." *Journal of Marriage and Family* 72:89-104.

Sucoff, Clea A. and Dawn M. Upchurch. 1998. "Neighborhood Context and the Risk of Childbearing among Metropolitan-Area Black Adolescents." *American Sociological Review* 63:571-85.

Swain, Randall C., Fred Beauvais, Ernest L. Chavez, and Eugene R. Oetting. 1997. "The effect of school dropout rates on estimates of adolescent substance use among three racial/ethnic groups." *American Journal of Public Health* 87:51-55.

Tobler, Amy L., Melvin D. Livingston, and Kelli A. Komro. 2011. "Racial/ethnic differences in the etiology of alcohol use among urban adolescents." *Journal of Studies on Alcohol and Drugs* 72:799-810.

Turner, Margery Austin. 1998. "Moving Out of Poverty: Expanding Mobility and Choice through Tenant-Based Housing Assistance." *Housing Policy Debate* 9:373 - 394.

U.S. Census Bureau. 2010. "Geographic Terms and Concepts - Census Tract ", vol. http://www.census.gov/geo/reference/gtc/gtc_ct.html.

U.S. Department of Education, National Center for Education Statistics. 2013. "The Condition of Education 2013 (NCES 2013-037)."

Vartanian, Thomas P. and Page Walker Buck. 2005. "Childhood and Adolescent Neighborhood Effects on Adult Income: Using Siblings to Examine Differences in OLS and Fixed Effect Models." *Social Service Review* 78:60-94.

Wandersman, Abraham and Maury Nation. 1998. "Urban neighborhoods and mental health: Psychological contributions to understanding toxicity, resilience, and interventions." *American Psychologist* 53: 647-656.

Wehlage, Gary G. and Robert A. Rutter. 1986. "Dropping Out: How Much Do Schools Contribute to the Problem?" *Teachers College Record* 87:374 - 392.

Whitbeck, Les B. , Ronald L. Simons, Rand D. Conger, K. A. S. Wickrama, Kevin A. Ackley, and Glen H. Elder Jr. 1997. "The Effects of Parents' Working Conditions and Family Economic Hardship on Parenting Behaviors and Children's Self-Efficacy." *Social Psychology Quarterly* 60:291-303.

Williams, David R. . 1999. "Race, Socioeconomic Status, and Health The Added Effects of Racism and Discrimination." *Annals of the New York Academy of Sciences* 896:173–188.

Wilson, William. 1987. *The Truly Disadvantaged: the inner city, the underclass, and public policy*. Chicago: University of Chicago Press.

Wilson, William J. 1996. *When work disappears: The world of the urban poor*. New York: Alfred Knopf.

Winship, Christopher and Stephen L. Morgan. 1999. "The Estimation of Causal Effects from Observational Data." *Annual Review of Sociology* 25:659-706.

Wodtke, Geoffrey T., David J. Harding, and Felix Elwert. 2011. "Neighborhood effects in temporal perspective: the impact of long-term exposure to concentrated disadvnatage on high school graduation." *American Sociological Review* 76:713-736.

Woodward, Lianne, David M. Fergusson, and L. John Horwood. 2001. "Risk Factors and Life Processes Associated with Teenage Pregnancy: Results of a Prospective Study From Birth to 20 Years." *Journal of Marriage and Family* 63:1170–1184.

Yang, Rebecca and Paul A. Jargowsky. 2006. "Suburban development and economic segregation in the 1990s." *Journal of Urban Affairs* 28:253–273.

Appendices

Appendix Table 2.1: Compare the sample for high school dropout and the full sample

Individual and family covariates		*P* > Chisq
Black	-0.46***	< 0.001
	(0.09)	
Male	-0.09	0.067
	(0.05)	
Number of children in the family at birth	-0.02	0.167
	(0.01)	
% of time family in poverty from birth to 14	-0.21	0.110
	(0.13)	
% of time family head unemployed from birth to 14	-0.21	0.100
	(0.13)	
% of time female headed household from birth to 14	0.30***	0.002
	(0.09)	
Head education level at child birth --- less than high school	-0.09	0.104
	(0.06)	
Number of times family moves neighborhood from birth to 14	0.02***	0.012
	(0.01)	
Neighborhood characteristics		
Average neighborhood poverty from birth to 14	121.0***	<0.001
	(28.26)	
Average neighborhood affluence from birth to 14	-118.0***	<0.001
	(28.25)	
Average neighborhood ICE from birth to 14	119.6***	<0.001
	(28.24)	
% of time live in minority concentrated neighborhood	0.37***	0.001
	(0.11)	
Intercept	-0.42	0.001

***$p < .05$;

Figures in parentheses are SEs.

