UNDERSTANDING THE ROLE OF NEIGHBORHOOD IN THE LONG-TERM CRIMINAL CONSEQUENCES OF CHILDHOOD MALTREATMENT

by

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A Dissertation

Submitted to the University at Albany, State University of New York

in Partial Fulfillment of

the Requirements for the Degree of

Doctor of Philosophy

School of Criminal Justice

2002

ABSTRACT

This dissertation focused on whether early childhood abuse and neglect experiences in conjunction with negative neighborhood structural characteristics were associated with an increased risk of developing antisocial behavior. This research had two major goals: (1) to examine the impact of neighborhood structural characteristics on the long-term criminal outcomes for maltreated children; and (2) to examine neighborhood social mobility as one possible social process through which neighborhood structural characteristics may influence the long-term criminal consequences for maltreated children. Drawing on a broad-based, ecological model for understanding the consequences of child abuse and neglect, this project utilized a conceptual framework from community social organization theory and research. The research tested propositions regarding the role of neighborhood structural characteristics in the development of two negative long-term outcomes for maltreated children - criminal offending and violence. Two broad sets of hypotheses were tested. First, it was hypothesized that victims of early child maltreatment residing in neighborhoods characterized by negative structural characteristics, such as concentrated disadvantage, residential instability, ethnic heterogeneity and low concentrated advantage, would be more likely to develop criminal and violent behavior than those who did not reside in such conditions. Second, it is hypothesized that neighborhood social mobility is one potential mechanism linking neighborhood factors to individual outcomes. The study linked data from documented cases of child abuse and neglect (physical abuse, sexual abuse, neglect, ($N = 908$) and matched controls, ($N = 667$), from the years 1967-1971) with area data from the 1970 and 1990 censuses. Hierarchical generalized linear

modeling (HGLM) was used to examine the interactions between variables at multiple ecological levels. Models revealed that child maltreatment, neighborhood concentrated disadvantage, and residential stability exerted an independent influence on criminal and violent offending. In addition, consistent with the ecological framework, the results revealed that neighborhood concentrated disadvantage and residential stability intensify negative criminal consequences of child maltreatment. While the results did not provide support for the mediation effect of neighborhood social mobility, the findings did suggest that criminal offending might be indirectly influenced by child maltreatment through reduced upward neighborhood social mobility. In addition to polices that focus on the individual, policies to address the long-term criminal consequences of child maltreatment must be part of a broader initiative focused on economic disadvantage in communities.

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CHAPTER I: INTRODUCTION

Child maltreatment is a complex problem that transcends all sectors of American society. The U.S. Department of Health and Human Services (2001) reported that 826,000 children were victims of maltreatment in 1999. This figure translates into a victimization rate of approximately 11.8 per one thousand children. More than half (58.4%) of the victims suffered from neglect, almost a quarter (21.3%) suffered from physical abuse, 11.3% suffered from sexual abuse, and approximately 8% suffered from psychological maltreatment. In addition, one-third (35.9%) of the victims reported experiencing other types of maltreatment such as abandonment, threats of harm, or congenital drug addition and/or multiple types of abuse and neglect.

The effects of child maltreatment can be economically and emotionally devastating. It is estimated that millions of dollars are spent each year on treatment and social services for maltreated children (Caldwell, 1992; Daro, 1988). However, the proximal economic costs are secondary to psychological and social damage caused by child maltreatment. Child maltreatment is known to have detrimental effects on the physical, psychological, cognitive, and behavioral development of children (National Research Council, 1993). These consequences range from minor to severe and include physical injuries, brain damage, developmental delays, attachment problems, depression, learning disorders, aggression, conduct disorder, and post-traumatic stress disorder (Aber & Cicchetti, 1984; Kaplan, Pelcovitz & Labruna, 1999; Widom, 1989b, 2000). In addition to the trauma inflicted on individual children, child maltreatment has also been linked to negative long-term costs for society. For instance, child maltreatment is associated with increased risk of low academic achievement (Perez & Widom, 1994),

alcohol and drug use (Ireland & Widom, 1994: Schuck & Widom, 2001; Widom & White, 1997), juvenile delinquency and adult criminality (Maxfield & Widom, 1996; Smith & Thornberry, 1995; Widom, 1989c). While the consequences of child maltreatment have serious implications for individuals, they also place a burden on society by expanding the need for public assistance programs, mental health and substance abuse treatment programs, police and court interventions, and correctional facilities.

The problem of child maltreatment has existed since the beginning of civilization (Ariès, 1962; Radbill, 1968; Ross, 1980). Unfortunately, its etiology, developmental sequelae, and intergenerational transmission has only recently become the focus of scientific inquiry. In fact, prior to the 1960s many segments of American society did not even acknowledge the existence of this pervasive social problem.

Increased concern for the welfare of maltreated children has led to a substantial growth in the number of research studies documenting the negative developmental consequences of abuse and neglect (Cicchetti & Olsen, 1990; Cicchetti & Toth, 1993; Maxfield & Widom, 1996; Smith & Thornberry, 1995; Widom, 1989c; 2000). Of particular interest for many years has been the association between childhood maltreatment and criminal offending. Numerous studies have demonstrated that victims of child abuse and neglect are at increased risk for delinquency and criminal offending (Maxfield & Widom, 1996; McCord, 1983; Smith & Thornberry, 1995; Widom 1989c; Zingraff, Leiter, Myers, & Johnsen, 1993). Due to methodological differences in past research, questions remain about the magnitude and dynamics of the child maltreatment-criminal offending relationship; however, the basic association has not been disputed.

The impact of child maltreatment on criminal offending has often been studied from a psychological perspective. However, researchers have recently argued that our understanding of the development of harmful sequelae for victims of child abuse and neglect requires the consideration of contextual variables (Widom, 2000). That is, child maltreatment takes place in a social as well as psychological context and, as such, research, prevention, and treatment should incorporate this contextual orientation (Earls, McGuire, & Shay, 1994; Garbarino & Sherman, 1980; Melton, 1992; Widom, 2000).

The purpose of this study is to assess the impact of neighborhood structural characteristics on the long-term criminal consequences of early childhood maltreatment. This research focuses on testing whether certain neighborhood characteristics may exacerbate or buffer the long-term criminal outcomes associated with being a victim of early child abuse and neglect. Drawing on an ecological framework, this research emphasizes the importance of considering the social context of child maltreatment. It highlights the need to explore transactions among variables at multiple ecological levels (Cicchetti & Lynch, 1993). Rather than viewing child maltreatment as an isolated event, this approach views child maltreatment as part of a matrix of problems such as poverty, unemployment, residential instability, family disruption, etc. Studying the consequences of child maltreatment from this perspective allows for a better understanding of the ecological context in which victims of child abuse and neglect are most likely to engage in later delinquency and adult criminal offending.

Theoretical Framework

The study of the effects of neighborhood on human behavior has a long history in the social sciences (Bursik & Grasmick, 1993; Hawley, 1950; Park & Burgess, 1925;

Sampson, Morenoff, & Earls 1999; Shaw & McKay, 1942; Warren, 1978). The Chicago school inspired many researchers to explore the effects of neighborhoods on a variety of social phenomena including criminal behavior, victimization, school achievement, attachment to work, and employment opportunities. Early research in this area (Shaw & McKay, 1942; Whyte, 1943), uncovered distinctive patterns of neighborhood social organization which corresponded to the overrepresentation of certain types of behaviors. Under the broad rubric of social ecology, this type of research has spanned many disciplines; from sociology (Gans, 1962; Sampson, 1992; Shaw & McKay, 1942; Whyte, 1943) to psychology (Belsky, 1980; Cicchetti & Rizley, 1981), anthropology (Lewis, 1966; Sullivan, 1989) and economics (Case & Katz, 1991).

Any study of neighborhood effects on human behavior must begin with a clear definition of the concept of neighborhood. As Crane (1991b) so eloquently noted: "The concept of a neighborhood is a little like the concept of obscenity; it is hard to define but most people know it when they see it" (p. 316). While community scholars have not yet reached consensus on an exact definition, the word "neighborhood" is generally defined spatially as a specific geographic area and functionally as a set of social networks (Hunter & Riger, 1986). Neighborhoods are the spatial units, associated networks, and perceived environments where face-to-face interactions take place. They are the settings where residents realize common values, socialize youth, exert social control, and grant access to opportunity structures.

Social disorganization theory can be used to identify key neighborhood characteristics that are likely to influence the relationship between child maltreatment and criminal offending. Following Shaw and McKay (1942), several researchers have argued

that a high concentrated disadvantage, residential instability, ethnic heterogeneity, and low concentrated advantage undermine the ability of a community's formal and informal institutions to supervise and monitor the activities of residents (Sampson & Morenoff, 1997; Sampson, Raudenbush, & Earls, 1997). The diminished capacity of informal social control associated with community social disorganization has been empirically identified as a potent risk factor for criminal behavior (Hawkins, Herrenkhol, Farrington, Brewer, Catalano, & Harachi, 1989).

Ecological theorists argue that risk factors at multiple levels may interact to exacerbate maladaptive developmental outcomes (Bronfenbrenner, 1979). On the basis of "process-person-context models" (Bronfenbrenner, 1979; Lynam, Caspi, Moffitt, Wikstöm, & Loeber, 2000; Rutter, 1979), it can be theorized that children who are exposed to risk factors at more than one level of the system will be at greater risk for the development of adverse outcomes. For example, the combination of child maltreatment and growing up in a disadvantaged neighborhood may greatly increase the likelihood of criminal and violent behavior.

In addition, an ecological model can highlight protective factors that may buffer or mediate the negative consequences associated with child maltreatment. These protective factors may explain why some children exhibit resilient behavior despite experiencing early childhood victimization. Certain neighborhood structural characteristics, such as economic resources, may be able to buffer children from maladaptive criminal outcomes associated with being a victim of childhood maltreatment.

Study Objectives

Although there is a significant body of literature connecting neighborhood structural characteristics to a range of maladaptive outcomes (Aneshensel & Sucoff, 1996; Coulton, Korbin, Su, & Chow, 1995; Elliot, Wilson, Huizinga, Sampson, Elliott, & Rankin, 1996; Garbarino & Kostelny, 1992; Sampson, Raudenbush, & Earls, 1997), *at the present time, there is no empirical research on the impact of neighborhood characteristics on the long-term criminal consequences of childhood maltreatment.* This study seeks to fill this gap in existing knowledge by examining the relationship between neighborhood structural characteristics and the long-term criminal consequences associated with child abuse and neglect. This research has two major goals:

- To examine the impact of neighborhood structural characteristics on the long-term criminal outcomes for maltreated children; and
- To examine neighborhood social mobility as one possible social process through which neighborhood structural characteristics may influence the long-term criminal consequences for maltreated children.

Potential Contributions of Research

This research has both practical and theoretical significance. By using a multi-level design, the proposed research will explore transactions among variables at multiple ecological levels. The results will hopefully increase extant knowledge of which contextual factors are important in influencing the criminal consequences associated with early childhood victimization. Improved understanding of connections between neighborhood characteristics and childhood victimization may help design interventions that are better at breaking the negative linkages between child maltreatment and criminal behavior.

One significant advantage of this study lies in its ability to test neighborhood social mobility as a possible mechanism for the child maltreatment-criminal offending relationship. Many researchers have speculated about how contextual factors influence individual outcomes. This study will not only allow for an examination of contextual factors, but will also permit an empirical test of neighborhood social mobility as one potential mechanism through which contextual effects may be manifested. Examining this potential mechanism may help in explaining why some individuals maintain positive and relatively well-functioning lives despite adversities experienced in early childhood.

This dissertation is organized into seven chapters. In the next chapter (II) the theoretical model is specified through reviews of the literature on child maltreatment and crime, neighborhood structural characteristics and crime, and the conjoint influence of child maltreatment, neighborhood context, and crime. Chapter III includes a description of the sample, measures, statistical techniques and analysis strategy used in the research. Chapters IV, V and VI present the results. The final chapter (VII) discusses implications of the study and conclusions.

CHAPTER II: BACKGROUND AND ANALYTIC FRAMEWORK

Development in Context

A multilevel ecological model can be used to examine the impact of specific neighborhood structural characteristics on the long-term criminal consequences of child maltreatment. An ecological perspective on human development emphasizes the need to view lives in context. This perspective asserts that human development is a product of the interaction between the human organism and its environment (Lewin, 1935) and highlights the need for researchers to examine multiple levels of explanation, from individual characteristics to macro-structural factors, to better understand human behavior. Ecological models stress the importance of the reciprocal nature of the relationship in person-context interactions (Bronfenbrenner, 1979).

Perhaps the most influential advocate of the ecological perspective on human development is Urie Bronfenbrenner (1979). Drawing from Lewin's (1943) field theory, Bronfenbrenner developed a conceptual scheme for the systematic analysis of environmental influences on human development. Bronfenbrenner's (1979, 1988) scheme consists of five hierarchical, nested structures -- microsystem, mesosystem, ecosystem, macrosystem, and chronosystem. Microsystems are the structures and processes involved in a person's immediate environment (e.g., home, daycare center, classroom, playground, etc.). These are the places where the individual participates in face-to-face interactions. Mesosystems are the linkages and processes between two or more settings in which a person participates (e.g., the relation between home, school, and neighborhood). Exosystems are the linkages and processes between two or more settings in which at least one of the settings a person is not an active participant (e.g., relations

between parents and his or her network of friends, relations between parents and the local school board, etc.). The macrosystem represents the overarching ideology and organization in which the first three systems operate, i.e. societal knowledge and custom. The chronosystem encompasses individual and environmental changes over time (Bronfenbrenner, 1988).

The ecological perspective emphasizes that development of delinquent, criminal or violent behavior should be viewed in the context of a series of environments or ecological systems in which the individual resides -- family, school, peer group, neighborhood, community, etc. Those who hold this perspective argue that criminal behavior does not just occur, but develops out of interactions between individual tendencies, socialization, and social circumstances. In this context, it is necessary to consider multiple environments to understand the development of criminal and violent behavior. While this premise has been readily accepted in some areas of criminology, "individual" and "ecological" perspectives on crime have developed separately. For our understanding of criminal behavior to move forward, researchers need to integrate these perspectives (Farrington, Sampson, & Wikström, 1993).

Styles and qualities of parenting have long been known to exert a profound impact on the social development of children. Empirical evidence overwhelmingly suggests that parenting plays a central role in understanding both normal and abnormal development (Cummings, Davies, & Campbell, 2000). It follows that consideration of the effects of parental behavior is an essential component of any model of individual development. Several extensive reviews of the literature have identified child maltreatment as one type of maladaptive parenting associated with an increased risk for

delinquency, adult criminal offending and violence (Hawkins et al., 1989; Loeber & Stouthamer-Loeber, 1987).

It is important to remember, however, that these maladaptive parent-child interactions do not exist in a vacuum. Child maltreatment does not affect children's development in isolation from other influences. Rather, the impact of parenting practices is often dependent on the context in which they are embedded. Families exist as part of a larger web of social institutions that influence the behavior of their members. As part of a neighborhood network, both family interaction and the resulting individual development are affected by access to a larger set of resources that provide social opportunities and elicit behavioral controls.

In addition to the direct influence of family and neighborhood, it is likely that the intersection of child maltreatment and negative neighborhood structural characteristics represents a synergistic situation that exacerbates the development of criminal and violent behavior. Children who are victims of child abuse and neglect live in different ecological systems than children who are not exposed to this type of maladaptive parenting. Of particular importance is that differences in ecological context are probably present in systems larger than the family, and that risk factors within these broad ecological levels are likely to influence outcomes at multiple levels. For example, the combined stress of living in neighborhoods characterized by poverty, disadvantage, and residential instability is likely to increase both the occurrence of child maltreatment and criminal behavior (Coulton et al., 1995). Thus, it is highly likely that individuals who experience abuse and neglect are also exposed to other negative ecological situations.

It is also likely that interactions among ecological systems differ for maltreated versus non-maltreated individuals. Interactions between maltreating parents and social institutions in areas of disadvantage are probably very different from interactions between parents and institutions under other conditions. For example, researchers would theorize that the same factors that influence the manifestation of maltreating behavior are also likely to influence interactions with other socially relevant actors for the child. That is, maltreating parents are likely to have fewer and lower quality interactions with other important individuals in their child's life such as teachers, neighbors and the child's peer group.

In sum, the goal of this study is to integrate different ecological systems; specifically the family and neighborhood, in order to better understand the development of criminal and violent behavior. It is theorized that the conjoint influence of child maltreatment and negative neighborhood structural characteristics may represent a synergetic situation that disproportionately affects the manifestation of negative behavior. Determining, whether, and by what means, neighborhood context influences changes in the child maltreatment-criminal offending relationship is a first step in exploring these important processes.

Child Maltreatment and Crime: A Review of the Literature

Early estimates of the relationship between child maltreatment and criminal offending were based on retrospective, cross-sectional or clinical studies (Kratcoski & Kratcoski, 1982; Lewis, Shanok, Pincus, & Glaser, 1979; Mouzakitis, 1981; Silver, Dublin, & Lourie, 1969; Steel, 1976; Wick, 1981). While these studies brought attention to the association between maltreatment and criminal behavior, they produced widely

varying estimates (10% to 85%) of the strength of the relationship. In addition, these early studies suffered from numerous methodological problems including retrospective design, unrepresentative samples, and uncontrolled confounding covariates. Due to these problems, it is difficult to draw any firm conclusions about the relationship between child maltreatment and criminal offending from these early studies. Their results and methodological limitations have been previously reviewed (Garbarino & Plantz, 1986; Howing, Wodarski, Kurtz, Gaudin, & Herbst, 1990; Widom 1989b). The current literature review is limited to more recent, scientifically rigorous studies that use prospective study designs and include some method to control for confounding factors.

McCord (1983) used case records collected between 1939 and 1945 to describe 232 parent-child interactions. The parent-child interactions were coded into four categories: (1) abused (n = 49); (2) neglected (n = 48); (3) rejected (n = 34); and (4) loved (n = 101). Between 1975 and 1979 the men were retraced and court records were used to gather information about criminal behavior. The records showed higher rates of criminal behavior among the abused, neglected, and rejected boys than among those raised by loving parents. However, being rejected appeared to have the greatest influence on later criminality. Twenty-one percent of the rejected group had a criminal history compared to 12% for the abused, 8% for the neglected, and 4% for the loved group. McCord also reported that "close to half (45%) of the abused or neglected boys had been convicted for serious crimes, became alcoholics or mentally ill, or had died while unusually young" (1983, p. 270).

Zingraff and his colleagues (1993; 1994) studied the association between child maltreatment and criminal offending in a sample of substantiated cases reported to the

Registry of Child Abuse and Neglect in a North Carolina county during 1983-1989 (N = 633). They compared the maltreated children with two smaller comparison groups. One comparison group was composed of a random sample of children from a general school population (n = 281), and the other comparison group was composed of a random sample of children receiving services from the Division of Social Services (DSS) (n = 177). Children with an official record of maltreatment were excluded from both of the comparison groups. Data on criminal offending was collected from Mecklenburg County juvenile court. It is important to note that the average age of the subjects at the time of the criminal offending data collection was 15 years old. Zingraff et al. (1993) found that maltreated children had higher rates of juvenile court referrals than either of the comparison groups (13.7% for the maltreated group versus 9.0% for the DSS group and 5.3% for the school sample). However, these effects were only observed for general delinquency and status offenses. A history of maltreatment did not increase the likelihood of property or violent offenses. When multivariate analyses were conducted to control for age, sex, race, and family structure, a history of maltreatment significantly increased the odds of engaging in later delinquency if the comparison group was the school sample. However, if the comparison group was the DSS sample, the effect of maltreatment was no longer significant. Finally, Zingraff et al. (1993) did not find large differences in the effect of maltreatment on delinquency when the type of abuse was evaluated.

Smith and Thornberry (1995) studied a sample of 1,000 children from the Rochester Youth Development Study (RYDS). Begun in 1988, the RYDS project was a multiwave panel study of a representative sample of 8th and 9th grade public school

students in Rochester, New York. The youth and their primary caretakers were interviewed every six months over four and a half years. Maltreatment data was gathered from Monroe County Child Protective Services records, while arrest data was gathered from the Rochester Police Department. The researchers found a significant bivariate relationship between maltreatment and the likelihood of official delinquency. Approximately 45% of the maltreated children had an official arrest, compared to 32% of the non-maltreated children. Even after controlling for important covariates (sex, race/ethnicity, underclass status, family structure, and mobility), the relationship remained significant ($OR = 1.71$, $p<.05$).

In a series of articles, Widom and her associates (1989c, Maxfield & Widom, 1996) examined the long-term criminal consequences of early childhood maltreatment in a midwestern metropolitan county sample from 1967-1971. Using a prospective cohort design, abused and neglected subjects ($n = 908$) were matched with control subjects ($n = 667$) on major demographic variables including age, sex, race and social class. In a follow-up approximately 25 years later, Maxfield and Widom (1996) found that early child abuse and neglect significantly increased rates of official delinquency and adult criminality. The prevalence of official offending among those who were maltreated was 49% compared to 38% for the matched control group. In addition, victims of child abuse and neglect began offending earlier and had a greater number of offenses than the matched control group children. Maxfield and Widom (1996) did not find large gender or race differences in the child maltreatment-criminal offending relationship. In additional analyses, Widom (1989c) and Maxfield and Widom (1996) tested the "cycle of violence hypothesis" where they assessed the relationship between early child abuse and

neglect and violence. The researchers found support for this hypothesis with 18% of the maltreated children being arrested for a violent offense compared to only 14% of the comparison children ($OR = 1.35$, $p < .05$) (Maxfield & Widom, 1996). However, additional analyses revealed differences in the relationship by type of abuse, gender, and race. Physical abuse and neglect increased the likelihood of later violent offending ($OR = 1.91$ and 1.55, respectively). In addition, the increased risk for an arrest for violence was only evident for abused and neglected females compared to abused and neglected males and African-Americans compared to Whites. Abused and neglected females were at increased risk for an arrest for violence ($OR = 2.38$, $p < .05$), while the effect for males was much smaller and not statistically significant. Thirty-four percent of the abused and neglected African-Americans had an arrest record for violence compared to 22% of the controls ($OR = 1.81$, $p < .01$).

Using a similar prospective cohort design, English, Widom and Brandford (2001) studied a sample of 877 substantiated cases of child maltreatment from the Puget Sound area of Washington State from 1980-1984. The maltreated individuals were matched with controls ($n = 877$) on age, race/ethnicity, gender, and approximate family social class. Criminal offending data was collected approximately 15-24 years later from local, state, and federal law enforcement agencies. The researchers found strong support for an association between child maltreatment and later delinquency, adult criminal offending, and violence. Individuals with a history of child abuse and neglect were 4.8 times more likely to have an arrest as a juvenile and 2.0 times more likely to have an arrest as an adult than the matched comparison children. The effect of child maltreatment was robust and remained significant even when type of abuse, gender, and race were considered.

Finally, when the authors tested the "cycle of violence hypothesis," a history of child maltreatment greatly increased the likelihood for later violence ($OR = 3.1, p < .001$). This finding was consistent for all types of abuse and neglect, for males and females, as well as, Whites and non-Whites. The only exception was Native Americans. For Native Americans in the sample, a history of abuse or neglect did not significantly increase the likelihood of violence ($OR = 1.9, p > .05$)[1].

In sum, there are a number of recent studies that have examined the relationship between childhood maltreatment and criminal offending. Several conclusions can be drawn from these studies. First, and foremost, the empirical evidence overwhelmingly supports child maltreatment as a risk factor for later involvement in delinquency, adult criminal offending and violence. Moreover, the relationship remains significant and powerful even when important confounding covariates are held constant. Differences in methodological design, measurement of constructs and follow-up periods makes comparisons difficult. However, the more scientifically rigorous studies estimate the increase risk in criminal behavior from child maltreatment somewhere between 4% and 15%. It is important to note that not all victims of child abuse and neglect go on to be criminal offenders. In fact, many victims of child abuse and neglect do not participate in delinquent, criminal, or violent behavior. Thus, while child maltreatment serves as a clear risk factor for later criminal involvement, many victims of child abuse and neglect do not go on to engage in later criminal or violent behavior.

Second, there is some ambiguity regarding the homogeneity of effects for different types of maltreatment. Several studies suggest that neglect or parental rejection

[1] The sample size for Native Americans in the Northwest Project was much small than the sample size for other racial groups. Power calculations revealed that the sample size for Native American did not provide enough power to detect statistically significant differences.

may produce a more powerful impact on later criminal behavior than other forms of maltreatment (McCord, 1983). Neglect represents the extreme omission of parental care including food, shelter, medical attention, etc. Researchers hypothesize that neglect may represent a more chronic form of maladaptive parenting with much greater developmental consequences (Maxfield & Widom, 1996). However, it is important to point out that one of the difficulties in assessing the child maltreatment-criminal offending relationship lies in the lack of conceptual precision of child maltreatment. This lack of conceptual precision is not a result of researcher sloppiness or differences in theoretical backgrounds, but is a product of the complex nature of child maltreatment. In principle, while each type of child maltreatment is distinct, in practice they often overlap and coincide, especially when studying troubled families over long time periods (Garbarino & Eckenrode, 1997). This overlap and co-occurrence is one reason researchers tend to refer to different types of child abuse and neglect under the broader term "maltreatment."