Appendix Table 2.2: Compare the female sample for teenage childbirth and the full female sample

Individual and family covariates		*P* > Chisq
Black	-0.26	0.053
	(0.13)	
Number of children in the family at birth	0.04***	0.047
	(0.02)	
% of time family in poverty from birth to 14	0.02	0.910
	(0.19)	
% of time family head unemployed from birth to 14	-0.14	0.452
	(0.19)	
% of time female headed household from birth to 14	0.24	0.079
	(0.13)	
Head education level at child birth --- less than high school	-0.20***	0.022
	(0.09)	
Number of times family moves neighborhood from birth to 14	0.04***	0.007
	(0.01)	
Neighborhood characteristics		
Average neighborhood poverty from birth to 14	20.89	0.583
	(38.07)	
Average neighborhood affluence from birth to 14	-19.13	0.615
	(38.06)	
Average neighborhood ICE from birth to 14	19.77	0.603
	(38.05)	
% of time live in minority concentrated neighborhood	0.12	0.479
	(0.16)	
Intercept	-1.07	<0.001

***$p < .05$;

Figures in parentheses are SEs.

Appendix Table 2.3: detailed distribution of neighborhood poverty and ICE over time for white and black children: high school dropout sample

	whites (unweighted N = 1667)	**blacks (unweighted N = 1410)**
Average neighborhood poverty	(range 0.014 - 0.511)	(range 0.024 - 0.868)
5% boundary	0.043	0.123
10% boundary	0.057	0.156
1st quartile boundary	0.088	0.226
2nd quartile boundary	0.134	0.317
3nd quartile boundary	0.188	0.399
90% boundary	0.255	0.503
95% boundary	0.312	0.535
mean	*0.15*	*0.319*
Average neighborhood ICE	(range -0.451 - 0.804)	(range -0.865 - 0.745)
5% boundary	-0.195	-0.478
10% boundary	-0.116	-0.435
1st quartile boundary	-0.013	-0.308
2nd quartile boundary	0.103	-0.187
3nd quartile boundary	0.265	-0.043
90% boundary	0.428	0.102
95% boundary	0.501	0.194
mean	*0.136*	*-0.17*

Appendix Table 3.1: Logistic regression of neighborhood affluence below 5% and children's outcomes

Independent variables	**high school dropout**	**teenage childbirth**
Neighborhood economic context		
Average neighborhood affluence from birth to 14 < 5%	0.35	0.97***
	-0.28	(0.46)
Neighborhood control variable		
% of time live in minority concentrated neighborhood	0.67	0.03
	(0.39)	(0.49)
Individual and family covariates		
Black	-0.65	---
	(0.35)	
Male	0.16	0.52
	(0.12)	(0.47)
Number of children in the family at birth	0.05	-0.02
	(0.04)	(0.06)
% of time family in poverty from birth to 14	1.26***	1.39***
	(0.45)	(0.58)
% of time family head unemployed from birth to 14	0.37	0.45
	(0.47)	(0.64)
% of time female headed household from birth to 14	-0.33	-0.17
	(0.30)	(0.43)
Head education level at child birth --- less than high school	0.66***	0.72***
	(0.15)	(0.23)
Number of times family moves neighborhood from birth to 14	0.09***	0.02
	(0.03)	(0.04)
Intercept	-1.76***	-1.61***
degree of freedom	3053	1022
loglikelihood	-16048.11	-7122.55
Chi squared	35871.78	13102.26

***$p < .05$;

Figures in parentheses are SEs.