Third, some studies suggest that the effects of child maltreatment on later criminal behavior may be conditioned by gender and race (Maxfield & Widom, 1996; Widom, 1989c). Some research findings suggest that the 'cycle of violence' may be more pronounced for females than males (English, et al., 2001; Maxfield & Widom, 1996; Widom, 1989c). One possible explanation for these findings is the differential gender risk for maladaptive developmental outcomes. In general, males compared to females are at much higher risk for a variety of behavior problems (Widom, 1984). The role of child abuse and neglect for high-risk individuals may simply not have a large independent contribution to the manifestation of maladaptive outcomes. For those already in high-risk

categories, researchers may need to consider threshold models. However, differential exposures to types of abuse complicate the study of gender effects. Males and females are not subject to the same forms of maltreatment (Widom, 2000). Any differences in response may be a function of the type of maltreatment, rather than gender differences.

Several researchers have highlighted the need to consider the importance of race and ethnicity in defining child maltreatment and understanding its consequences (Korbin 1997; Korbin, Coulton, Chard, Platt-Houston, & Su, 1998; Widom, 2000). Research on the cycle of violence suggests that the relationship between child abuse and neglect and later violent behavior may be much more powerful for African-Americans than other racial or ethnic groups (English et al., 2001; Maxfield & Widom, 1996). Abused and neglected racial and ethnic minorities may manifest more severe consequences in response to their maltreatment because of discrimination (Wyatt, 1990) or differential responses by community agencies (Widom, 2000).

Fourth, and last, although there is a significant body of empirical evidence on the child maltreatment-criminal offending relationship, much less progress has been made in elucidating the processes and mechanisms by which childhood victimization contributes to later criminal and violent behavior. Although the study described herein will not test these potential mechanisms, they have been added to the discussion to illustrate why and how an ecological approach may be important to understanding the child maltreatment-criminal offending relationship. In a recent article, Widom (2000) articulated some of these potential processes:

- *physiological damage* – certain forms of physical abuse and neglect may result in brain damage and developmental retardation, which in turn are hypothesized to affect school performance and behavior.
- *social learning* – victims of child maltreatment maybe more likely to model abusive and neglectful behavior, as well as see it as an appropriate way to deal with certain circumstances.
- *failure in attachment* – victims of child maltreatment maybe more likely to develop an internal working model that promotes hostile social-information-process patterns. That is, abuse and neglect victims maybe more likely to interpret ambiguous events as hostile and respond in aggressive ways.
- *maladaptive coping styles* – abuse and neglect may lead to inadequate coping skills, that in turn are hypothesized to increase the likelihood of maladaptive behavior.
- *changes in self-concept or attribution styles* – child maltreatment may affect the child's self-concept, attitudes, or attributional styles which may in turn affect future behavior.

Each of the above processes represents a potential pathway though which child maltreatment may influence later behavior. It is important to note that the relationship between child maltreatment and later offending may be more complex. However, in a general sense it is argued that child maltreatment produces changes in the individual's physiology, self-conceptualization, problem-solving skills, social processes patterns and

opportunities for learning certain types of behavior that in turn are associated with the development of criminal and violent behavior.

Neighborhood Context and Crime: A Review of the Literature

Neighborhood context has long been recognized as having an important influence on the development of delinquent and adult criminal behavior. It is commonly believed that neighborhood context influences attitudes, values, and opportunities related to engaging in criminal offending. Criminologists' interest in neighborhood effects dates back more than 50 years to Shaw and McKay's (1942) now classic work, *Juvenile Delinquency in Urban Areas*. Recently, there has been a great deal of renewed interest in the influence of neighborhood context. Changes in the socioeconomic and ethnic composition of American cities has highlighted neighborhood context as a key element for reproducing social disadvantage (Massey & Denton, 1993; Wilson, 1987; 1996). These changes have prompted many urban scholars to revisit community social organization theories as potential explanatory models of problem behavior, aggression, delinquency, adult criminal offending, and violence (Bursik, 1988; Coulton et al., 1995; Kornhauser, 1978; Sampson, 1992; Sampson & Groves, 1989; Sampson & Morenoff, 1997).

Neighborhoods and neighborhood effects can be defined in many ways. There is no simple definition for what constitutes a neighborhood, and the effects of neighborhood context are likely to be complex and multidimensional. The conceptualization of neighborhood tends to vary based on the hypothesized relationships between neighborhood characteristics and the events under study. In the criminological literature, neighborhood is often conceptualized as the immediate social context where individuals

and families interact with social institutions that regulate resident behavior and control access to resources and opportunities.

In extensive reviews of research that details neighborhood effects, both Jencks and Mayers (1990) and Leventhal and Brooks-Gunn (2000) identified "collective socialization" or "norms/collective efficacy" models as key theoretical ways in which neighborhoods may influence child development. These models are based on the ideas and principles put forth in theories of community social organization. In the general sense, community social organization refers to the patterns and functions of networks (both formal and informal) and organizations in a specific location (Kasarda & Janowitz, 1974). The social organization of community structures helps accomplish the goals of residents, socialize youth, and exert social control within the community (Sampson, 1992). Researchers hypothesize that certain physical and demographic characteristics of communities (such as poverty, ethnic diversity, residential instability, segregation, and physical decay) reduce the ability of the community to provide the necessary functions for its residents to become well-adjusted, productive citizens (Connell, Aber, & Walker, 1995).

In recent years, the body of empirical evidence on the relationship between community social organization and crime has grown exponentially. One major proponent of this perspective is Robert Sampson. Along with his colleagues, Sampson has explored the relationship between criminal behavior and neighborhood social organization characteristics using data from the Project on Human Development in Chicago Neighborhoods (PHDCN). The Project on Human Development in Chicago Neighborhoods (PHDCN) is a large-scale interdisciplinary study designed to explore how

individual, family, and community factors interact in the development of both prosocial and antisocial behavior.

In an early article using the PHDCN data, Sampson (1997) explored the relationship between neighborhood structural characteristics, concentrated poverty, ethnicity/immigration, and residential stability on rates of neighborhood child social control and delinquency. Neighborhood child social control was measured by aggregating citizen responses to three questions, which targeted the likelihood of intervention in neighborhood children's maladaptive behavior (skipping school, spray-painting and showing disrespect). Consistent with social disorganization theory, Sampson found that all three neighborhood structural factors were strongly related to neighborhood rates of child social control. Areas of higher disadvantage, higher ethnicity/immigration and lower residential stability were associated with neighborhoods in which the residents felt that neighbors were less likely to intervene with children engaging in maladaptive behaviors. In turn, he found that this concept of child social control was significantly related to lower rates of adolescent delinquent behavior.

Drawing on Bandura's (1986) concept of collective efficacy, Sampson, Raudenbush and Earls (1997) argued that the most important aspect of community social organization on crime rates was the concept of social networks (psychological support, mutual exchanges, and intergenerational ties). They reason that collective efficacy (the combined aspects of informal social control and social cohesion) is the mechanism that mediates the relationship between neighborhood social organization characteristics and neighborhood crime rates (Sampson et al., 1997). Using data from the PHDCN project, Sampson and his colleagues (1997) tested their hypothesis regarding collective efficacy.

The researchers found that relationships between neighborhood concentrated poverty and residential instability and homicide rates were largely mediated by their concept of collective efficacy. It is important to note that these relationships remained significant even after controlling for important individual factors known to affect homicide rates (gender, race/ethnicity, age, marital status, homeownership, and mobility). Sampson and his colleagues (1997) concluded that their concept of "collective efficacy" is an important link in understanding when and how the risk of neighborhood social disorganization is translated into high rates of neighborhood criminal behavior.

In additional analyses, Sampson, Morenoff and Earls (1999) attempted to further explore the links between neighborhood social organization characteristics and "collective efficacy." They considered a related but conceptually distinct characteristic of community social organization often discussed by poverty researchers -- *concentrated affluence*. The addition of concentrated affluence was an attempt to recognize the importance of the upper tail of the socioeconomic distribution. Analyses revealed that concentrated affluence had a powerful effect on the components of "collective efficacy" (intergenerational closure, reciprocated exchange, and child-centered social control). That is, neighborhoods with more concentrated affluence had more collective efficacy -- more intergenerational closure, reciprocated exchange and child-centered social control. Concentrated affluence had a larger effect on collective efficacy than either disadvantage or residential stability (Sampson et al., 1999). The analyses did not explore the effect of concentrated affluence on rates of criminal behavior.

It is important to point out that the research done by Sampson and his colleagues focused on the relationships among aggregated measures (i.e., the relationships among

rates of neighborhood social organization characteristics, "collective efficacy" and criminal behavior). While Sampson and his colleagues have done much to improve both the conceptual clarity and research methodology of social disorganization research, their work has not explored whether or not these aggregated measures are linked to individual-level outcomes[2].

The current state of knowledge regarding the effect of neighborhood context on individual behavior is limited. The research has been hampered significantly by the absence of data combining information on individual, family, and neighborhood levels. The most relevant multi-level studies of neighborhood effects on criminal offending are those carried out by Simcha-Fagan and Schwartz (1986), Gottfredson, McNeil, and Gottfredson (1991), Peeple and Loeber (1994), Elliott and his colleagues (1996), Wikström and Loeber (2000), and Lynam and his colleagues (2000).

Simcha-Fagan and Schwartz (1986) examined residential stability, economic level, community organization, participation, and criminal subculture on three measures of delinquency (self-reported, severe self-reported, and official) for 553 urban adolescent males living in New York City. Using 1980 census data they found that these community dimensions accounted for a substantial amount of between-community variance in criminal offending. However, the patterns of association differed by measure of delinquency. Self-reported levels of delinquency were significantly related to levels of participation and residential stability, while official delinquency was related to economic

[2] One of the issues with using Sampson's work to draw conclusions about neighborhood effects on individual behavior is committing the "ecological fallacy." Robinson (1950) pointed out that valid conclusions about correlations between individuals cannot necessarily be drawn from "ecological correlations" (correlations between rates in neighborhoods). For example, Wallis and Maliphant (1967) found that delinquency rates in London were negatively related to divorce rates; however, individual delinquents in their sample were more likely to have divorced parents.

and subculture measures. When individual-level models were tested, the variances accounted for by the structural characteristics were greatly reduced; however, certain characteristics were still significant predictors of individual delinquent behavior. Residential stability and participation influenced self-reported delinquency, while only criminal subculture influenced official delinquency.

In another early study of community effects, Gottfredson et al. (1991) analyzed the effects of community disorganization and education/affluence (census based factor scores) for male and female students ($N = 3,729$). They found mixed support for community effects. Higher education/affluence was associated with less theft and vandalism for males, while more disorganization was associated with more interpersonal violence for females. These effects were further reduced when mediating theoretical variables such as peer influence, parental supervision, and school attachment were included.

Using data from the Pittsburgh Youth Study, Peeple and Loeber (1994) focused on the relationship between race and self-reported delinquency in different types of neighborhoods in Pittsburgh. Using 1980 census data, the Pittsburgh neighborhoods were dichotomized and labeled underclass vs. non-underclass neighborhoods. The researchers found that the relationship between race and juvenile offending was only significant in underclass neighborhoods. That is, the offending patterns for African-Americans who resided in non-underclass neighborhoods were similar to Whites. However, in underclass neighborhoods, African-American offending was significantly higher than that of Whites.

Elliott and his colleagues (1996) explored the impact of neighborhood disadvantage on criminality using Chicago and Denver sites of the Research Network on Successful Adolescent Development project. The structural measure of neighborhood disadvantage was a standardized composite scale composed of 1990 census data on poverty, mobility, family structure, and ethnic diversity. Additional measures of neighborhood social integration, informal networks, and informal control were developed from residents' responses to questionnaires. Criminality was measured using a composite measure of self-reported behavior of arrests, delinquent behavior, and drug use. Two different types of analyses were conducted. One set of analyses assessed the impact of neighborhood disadvantage, social integration, informal networks, and informal control on *aggregate-rates* of criminality. The other set of analyses assessed the impact of these factors on the development of *individual-level* criminality. At the aggregate-level using structural equation modeling, Elliott et al. (1996) found that informal control mediated the relationship between neighborhood disadvantage and criminality. That is, advantaged neighborhoods had more informal control, which in turn was associated with less criminal behavior.

At the individual level, the researchers divided the Chicago and Denver samples and used hierarchal linear modeling (HLM) to control for individual covariates (age, sex, socioeconomic status, family structure and length of residence). Results from individual level analyses were different from the aggregate-level analyses. In the Chicago sample, informal control remained an important neighborhood influence on individual criminality. In the Denver sample, informal control was no longer significant, but informal networks emerged as a significant neighborhood effect. In both cases

neighborhood disadvantage influenced criminal behavior, although the form of neighborhood organization mediating the effect differed[3].

Wikström and Loeber (2000) studied the relationship between neighborhood socioeconomic context, individual characteristics, and serious male offending with data from the Pittsburgh Youth Study. Using 1990 census data they developed a composite measure of neighborhood socio-economic status, which included percent split families, median household income, percent families below poverty, percent households with public assistance, percent unemployment, and percent African-American. Because of the small numbers of subjects in many of the neighborhoods they used quartiles to divide the neighborhoods into three groups -- advantaged (n = 134), middle-range (n = 505) and disadvantaged (n = 309). They then further divided the disadvantaged group into two subgroups -- disadvantaged nonpublic housing (n = 191) and disadvantaged public housing (n = 118). Individual characteristics such as impulsivity, parental supervision, school motivation, peer delinquency, and attitudes about delinquency behavior were categorized into risk and protective factors. Individuals were then classified into three groups based on the number of risk or protective factors present -- high risk, balance risk and protective and high protective.

Bivariate analyses showed that neighborhood socioeconomic context influenced both the prevalence and the age of onset of serious male juvenile offending. The prevalence of offending in disadvantaged public housing areas was twice as high as in advantaged areas (63.7% verses 30.9%, respectively). Early age of onset of criminal

[3]Differences in mediation process may be attributable to differences in the measurement of neighborhood. In Chicago the neighborhoods were defined by census tracts, while in Denver the neighborhoods were defined by block groups. In the conceptualization of neighborhood effects, the block group unit of analysis may be more likely to capture the social interaction processes of neighborhoods, while the census tracts may be more likely to capture the structural or social control aspect of neighborhoods. These differences may account for the differential findings between the two sites.

behavior was more common in disadvantaged areas, and there were fewer late onsets in advantaged areas. However, when multivariate analyses were conducted to control for individual risk and protective factors, neighborhood socioeconomic context did not have as strong, or consistent, effect on individual criminal behavior. Wikström and Loeber (2000) found that neighborhood socioeconomic context only influenced the late onset of serious juvenile offending for those individuals who had either a balanced number of risk and protective factors or a high number of protective factors. The authors concluded "the findings suggest that there is a significant direct effect of neighborhood disadvantage on well-adjusted children influencing them to become involved in serious offending as they reach adolescence..." (Wikström & Loeber, 2000, p.1133-1134).

In similar research employing the Pittsburgh Youth Study, Lynam and his colleagues (2000) explored the relationship between neighborhood socioeconomic status, impulsivity, and juvenile delinquency. Using the same measures for neighborhood socioeconomic status as described earlier (see above, Wikstöm & Loeber, 2000), the authors used several statistical techniques (ordinary least squares regression and hierarchical linear modeling) to test interaction effects between individual impulsivity and neighborhood socioeconomic context on five official measures of delinquency at age 13 (total offenses, variety of status offenses, variety of vice and drug offenses, variety of theft offenses, and variety of violent offenses). The researchers found significant interactions between impulsivity and neighborhood socioeconomic status for four of the five official measures of delinquency (variety of status offenses was not significant). Impulsivity was shown to have influenced criminal offending only for those individuals residing in more disadvantaged neighborhoods. Lynam, et al. (2000) concluded that the

relationship between impulsivity and official criminal offending was conditioned by neighborhood socioeconomic status.

In sum, there is some empirical evidence to suggest that certain neighborhood factors may be associated with the development of individual level criminal and violent behavior. The neighborhood characteristic most frequently associated with individual offending was disadvantaged socioeconomic status. Neighborhood disadvantage appears to be associated with considerable drawbacks for children growing up under these conditions.

The body of research is fragmented, however. While there is considerable consensus on the theoretical effects of neighborhood context, the operationalization of important constructs and methodological techniques used to assess them are still quite diverse. What constitutes neighborhood and how to assess important constructs such as social control, informal networks, and mutual exchange is still debated. One of the biggest problems may be the limited variation in neighborhood context in many studies. The majority of the studies reviewed, as well as the majority of the studies in the field of criminology, used sampling techniques to maximize the number of delinquents. The unintended effect of this sampling technique is to end up with fairly homogeneous neighborhoods. While researchers have begun to map out an agenda for studying neighborhood effects on the development of individual-level outcomes, there is still much work to do.

Although the present research will not examine the mechanisms whereby negative neighborhood structural characteristics influence criminal behavior, a discussion of these processes illustrates the potential importance of an ecological framework in

understanding the child maltreatment-criminal offending relationship. In a recent article, Leventhal and Brooks-Gunn (2000) outlined two possible causal mechanisms of the "social organization" aspect of neighborhood effects:

- *collective efficacy* – neighborhood social disorganization may lead to a breakdown in "collective efficacy" (the combined aspects of informal social control and social cohesion) which in turn increases the likelihood of criminal and violent behavior.
- *presence of risk* – neighborhood social disorganization may lead to an increase in the presence of risk (victimization, violence, and the presence of harmful substances such as alcohol, drugs, and guns) which in turn increases the likelihood of violence and criminal offending.

As with child maltreatment, each of these processes represents a potential pathway through which neighborhood social organization may impact the development of criminal and violent behavior. In the present conceptualization, neighborhood social organization characteristics represent processes not only in the microsystem, but also processes and linkages in the mesosystem, exosystem, and macrosystem.

Through the presence or absence of collective efficacy (i.e., social control, mutual exchange, and intergenerational ties) and risk, neighborhood social organization is hypothesized to directly impact the microsystem of the individual. That is, neighborhood social organization impacts the proximal environment in which the individual functions, grows and develops. It is theorized that in areas of low collective efficacy and high risk, social problems may cluster; creating "socially toxic environments" (Garbarino, 1995).

Recent research by Coulton et al. (1995) supports the idea of clustering of negative social conditions.

The presence or absence of these characteristics also affects the linkages between actors and institutions relevant to the development of the individual: that is, linkages between relevant actors such as parents and neighbors (mesosystem), parents and teachers (mesosystem) and parents and employers (exosystems). Based on the ecological framework, researchers would theorize that in neighborhoods with low collective efficacy and high-risk opportunities the quantity and quality of interactions between relevant actors in the family and neighborhood would be lower. Parents would be less likely to interact with neighbors, teachers, peers, parents, police, etc. In addition, when parents do interact with individuals in the neighborhood it is theorized that the quality of interactions would be lower. That is, the types of parental interactions that occur would be less likely to lead to the development of prosocial normative behavior in their children.

Neighborhood social organization characteristics are also thought to affect patterns of cultural learning (Kornhauser, 1978). While this conceptualization of the macrosystem is narrower than Bronfenbrenner's (1988), empirical evidence provides support for the idea that community organization may promote the development of a localized maladaptive ideology or culture. Ethnographic studies generally support the idea that disorganized communities are favorable to the development of value systems that legitimatize, or at least tolerate, crime and violence (Sampson, 1992).

Conjoint Influence of Child Maltreatment and Neighborhood Context on Crime

Bronfenbrenner's (1979; 1988) ecological framework identifies influential domains for the development of behavior. Individual characteristics, family interaction, peer groups, neighborhood, community and social institutions such as school and workplace, represent domains through which individual behavior can be influenced. As an individual grows and develops, each ecological context can have a direct influence on the development of behavior. In this study, it is argued that the family and the neighborhood are two important domains for the development of criminal and violent behavior.

Bronfenbrenner's (1979; 1988) model does not inform how specific characteristics within specific domains influence certain types of behavior. In this study, the argument is being made that within the family domain child maltreatment is one possible mechanism that may influence the development of criminal and violent behavior. The above section presents a summary of significant literature showing the independent detrimental effects of child maltreatment on later delinquency and adult offending. In addition, several potential causal processes associated with the child maltreatment-criminal offending relationship were highlighted -- physiological damage, social learning, failure in attachment, maladaptive coping, and changes in self-concept or attribution styles.

In this study, the argument is also be made that within the neighborhood domain, neighborhood structural characteristics are potential catalysts for the development of criminal offending. That is, specific neighborhood structural characteristics such as economic deprivation, residential instability and ethnic heterogeneity may facilitate the

development of antisocial behavior. Again, a significant body of literature was summarized showing a significant effect of neighborhood characteristics on the development of individual criminal and violent behavior.

Why would the conjoint influences of child maltreatment and negative neighborhood structural factors lead to exponential increases in criminal and violent behavior? As stated earlier, while Bronfenbrenner presented a conceptual framework for examining the development of behavior, he did not delineate the causal mechanisms for how these synergistic situations might influence specific types of behavior. Nonetheless, based on the ideas put forth in the ecological framework, one can theorize that neighborhood characteristics can have both negative and positive moderating effects on the child maltreatment-criminal offending relationship (Bronfenbrenner, 1979).

In terms of negative moderating effects, certain neighborhood characteristics may *exacerbate* the effect of causal processes such as physiological damage, social learning, failure in attachment, maladaptive coping, and changes in self-concept or attribution styles theorized to be associated with the child maltreatment-criminal offending relationship. A lack of collective efficacy (social control and social cohesion) and/or increased presence of risk (violence, victimization and/or presence of harmful substances) may exacerbate the manifestation of physiological damage, social learning, failure of attachment, maladaptive coping, and changes in self-concept or attribution styles associated with child maltreatment. For example, the decreased social control associated with neighborhood disorganization may provide more opportunities for learning criminal and violent behavior. Moreover, the increased exposure to violence and

victimization associated with high-risk neighborhoods may increase the likelihood of developing hostile attributions (Dodge, Pettit, & Bates, 1994).

In terms of positive moderating effects, certain neighborhood characteristics may *buffer* or reduce the effect of causal processes associated with the child maltreatment-criminal offending relationship. The presence of collective efficacy and/or absence of risk may buffer or reduce the effect of causal processes associated with the child maltreatment-criminal offending relationship. The presence of mutual exchange and intergenerational ties may provide prosocial role models, resources and opportunities for the abused and neglected child that can negate causal processes associated with the development of criminal behavior. For example, the presence of social control may reduce learning opportunities for criminal and violent behavior. In this context, one can think of the neighborhood as a safety net that can catch abused and neglected children and reduce the harmful consequences of their experiences.

In sum, if neighborhood structural characteristics are significant factors in the child maltreatment-criminal offending relationship, different patterns of criminal and violent behavior should emerge at different levels of neighborhood structural characteristics. If the empirical evidence reveals different patterns, then a convincing case may be made for the influence of neighborhood characteristics on the development of long-term criminal outcomes for victims of child abuse and neglect.

Potential Mediator: Neighborhood Social Mobility

A focus on change is central to an ecological perspective on the development of criminal and violent behavior. Changes in the individual and environment over time are captured by the chronosystem (Bronfenbrenner, 1988). Changes can be both normative

(school, employment, marriage, retirement) and nonnormative (a death in the family, divorce, moving, etc.) (Baltes, 1979; Baltes, Reese, & Lipsett, 1980). As an individual grows and develops, normative and nonnormative changes can have a substantial influence on the individual's residence. According to this perspective, pathways to crime and/or conformity may be modified over the life course by changes in neighborhood characteristics.

Researchers have theorized about the mechanism(s) through which neighborhood structural characteristics may influence the long-term criminal consequences of child maltreatment. Studies have shown that neighborhood characteristics affect a variety of psychological, social, and economic outcomes, including life satisfaction (Fernandez & Kulik, 1981), educational attainment (Crane, 1991a), marital and nonmarital fertility (Billy & Moore, 1992; Hogan & Kitagawa, 1985), sexual activity (Brewster, Billy, & Grady, 1994), criminal victimization (Smith & Jarjoura, 1989) and children's cognitive development (Brooks-Gunn, Duncan, Klebanov, & Sealand 1993; Entwisle, Alexander, & Olson, 1994). This research focuses on only one potentially important factor -- *neighborhood social mobility.* Residential mobility out of poor neighborhoods into better ones may enhance employment and educational prospects, increase access to services and facilities, and reduce exposure to crime and violence (Alba, Logan, & Bellair, 1994; Massey, Condran, & Denton, 1987; Rosenbaum & Poplin, 1991; Wilson, 1979).

Though there is very little research on individual level outcomes associated with residential mobility, a series of experimental housing programs provides some empirical evidence for the positive effect of moving to more socially advantaged neighborhoods. In an effort to address racial discrimination in the Chicago Housing Authority's public

housing program, the courts introduced the Gautreaux Assisted Housing Program in 1976. Since the programs inception, it has moved about 4,000 low-income black families from Chicago's high-rise housing projects to more affluent areas in the city and suburbs. Participants had to meet three eligibility requirements: (1) families had to have four or fewer children; (2) families had to have a steady source of income (usually Aid to Families with Dependent Children or AFDC) and pay their own rent; and (3) families were expected to demonstrate "good housekeeping" on the day of the counselor's visit. These three criteria eliminated approximately 30% of the public housing residents. Since the residents were assigned to the first available housing and were not allowed to choose between city and suburban locations, their assignment constituted a kind of quasi-experimental manipulation.

In a series of evaluations of the Gautreaux Assisted Housing Program, researchers found positive differences in employment outcomes for adults and developmental outcomes for children whose families moved to the suburbs. However, suburban children reported experiencing more overt racism and were more likely to be placed in special education programs (Kaufman & Rosenbaum, 1992; Rosenbaum, 1991; Rosenbaum, Rubinowitz, & Kulieke, 1986).

Ludwig, Duncan, and Hirschfield (2000) assessed the effect of the U.S. Department of Housing and Urban Development's Moving to Opportunity (MTO) housing-mobility experiment on adolescent criminal activity. Since 1994, the Moving to Opportunity (MTO) program has randomly assigned a total of 638 families from high-poverty areas in Baltimore neighborhoods to three different "treatment groups": (a) an *experimental group* – families that received housing subsidies, counseling and search

assistance to move from poverty census tracts to private housing in non-poverty census tracts, (b) a *section 8-only group* – families that received private-housing subsidies with no limits on relocation options, and (c) a *control group* - families that received no assistance. The MTO's design helped overcome the endogenous-membership problem found in previous studies by separating family residential preferences from adolescent outcomes (Ludwig et al., 2000).

The researchers conducted a series of analyses to assess whether or not memberships in the experimental MTO group reduced criminal activity among adolescent family members. The key outcome measure was official arrest history collected from local authorities. Their findings indicated that relocation of the experimental group reduced the adolescent family member's arrests for violent offenses on the order of 30% to 50%. On the other hand, property-crime arrests increased compared to the controls, although the difference did not remain significant when the researchers controlled for random differences in pre-program characteristics.

Implicit in the neighborhood social mobility construct is the idea that either the ability or opportunity to move to neighborhoods with more positive structural characteristics is beneficial. It is assumed that individuals who are able to escape distressed neighborhoods will have access to more resources and opportunities to succeed. Conversely, it is assumed that individuals who are unable to escape distressed neighborhoods will not receive enhanced resources or opportunities and are likely to face the same obstacles and barriers that plagued their parents.

It is important to point out that neighborhood social mobility is a complex and multidimensional construct, including both social mobility and geographic mobility. This

means that dimensions of change in social characteristics (i.e., resources, income, networks) as well as the change in geographic location (i.e., physical locality) are included in the larger construct of neighborhood social mobility.

The effect of child maltreatment on neighborhood social mobility is unknown. Based on existing literature, researchers theorize that child maltreatment places children on a life path that decreases opportunities for later success. The inability to move to neighborhoods with more social resources and less crime and violence may be one such restricted opportunity. Reduced upward neighborhood social mobility may prove to be one of the life-course processes or mechanisms that decreases the likelihood of long-term healthy prosocial development for victims of early childhood maltreatment.

Hypotheses

This study will examine multiple hypotheses regarding the role of family and neighborhood factors and the conjoint influence of child maltreatment and neighborhood structural characteristics on criminal and violent behavior. According to the *direct influence hypothesis,* child maltreatment and neighborhood structural characteristics are important independent factors in the development of criminal and violent behavior. It is expected that child maltreatment and negative neighborhood structural characteristics (concentrated disadvantage, residential instability, ethnic heterogeneity, and concentrated advantage) are each independently associated with higher levels of criminal and violent behavior, even when controlling for important individual characteristics (gender, race and age at time of last records check).

The process-person-context model or *interaction effects hypothesis* predicts that the effects of child maltreatment on criminal and violence offending will vary by

neighborhood structural characteristics. For example, victims of child maltreatment who reside in neighborhoods with negative characteristics (concentrated poverty, residential instability, ethnic heterogeneity, and low concentrated advantage) will be more likely to manifest criminal and violent behavior than those who reside in neighborhoods with less negative characteristics (less concentrated poverty, less residential instability, less ethnic heterogeneity, and high concentrated advantage).

Lastly, the *mediator hypothesis* posits that neighborhood social mobility will mediate the relationship between child maltreatment and criminal and violent behavior. This hypothesis states that being a victim of child abuse and neglect is associated with less upward neighborhood social mobility, which in turn is associated with higher levels of criminal and violent behavior. The concept of neighborhood social mobility refers to changes in the structural characteristics of an individual's neighborhood. Changes in these characteristics can occur in one of two ways. First, structural characteristics of the neighborhood can change. That is, the individual can reside in the same neighborhood, although the characteristics of that particular neighborhood change over time. Second, the individual can move into a different neighborhood with different structural characteristics. Maltreated children will be at increased risk for criminal and violent behavior because of either their inability to stay in neighborhoods with increasing positive neighborhood characteristics (less concentrated poverty, less residential instability, less ethnic heterogeneity, and high concentrated advantage) or their inability to relocate to neighborhoods with more positive characteristics.

Selection effects should be considered in any analysis focusing on neighborhood structural characteristics. The processes through which families select to reside in

different neighborhoods may introduce unknown bias into the empirical analyses (Tienda, 1991). For example, parents who have the fewest resources to protect their children from harmful neighborhood influences may be more likely to reside in neighborhoods characterized by negative structural characteristics because they lack the resources necessary to move. This selection scenario leads to an *overestimation* of the effects of neighborhoods with negative structural characteristics. However, it is also possible that parents who are well equipped to resist the influence of negative neighborhoods may choose to live in neighborhoods where these influences are disproportionately represented in order to take advantage of other benefits, such as cheaper housing or a shorter commute. This selection scenario leads to an *underestimation* of the effect of negative neighborhood characteristics. Consequently, it is possible to think of probable scenarios of selection bias, but it is difficult to predict the total bias effect of family choices. In the next section the research design and variables used to test these hypotheses are described.

CHAPTER III: RESEARCH DESIGN AND METHODS

Design

The data on the consequences of child abuse and neglect is based on a cohort design study (Leventhal, 1982; Schulsinger, Mednick, & Knop, 1981) in which abused and neglected children were matched with non-abused and non-neglected children and followed prospectively into young adulthood (Widom, 1989a). Important characteristics of the study design are: (1) a prospective design; (2) a large sample; (3) unambiguous operationalization of abuse and neglect; (4) different types of abuse (physical and sexual) and neglect; (5) a control group matched on age, sex, race and approximate social class; and (6) assessment of the long-term consequences of abuse and neglect in both adolescence and young adulthood. Information about neighborhood structural characteristics based on census tract information was added for this dissertation. For more details on the study design and subject selection, see Widom (1989a).

Abuse and neglect cases. There are a total of 908 cases of child abuse and neglect in the original database on child maltreatment. In the original study, cases of child abuse and neglect were restricted to situations in which the victim was 11 years of age or less in order to preserve temporal sequence. The cases represent all validated and substantiated court cases of physical abuse, sexual abuse and neglect for one Midwestern metropolitan area for the years 1967 through 1971. Information on the abuse and neglect cases was gathered from juvenile court and probation records.

Child maltreatment definitions. Child maltreatment includes documented cases of physical and sexual abuse and neglect. *Physical abuse* cases include injuries such as bruises, welts, burns, abrasions, lacerations, wounds, cuts, bone and skull fractures and

other evidence of physical injury. *Sexual abuse* charges varied from relatively non-specific charges of "assault and battery with intent to gratify sexual desires" to more specific charges of "fondling or touching in an obscene manner," sodomy, rape, incest and so forth. *Neglect* cases reflected a judgment that the parents' deficiencies in childcare were beyond those found acceptable by community and professional standards at the time. These cases represented extreme failure to provide adequate food, clothing, shelter and medical attention to children.

Matched control cases. There are a total of 667 matched controls in the original child maltreatment database. One important element of the research design of the original study was the establishment of a matched control group. The control group was matched as closely as possible on the bases of sex, age, race and approximate family socioeconomic status (during the time period under study, 1967-1971). To accomplish the matching process, the abused and neglected sample was divided into two groups -- under school age and school age. Birth record information was used to select a matched control group for the abused or neglected children under school age. There were 229 (72%) matches for the 319 abused and neglected children under school age. For the abused or neglected children of school age, elementary school records were used to find matched control children. There were 438 (74%) matches for the 589 school-aged abused and neglected children. Overall, there were a total of 667 (73.7%) matches for the 908 abused and neglected children.

Demographic characteristics of the groups. For the abused and neglected group, there were about equal proportions of males and females (49% versus 51%, respectively). There were more Whites than African Americans (67% versus 31%, respectively). The

mean age at the time of the last record check was 32.03 years (SD = 3.56). The age distribution of the sample at the last records check indicates that most of the subjects had passed through their peak offending ages. Only 3% of the sample was less than 25 years old at the time of the last criminal records check.

The controls were matched with the abused and neglected children in terms of sex, race and age. They were also equally divided between females and males (50% versus 50%). There were slightly more African American controls (35%). The mean age of the control subjects was 32.08 (SD = 3.55).

Neighborhood characteristics. The subjects came from approximately 150 census tracts in a mid-western metropolitan area. There were several options available when defining neighborhood as a unit of analysis, including census boundaries, police districts, school districts, health districts and local knowledge of neighborhood boundaries. Census tract was chosen as a proxy for neighborhood for two reasons. First, data on neighborhood structural characteristics was readily available. Second, a census tract is small enough to reasonably approximate a neighborhood; however, census tracts do not necessarily represent neighborhoods. Rather, census tracts are generally more heterogeneous than true residential neighborhoods (Aber & Duncan, 1997).

Variables and Measures

Child maltreatment. The hypothesis that child maltreatment can influence criminal and violent behavior was tested using several indicators of child maltreatment. *Abuse/neglect* is a dichotomous variable with no official case of physical abuse or sexual abuse or neglect coded as 0 and any official case of physical abuse, sexual abuse or neglect coded as 1. *Physical abuse* is a dichotomous variable with 0 coded as no official

case of physical abuse and 1 coded for an official case of physical abuse. *Sexual abuse* is a dichotomous variable with 0 coded for no official case of sexual abuse and 1 coded for an official case of sexual abuse. *Neglect* is also a dichotomous variable with 0 coded for no official neglect and 1 equaling an official case of neglect. Table 1 presents descriptive statistics for individual ($N = 1460$) and 1970 neighborhood ($N = 150$) level variables, which were used for testing the direct and interaction hypotheses.

Neighborhood structural characteristics. The hypothesis that neighborhood factors can influence criminal and violent behavior were tested using several neighborhood level variables. This dissertation focuses on four theoretical constructs: (1) *concentrated disadvantage* (percent families in poverty, percent families receiving public assistance, percent residents unemployed, percent female-headed households and percent black residents); (2) *residential stability* (percent owner occupied and percent non-movers in < 5 years); (3) *ethnic heterogeneity* (percent non-native born and percent Spanish speaking); and (4) *concentrated advantage* (percent middle-class neighbors, percent affluent neighbors, percent individuals in managerial and professional occupations, and percent individuals with 4 or more years of college). All information was compiled from the U.S. Census Bureau 1970 (childhood) and 1990 (young adult) summary files[4]. For each neighborhood construct, each indicator was standardized and then summed. Table 2 presents a summary of the neighborhood measures.

[4] All of the 1970 census measures were replicated exactly with the 1990 census data, with the exception of two measures. Because of changes in reporting of decennial census data, it was not possible to exactly replicate two of the thirteen measures - percent families receiving public aid and percent individuals with 4 or more years of college. Instead, percent households receiving public aid and percent individuals with a college degree were used for the 1990 data measures.

Table 1. Descriptive Statistics for Individual (N = 1460) and 1970 Neighborhood (N = 150) Characteristics

	Mean	SD	Minimum	Maximum
Individual Level (N = 1460)				
Abuse/neglect	.58	.49	0	1
Physical abuse	.10	.30	0	1
Sexual abuse	.09	.29	0	1
Neglect	.45	.80	0	1
Male	.49	.50	0	1
Non-White	.35	.48	0	1
Age	32.09	3.56	22.74	41.93
Criminal arrests	2.71	5.62	0	53
Violent arrests	.34	1.02	0	11
1970 Neighborhood-Level (N = 150)				
Concentrated disadvantage	0	4.35	-5.28	16.14
Residential stability	0	1.73	-5.41	3.41
Ethnic heterogeneity	0	1.58	-1.89	6.45
Concentrated advantage	0	3.58	-3.06	17.89

Table 2. Definitions for 1970 and 1990 Neighborhood Variables

Variable	Definition	Source
Concentrated Disadvantage		
Poverty	% families in poverty	1970 & 1990 Census
Public assistance[a]	% families receiving public aid	1970 & 1990 Census
Unemployment	% individuals 16 years or older unemployed	1970 & 1990 Census
Female-headed household	% female-headed households with children under 18	1970 & 1990 Census
Black	% black individuals	1970 & 1990 Census
Residential Stability		
Owner-occupied	% owners residing in housing	1970 & 1990 Census
Same house	% individuals 5 years or more who resided in same house since 1965	1970 & 1990 Census
Ethnic Heterogeneity		
Foreign born	% individuals born outside US	1970 & 1990 Census
Spanish speaking	% individuals who speak Spanish	1970 & 1990 Census
Concentrated Advantage		
Middle class neighbors	% families with income $25,000-$49,999	1970 & 1990 Census
Affluent neighborhood	% families with income $50,000 or more	1970 & 1990 Census
Professional/managerial	% individuals 16 years or older with professional or managerial occupations	1970 & 1990 Census
College[b]	% individuals 25 years or older with 4 or more years of college	1970 & 1990 Census

[a] For 1990 percent households receiving public assistance was utilized.
[b] For 1990 percent individual with a college degree was utilized.

Neighborhood social mobility. Neighborhood social mobility was assessed as the change in the respondent's neighborhood characteristics from childhood to young adulthood. Childhood characteristics were measured at the time the person's case went to court between the years 1967 and 1971. Young adult characteristics were measured approximately 20 years later (between 1989 and 1995). The neighborhood social mobility measure was based on changes in census tract information derived from the person's address at the appropriate time period. Of the original 1460 respondents only 1196 were included in the young adult interview, and thus possessed valid young adult (1990) addresses. Of the 1196 respondents there was valid information for 1085 individuals. It is important to note that individuals who where incarcerated or institutionalized at the time of the young adult interview were excluded ($N = 56$). Additionally, 56 respondents' possessed addresses that could not be linked to census tracts, so for these individuals zip code information was used. Table 3 presents a summary of case attrition. Table 4 presents descriptive statistics for individual level ($N = 1085$) and 1990 neighborhood level ($N = 465$) variables.

Neighborhood social mobility, or change in neighborhood structural characteristics, was calculated so that each change characteristic would have an intuitive interpretation in the analytic models. Change in concentrated disadvantage has a mean of −1.07 ($SD = 5.03$) and ranges from -17.47 to 19.23. Larger negative scores indicate change in the direction of less concentrated disadvantage, while larger positive scores indicate change in the direction of more concentrated disadvantage. Change in residential stability has a mean of .26 ($SD = 2.25$) and ranges from −7.36 to 7.01. For residential stability larger negative scores indicate change in the direction of less

Table 3. Summary of Case Attrition

Original sample individual level $N = 1575$	
Number Excluded	**Reason**
93	Missing 1970 address information
13	Missing 1970 census tract data
8	Missing race
1	Missing age
Direct and interaction hypotheses individual level $N = 1460$	
Follow-up interview individual level $N = 1196$	
Number Excluded	**Reason**
64	Missing 1970 address information
10	Missing 1970 census tract data
3	Missing 1990 address information
5	Missing 1990 census tract data
53	Excluded in prison or jail
3	Excluded institutionalized
Neighborhood social mobility hypothesis individual level $N = 1085$	

Table 4. Descriptive Statistics for Individual (N = 1085) and 1990 Neighborhood (N = 465) Characteristics

	Mean	SD	Minimum	Maximum
Individual Level (N = 1058)				
Abuse/neglect	.55	.50	0	1
Male	.48	.50	0	1
Non-White	.36	.48	0	1
Age	32.08	3.50	22.74	41.93
Same neighborhood	.05	.22	0	1
Change in concentrated disadvantage	-1.07	5.03	-17.47	19.23
Change in residential stability	.26	2.25	-7.36	7.01
Change in ethnic heterogeneity	.11	1.83	-7.04	17.68
Change in concentrated advantage	.51	3.08	-14.11	10.72
Criminal arrests	2.54	4.99	0	38
Violent arrests	.31	.91	0	8
1990 Neighborhood Level (N = 465)				
Concentrated disadvantage	1.29	4.53	-4.67	28.62
Residential stability	-.25	1.73	-6.18	3.40
Ethnic heterogeneity	-.28	1.32	-.87	18.62
Concentrated advantage	-.90	2.90	-8.81	8.28

residential stability, while larger positive scores indicate change in the direction of more residential stability. Change in ethnic heterogeneity has a mean of .11 (SD = 1.83) and a range of –7.04 to 17.68. Larger negative scores mean change in the direction of less ethnic heterogeneity, while larger positive scores indicate change in the direction of more ethnic heterogeneity. Last, concentrated advantage has a mean of .51 (SD = 3.08) with a range of –14.11 to 10.72. For concentrated advantage, larger negative scores mean change to less concentrated advantaged neighborhoods, while larger positive scores indicate change to more advantaged neighborhoods.

Same neighborhood. In order to account for the potential differential effect of individual change versus neighborhood change, an additional neighborhood measure was included. In this data set, it is possible for an individual to be in the same neighborhood in both 1970 and 1990, but the neighborhood structural characteristics may have changed. In order to deconstruct the effects of moving into a neighborhood with different structural characteristics versus living in the same neighborhood in which the neighborhood's structural characteristics change, a new variable same neighborhood was created. Same neighborhood was assessed from the 1970 and 1990 census tract information. Respondents who resided in the same census tract in 1970 and 1990 were coded as 1, and all others were coded as 0. Fifty-five respondents resided in the same neighborhood in 1970 and 1990.

Criminal offending. Criminal offending was assessed from official juvenile and adult arrest data. The decision to use official arrest data is based on the following reasons: (1) readily available; (2) relatively inexpensive; (3) less retrospective bias than self-reports; and (4) generally efficient regarding serious offending (Geerken, 1994).

Data on criminal offending was collected in 1987-88 and then again in 1994 from local, state and federal law enforcement records[5].

Violence. Violence was assessed from official juvenile and adult arrest data. Violence included arrests for the following crimes and attempts: assault, battery, robbery, manslaughter, murder, rape and burglary with injury. As with criminal offending, violent arrests were assessed in 1987-88 and 1994 with data collected from local, state and federal law enforcement records.

Control Variables. In order to reduce the likelihood of spurious findings, one needs to control for variables that either theoretically or empirically serve as covariants of neighborhood factors, child maltreatment, and/or the specific long-term consequences. For example, many of the same individual factors that increase the likelihood of child abuse and neglect are also associated with the development of criminal offending, violence, and substance abuse. Thus, the respondents' gender (0=female, 1=male), race (0=White, non-Hispanic, 1=non-White) and age (at the time of last records check) were included as control variables.

Statistical Techniques and Analysis Strategy

The nested structure of the data is addressed by using hierarchical linear models (HLM) that account for the interdependence of observations within neighborhood clusters. The HLM procedures described in Bryk and Raudenbush (1992) are used to simultaneously estimate within and between neighborhood equations (see Appendix A for more information on the necessity of using HLM models with this data). Using criminal arrests as the example, the model is:

[5] One individual in the study incurred 206 verified criminal arrests. Because this number was usually high and more than 3 standard deviations it was recoded to 53 (the next highest number of arrests).

Individual level model

$$Criminal\ arrests_{ij} = \beta_{0j} + \sum_{q=1}^{11} \beta_q X_{qij} + r_{ij},$$

Where β_{0j} is the intercept; X_{qij} is the value of covariate q associated with respondent *i* in neighborhood *j*; and β_q is the partial effect of that covariated on criminal arrests. The error term, r_{ij}, is the unique contribution of each individual, which is assumed to be independently and normally distributed with constant variance σ^2.

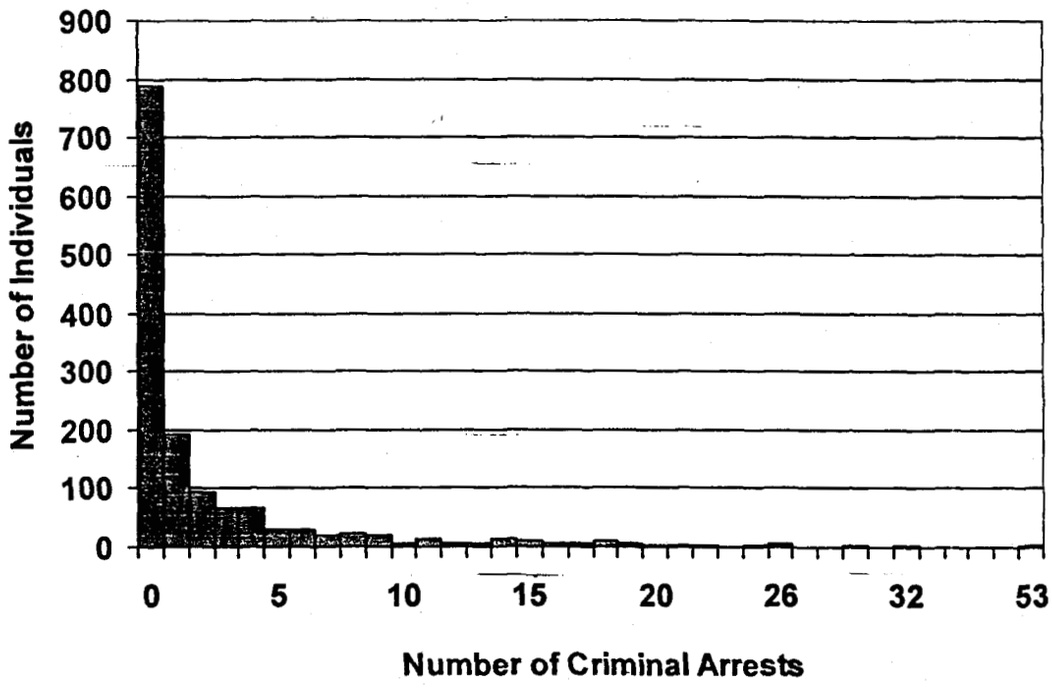
Neighborhood level model

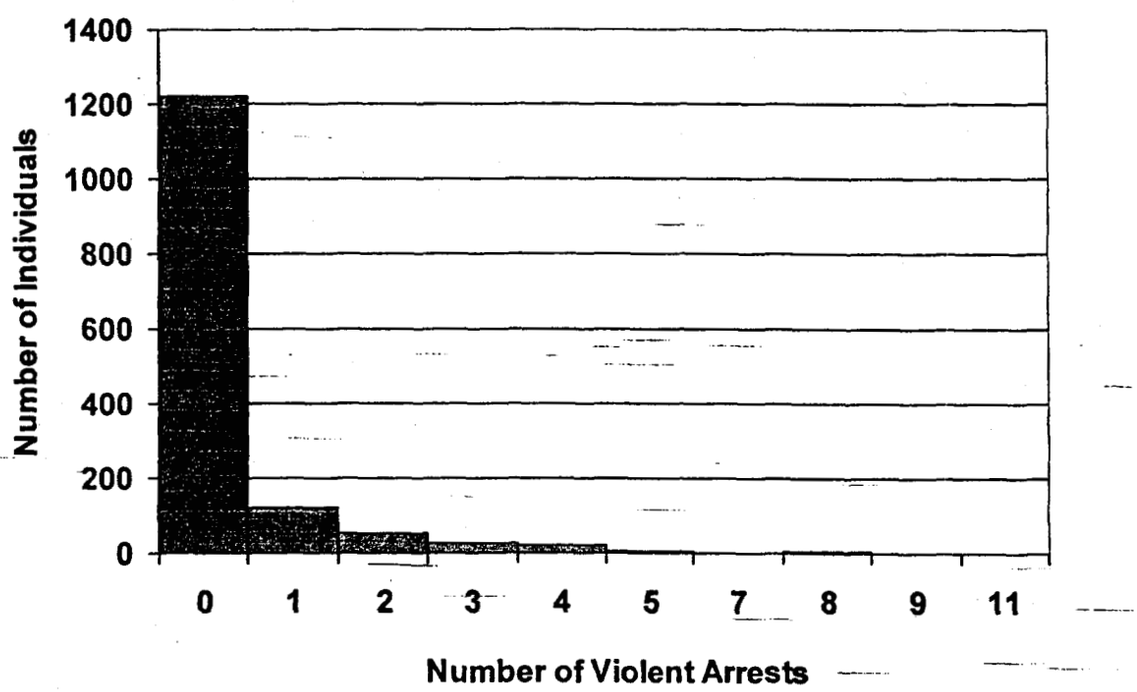
$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Concentrated disadvantage}) + \gamma_{02}(\text{Residential stability}) + \gamma_{03}(\text{Ethnic heterogeneity}) + \gamma_{04}(\text{Concentrated advantage}) + U_{0j},$$

Where γ_{00} is the overall average criminal arrests score and γ_{01} through γ_{04} are the regression coefficients of the effects of concentrated disadvantage, residential stability, ethnic heterogeneity, and concentrated advantage on criminal arrests.

Analyses of both criminal and violent arrests across all individuals in all neighborhoods showed that the data did not fit a normal distribution. The high number of zeros in the data (see Figure 1) meant that a standard transformation could not be used to approximate a normal distribution. Instead, a hierarchical generalized linear model (HGLM), a specialized approach to HLM modeling, was used to simulate a Poisson regression model with a logarithmic link with extra-Poisson variation (Raudenbush, Bryk, Cheong, & Congdon, 2000, ch.5).

Figure 1. The Distribution of the Number of Arrests Per Individual, Criminal Arrests (top) Violent Arrests (bottom).





Hierarchical generalized linear modeling (HGLM), like HLM modeling, is sensitive to the location of the level-1 predictor variables. Bryk and Raudenbush (1992), as well as others (e.g., see Firebaugh, 1978), argue that the individual-level coefficient of interest is the pooled-within-neighborhood relationship (β_w):

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij} - \overline{X}_j) + r_{ij}$$
$$\beta_{0j} = \gamma_{00} + u_{0j}$$
$$\beta_{1j} = \gamma_{10}$$
where $\gamma_{10} = \beta_w$

This means that all empirical tests of the direct, interaction, and neighborhood social mobility hypotheses used level-1 predictors that were group-mean centered. Due to the difficulty of disentangling individual and neighborhood effects, researchers have recommended using more liberal alpha levels (Kenny & La Voie, 1985; Myers, 1972). The ability to detect statistical significance depends on a number of factors including effect size, precision of estimates and sample size. Multilevel studies often do not have the statistical power to detect complex interactions. For this reason a more liberal alpha level of .10 was used in this study. This is consistent with previous studies using HLM modeling (Sampson et al., 1997).

Due to the complexity of the analyses, the analysis strategy is divided into five steps. The first step of the analysis strategy was to geo-code all of the respondents' childhood and young adulthood addresses into the appropriate 1970 and 1990 census tracts. The 1970 addresses were geo-coded by hand[6]. Of the original 1575 individuals there was valid information for 1460. The young adult addresses (1990) were geo-coded

[6] The 1970 geo-coding was done by hand because of the unavailability of computerized 1970 street information.

using commercial geo-coding software, ArcView 3.2[7]. ArcView 3.2 contains the address ranges from the Census Bureau's Tiger/Line files and allows the placement of each address at its geographic location on a map.

The second step involved in the analysis strategy was building individual level models. Using procedures outlined in Bryk and Raudenbush (1992), the "step-up" approach was used to develop appropriate individual level models that would serve as the baseline for testing the direct and interaction hypotheses. Individual baseline models were developed for both criminal arrests and violent arrests (see Appendix B for all individual level models).

The third step involved using the baseline models to test the direct and interaction hypotheses. There is some debate on how best to assess neighborhood effects (see Duncan & Raudenbush, 2001). In the past, researchers have conducted factor analyses on the neighborhood structural characteristics to examine the underlying organization of census-tract variables, and then, they have used the factor scores to assess the effect of neighborhood characteristics on individual outcomes. However, for the current study this approach presents several problems[8]. First, because the effects of residential stability maybe curvilinear - with both high and low rates of mobility indicating neighborhood problems – its inclusion with concentrated disadvantage may violate the assumption of linearity in factor analysis. Such a situation would make including measures of

[7] Although there is little literature on the accuracy of geo-coding, two independent studies have shown that that the error rate to be between 5 and 8 percent (see Krieger, & Waterman, Leuieux, 2001; Ratcliffe, 2001).

[8] See Appendix C for more information on factor analysis and the non-linear relationship between concentrated disadvantage and residential stability.

residential stability and concentrated disadvantage inappropriate[9]. Second, it would be extremely difficult to replicate the factor scores for the young adult neighborhood data (1990). This situation would make the testing of the neighborhood social mobility hypothesis impossible. Third, and probably most important, the arbitrary imposition of the restriction that the factors must be uncorrelated (orthogonal rotation) often does not capture the complexity of real neighborhoods. This technique often creates artificial constructs that are not true representations of actual neighborhoods. Thus, real world policy implications drawn from such analyses would be problematic.

Instead, a better approach is to add each neighborhood characteristic sequentially, and to assess the added contribution of each structural characteristic. According to the theoretical interpretation of Shaw and McKay, "economic level, mobility and heterogeneity are in that order, the variables assumed to account for variation in the capacity of subcommunities within a city to generate an effective system of controls" (Kornhauser, 1978, p.83). Based on this theoretical perspective the neighborhood structural characteristics were added and assessed in the following order - concentrated disadvantage, residential stability, ethnic heterogeneity, and concentrated advantage. The interaction hypothesis or moderation effect was explored through hierarchical generalized linear modeling (HGLM) that included interactions between child maltreatment and the neighborhood structural characteristics.

The fourth step of the analysis strategy involved testing the neighborhood social mobility hypothesis. According to Baron and Kenny (1986) there are three equations that

[9] This problem is not unique to this data set. Duncan and Aber (1997) encountered the same problem with the Panel Study of Income Dynamics (PSID) data and were forced to drop residential stability from their factor analysis.

must be performed and four conditions that must be met to establish a mediation relationship. Using the variables in this research the three equations are:

Equation 1 - Individual level

$$\text{Offending}_{ij} = \beta_{0j} + \beta_{1a}X_{1aij}(\text{Abuse/neglect}) + \sum_{q=1}^{11}\beta_q X_{qij}\,(\text{Control variables}) + r_{ij}$$

where offending is expected to follow the $Y_{ij}|\lambda_{ij} \sim P(\eta_{ij},\lambda_{ij})$ sampling model and have a variance of $1/w_{ij}$ where $w_{ij} = \eta_{ij}\lambda_{ij}$.

Equation 1 - Neighborhood level

$$\beta_{0j} = \gamma_{00} + U_{0j},$$

where γ_{00} is the overall average offending score for the 1970 neighborhood

Equation 2 - Individual level

$$\text{Change in neighborhood factor}_{ij} = \beta_{0j} + \beta_{1b}X_{1bij}(\text{Abuse/neglect}) + \sum_{q=1}^{11}\beta_q X_{qij}\,(\text{Control variables}) + r_{ij}$$

where change in neighborhood factor is expected to follow a normal distribution and r_{ij} have a variance of $1/w_{ij}$ where $w_{ij} = \eta_{ij}\lambda_{ij}$.

Equation 2 - Neighborhood level

$$\beta_{0j} = \gamma_{00} + U_{0j},$$

where γ_{00} is the overall average offending score for the 1970 neighborhood

Equation 3 - Individual level

$$\text{Offending}_{ij} = \beta_{0j} + \beta_{1c}X_{1cij}(\text{Abuse/neglect}) + \sum_{q=1}^{11}\beta_q X_{qij}(\text{Change in neighborhood factors}) + \sum_{q=1}^{11}\beta_q X_{qij}(\text{Control variables}) + r_{ij}$$

where offending is expected to follow the $Y_{ij}|\lambda_{ij} \sim P(\eta_{ij},\lambda_{ij})$ sampling model and have a variance of $1/w_{ij}$ where $w_{ij} = \eta_{ij}\lambda_{ij}$.

Equation 3 - Neighborhood level

$$\beta_{0j} = \gamma_{00} + U_{0j},$$

where γ_{00} is the overall average offending score for the 1970 neighborhood

Using these equations, the four necessary conditions for a mediation effect are: (1) β_{1a} must be significant; (2) β_{1b} must be significant; (3) β_q associated with the neighborhood structural characteristics change scores must be significant; and (4) β_{1a} must be smaller than β_{1c}. If β_{1a} is reduced to a non-significant effect, full mediation is demonstrated. If β_{1a} is reduced, but still significant, then partial mediation is demonstrated. If β_{1a} is not reduced and still significant, then mediation is not present. The control variables were included in the estimation of all models, and separate models were estimated for each outcome – criminal and violent arrests

At present there is no "conventional" procedure for determining statistical differences in Poisson regression coefficients calculated with hierarchical generalized linear modeling (HGLM)[10]. Thus, for these analyses the reduction in β_{1a} will be reported, and then generally assessed using the 95% confidence intervals from the estimate of β_{1a} and β_{1c}.

The final step of the analysis involves replicating the interaction analyses by type of abuse (any physical abuse, any sexual abuse and any neglect), gender (male and female) and race (White, non-Hispanic and non-White). The interaction analyses were replicated with appropriate interaction terms to assess the potential differing effects.

[10] The models in this dissertation included a parameter to correct for over-dispersion. The techniques put forth by Clogg, Petkova, & Haritou (1995) to compare regression coefficients cannot be applied in these models because the variances are not constant.

CHAPTER IV: RESULTS - CRIMINAL ARRESTS

This chapter is organized into four sections. The first section presents the results for the individual level model. The individual level model served as the basis for subsequent tests of the direct and interaction hypotheses. The second section focuses on the empirical test of the direct hypothesis - *child maltreatment and negative neighborhood structural characteristics independently increase the likelihood of criminal offending*. Consistent with the analysis strategy introduced in the earlier chapter (III), each neighborhood structural characteristic -- concentrated disadvantage, residential stability, ethnic heterogeneity, and concentrated advantage -- was added to the intercept of the individual level model in a stepwise progression to assess the effect of neighborhood structural characteristics on rates of criminal arrests. The third section presents the results for the interaction hypothesis -- *the impact of child maltreatment on criminal offending will be more pronounced in neighborhoods characterized by negative structural characteristics*. In this section, each neighborhood structural characteristic – concentrated disadvantage, residential stability, ethnic heterogeneity, and concentrated advantage -- was added to both the intercept and the slope of abuse/neglect in a stepwise progression to assess the conjoint influence of abuse/neglect and neighborhood on criminal outcomes. The fourth, and final section, presents a summary of the results of the interaction hypothesis by gender, race and type of abuse/neglect.

Individual Level Model - Criminal Arrests

The first step in the analysis strategy was to develop an appropriate individual level model that could be used to assess the direct and interaction hypotheses for the

dependent variable criminal arrests[11]. Using procedures outlined in Bryk and Raudenbush (1992) the "step-up" approach to level-1 model building was used. The most appropriate individual level model for criminal arrests is as follows:

Individual level

$$\text{Number of criminal arrests}_{ij} = \beta_{0j} + \beta_1 X_{1ij}(\text{Abuse/neglect}) + \beta_2 X_{2ij}(\text{Male}) + \beta_3 X_{3ij}(\text{Non-White}) + \beta_4 X_{4ij}(\text{Age}) + r_{ij}$$

where β_{0j} is the intercept; $\mathbf{X}_1$ is the value of the covariate for abuse/neglect associated with respondent *i* in neighborhood *j*; $\mathbf{X}_2$ is the value of the covariate for male associated with respondent *i* in neighborhood *j*; $\mathbf{X}_3$ is the value of the covariate for non-White associated with respondent *i* in neighborhood *j*; $\mathbf{X}_4$ is the value of the covariate for age associated with respondent *i* in neighborhood *j*; β_1 is the log-event rate for abuse/neglect on criminal arrests; β_2 is the log-event rate for male on criminal arrest; β_3 is the log-event rate for non-White on criminal arrests; and β_4 is the log-event rate for age on criminal arrests. The error term, r_{ij}, is the unique contribution of each individual, and assumed to follow the $Y_{ij}|\lambda_{ij} \sim P(\eta_{ij},\lambda_{ij})$ sampling model; and have a variance of $1/w_{ij}$ where $w_{ij} = \eta_{ij}\lambda_{ij}$.

[11] For a complete description of all intermediate models involved in the individual level (level-1) modeling building process see Appendix C.

Neighborhood level

$\beta_{0j} = \gamma_{00} + U_{0j},$

$\beta_{1j} = \gamma_{10} + U_{1j},$

$\beta_{2j} = \gamma_{20},$

$\beta_{3j} = \gamma_{30},$

$\beta_{4j} = \gamma_{40}$

where γ_{00} is the overall log average number of criminal arrests and is assumed to vary across neighborhoods (U_{0j}); γ_{10} is the effect for abuse and is assumed to vary across neighborhoods (U_{1j}); γ_{20} is the effect for male and is assumed invariant across neighborhoods; γ_{30} is the effect for non-White and is assumed invariant across neighborhoods; γ_{40} is the effect for age and is assumed invariant across neighborhoods.

Table 5 presents the results of the analysis for individual level model for criminal arrests. This model evaluates the effects of the explanatory variables on the log event rate of criminal arrests. As anticipated, the model shows that being abused and/or neglected significantly increases the rate of criminal arrests. The estimate for abuse/neglect (.46) indicates that the arrest rate for abused and/or neglected respondents is 58% greater than that for controls. As expected, the other individual characteristics, male (b = 1.49, SE = .10, t = 15.23, p = <.001), non-White (b = .77, SE = .15, t = 5.04, p = <.001), and age (b = .06, SE = .01, t = 4.99, p = <.001) are also strongly associated with increased rates of criminal arrests. Males have an arrest rate 344% greater than females,

Table 5. Individual Baseline Model for Criminal Arrests

	Criminal Arrests		
	b	*SE*	*Exp(b)*
Fixed Effects			
Individual Level			
Abuse/neglect	.46***	.12	1.58
Male	1.49***	.10	4.44
Non-White	.77***	.15	2.16
Age	.06***	.01	1.06
Neighborhood Level			
Intercept	.54***	.07	1.72
Random Effects	*Reliability*		*Variance*
Intercept (τ_{00})	.48		.30***
Abuse/neglect (τ_{11})	.25		.45*
Individual level (σ^2)			5.45

[a] p<.10 *p<.05 **p<.01 ***p<.001

non-Whites 116% greater than White, non-Hispanics, and each additional year in age is associated with a 6% increase in the arrest rate.

With regard to the neighborhood level, the mean number of criminal arrests in each neighborhood is 1.72. This estimate is the average number of arrests in each neighborhood after correcting for disproportionate risk in each neighborhood based on the individual characteristics. That is, the neighborhood mean arrest rate is adjusted by the proportion of abused/neglected, male, non-White and older respondents.

Table 5 also provides variance estimates of the random effects. Specifically, the estimated variance among neighborhood criminal arrests is .30, with a X^2 statistic of 265.63, to be compared to the critical value of X_2 with $J\text{-}1 = 149$ degrees of freedom. From these results, the null hypothesis ($\tau_{00} = 0$) can be rejected and it can be inferred that there are statistically significant differences in the mean number of criminal arrests among the 150 neighborhoods. The estimated variance of the slope for abuse/neglect is .45 with a X^2 statistics of 141.07 and 114 degrees of freedom. The null hypothesis ($\tau_{11} = 0$) can be rejected and it can be inferred that the relationship between abuse/neglect and criminal arrests varies across neighborhoods.

Associated with estimated log mean neighborhood number of criminal arrests (β_{0j}) and the slope for abuse/neglect (β_{1j}) are reliability estimates. Reliability estimates indicate on average how reliable the estimates are of the intercept and slope, based on computing each intercept and slope separately for each neighborhood. Reliability estimates depend on the "degree to which the true underlying parameters vary" from neighborhood to neighborhood and "the precision with which each" neighborhood "regression equation is estimated" (Bryk & Raudenbush, 1992, p. 69). Only when

reliabilities become very small (i.e., <.05) are there statistical difficulties in estimating the coefficients (Bryk & Raudenbush, 1992, p. 69)[12].

The results indicate that the intercepts are reliable (.48). The slope estimate for abuse/neglect is somewhat less reliable (.25), but still within acceptable levels. The primary reason for less reliability of the slope is that the true slope variance across neighborhoods is much smaller than the variance of the true means. Additionally, the slopes are estimated with less precision than means because more neighborhoods are relatively more homogeneous on abuse/neglect.

The estimate of the individual level variance (σ^2) is 5.45. The "variance explained" or the proportion of reduction in variance can be calculated at the individual level by comparing the variance estimate from a one-way ANOVA model (see Appendix A), which did not include the individual level covariates (abuse/neglect, male, non-White and age) to the criminal arrests model described above. For example:

Equation 4.1

$$\text{Proportion variance explained at individual level} = \frac{\sigma^2 \text{ (random ANOVA)} - \sigma^2 \text{ (baseline individual model)}}{\sigma^2 \text{ (random ANOVA)}}$$

Adding abuse/neglect, male, non-White and age reduced the within-neighborhood variance by 58%. In other words, the individual level variables account for approximately 58% of the individual level variation in criminal arrests.

[12] Unlike more traditional estimates of reliability, such as Cronbach (1951) α, reliability estimates for multilevel data do not have well-established "acceptable" levels. The reliability reported is the average reliability for the associated unit of analysis. The computational method used by HLM basically uses "conditional shrinkage" to correct for less reliable units (Bryk & Raudenbush, 1992). This means the estimates produced from less reliable units are shrunk toward the grand data estimated mean. At this point, the only defined criteria for reliability in HGLM models is statistical adequacy. When reliabilities become too small (<.05), then the model has difficulty estimating the parameters.

Direct Hypothesis - Criminal Arrests

Using the individual level as a baseline model, the neighborhood structural characteristics -- concentrated disadvantage, residential stability, ethnic heterogeneity, and concentrated advantage -- were added in a stepwise progression to assess the direct hypothesis. Table 6 presents these results.

Model 1 presents the results with the introduction of neighborhood *concentrated disadvantage*. As hypothesized, respondents from disadvantaged neighborhoods are more likely to engage in criminal activity. The estimate for concentrated disadvantage (.05) indicates that for each unit increase in concentrated disadvantage there is an estimated 5% increase in the rate of criminal arrests. Using the standard deviation of concentrated disadvantage (SD = 4.35) the mean number of criminal arrests for neighborhoods that score either two standard deviations below or above the average level of concentrated disadvantage can be calculated; 1.04 criminal arrests for neighborhoods that fall two standard deviations below and 2.47 criminal arrests for neighborhoods that fall two standard deviations above. Put another way, respondents from very disadvantaged neighborhoods (+2 SD) on average acquired 1½ more arrests than respondents from neighborhoods with low levels of concentrated disadvantage (-2 SD).

Table 6 also provides the variance estimates for the random effects. For Model 1, the variance among neighborhoods is .27, with a X^2 statistic of 219.38, to be compared to the critical value of X_2 with $J\text{-}1$=149 degrees of freedom. From these results the null hypothesis ($\tau_{00} = 0$) can be rejected and it can be inferred that statistically significant

Table 6. The Impact of Child Maltreatment and Neighborhood Structural Characteristics on Criminal Arrests

	Model 1			Model 2			Model 3			Model 4		
	b	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*
Fixed Effects												
Individual Level												
Abuse/neglect	.50***	.13	1.65	.50***	.13	1.65	.51***	.13	1.67	.51***	.13	1.67
Male	1.49***	.10	4.44	1.49***	.10	4.44	1.49***	.10	4.44	1.49***	.10	4.44
Non-White	.75***	.15	2.12	.76***	.15	2.14	.76***	.15	2.14	.76***	.15	2.14
Age	.06***	.01	1.06	.06***	.01	1.06	.06***	.01	1.06	.06***	.01	1.06
Neighborhood Level												
Intercept	.47***	.08	1.60	.48***	.08	1.62	.46***	.08	1.58	.47***	.08	1.60
Concentrated disadvantage	.05***	.01	1.05	.06**	.02	1.06	.06**	.02	1.06	.06**	.02	1.06
Residential stability				.08[a]	.04	1.08	.06	.05	1.06	.05	.05	1.05
Ethnic heterogeneity							-.07	.05	.93	-.08	.06	.92
Concentrated advantage										.01	.03	1.01
Random Effects	*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*	
Intercept (τ_{00})	.46	.27***		.45	.26***		.45	.25***		.45	.26***	
Abuse/neglect (τ_{11})	.28	.52*		.28	.52*		.28	.52*		.27	.52*	
Individual level (σ^2)		5.36			5.36			5.35			5.35	

[a] p<.10 *p<.05 **p<.01 ***p<.001

differences in mean number of criminal arrests exist among the 150 neighborhoods, even after controlling for neighborhood concentrated disadvantage.

Similar, to the "variance explained" concept introduced earlier in this chapter, the proportion of reduction in variance at the neighborhood level can be calculated by comparing the neighborhood variance estimate from the individual model to the model presented in Table 6.

Equation 4.2

$$\text{Proportion variance explained at neighborhood level} = \frac{\tau_{00}\text{ (individual model)} - \tau_{00}\text{ (concentrated disadvantage)}}{\tau_{00}\text{ (individual model)}}$$

Adding concentrated disadvantage reduces the neighborhood level or between neighborhood variance by 1%.

Model 2 presents the results with the introduction of *residential stability*. Contrary to the hypothesis, the estimate for residential stability suggests that as residential stability increases the rate of criminal arrests increases by about 8%. However, the standard error for the estimate is relatively large, signifying that the 95% confidence interval includes zero (*95% CI* = .00-.16); thus, reducing the certainty that the estimate for residential stability differs from zero.

The slope for neighborhood concentrated disadvantage changes slightly from .05 to .06 when residential stability is added. This suggests a suppression effect. While this may not seem like a large change, the cumulative effect of going from a 5% increase in the criminal arrest rate to a 6% increase is substantial. At two standard deviations above the mean for neighborhood concentrated disadvantage, the mean arrest rate for the

equation presented in Model 2 is 2.72 versus 2.42 for Model 1. This change corresponds to an 11% increase in the average number of arrests for respondents residing in the most disadvantaged neighborhoods (+2 *SD*).

Using equation 4.2 presented earlier in this chapter, the neighborhood level "variance explained" can be calculated by adding residential stability. The neighborhood variance component was reduced from .27 to .26. Hence, it can be concluded that the addition of residential stability accounts for an additional .04% of the neighborhood variation in criminal arrests.

Model 3 presents the results with the introduction of *ethnic heterogeneity*. The estimate for ethnic heterogeneity (-.07) shows that as ethnic heterogeneity increases the rate of criminal arrests decreases by 7%. However, the large standard error and corresponding small t-ratio, indicates that one cannot reject the null hypothesis that the coefficient is actually different from zero. The introduction of ethnic heterogeneity does not substantially change the estimate for concentrated disadvantage. However, the introduction of ethnic heterogeneity reduces the estimate for residential stability, from .08 to .06. These results suggest that residential stability and ethnic heterogeneity share some of the variance associated with criminal arrests. Additionally, although the estimate for ethnic heterogeneity is not statistically significant, its introduction into the model accounts for an additional .04% of the neighborhood level variance in criminal arrests.

Model 4 presents the results with the introduction of *concentrated advantage*. The estimate for concentrated advantage (.01) indicates that for a one-unit change in concentrated advantage the rate of criminal arrests increases by 1%. However, the relatively large standard error and correspondingly small t-ratio, indicates that the null

hypothesis cannot be rejected. While the addition of concentrated advantage slightly affects the estimates for residential stability (.06 to .05) and ethnic heterogeneity (-.07 to -.08) it does not explain any additional neighborhood level variance in criminal arrests. The random effects component ($\tau_{00} = .26, X^2 = 210.39, df = 149, p = <.001$) suggests, that even after controlling for neighborhood concentrated disadvantage, residential stability, ethnic heterogeneity, and concentrated advantage, there is still unexplained neighborhood level variance in criminal arrests.

It is important to note the estimate for abuse/neglect is positive and statistically significant across all four models. Even with the introduction of all neighborhood structural characteristics -- concentrated disadvantage, residential stability, ethnic heterogeneity and concentrated advantage -- being abused and/or neglected in early childhood remains a significant factor in later criminal offending.

Interaction Hypothesis - Criminal Arrests

Using the individual level model presented earlier as a baseline, the neighborhood characteristics -- concentrated disadvantage, residential stability, and ethnic heterogeneity -- were added to both the intercept and to the slope of abuse/neglect in a stepwise progression to assess the interaction hypothesis. Table 7 presents these results.

Model 1 presents the results for the introduction of *concentrated disadvantage*. The estimate for the interaction between abuse/neglect and concentrated disadvantage (.03) indicates that for each unit increase in concentrated disadvantage there is a 3%

Table 7. The Impact of the Conjoint Influence of Child Maltreatment and Neighborhood Structural Characteristics on Criminal Arrests

	Model 1			Model 2			Model 3			Model 4		
	b	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*
Fixed Effects												
Abuse/neglect	.42**	.14	1.52	.44**	.14	1.55	.42**	.14	1.52	.39*	.17	1.48
Concentrated disadvantage	.05***	.01	1.05	.06***	.02	1.06	.05**	.02	1.05	.06**	.02	1.06
Abuse/neglect x Concentrated disadvantage	.03	.03	1.03	.05[a]	.03	1.05	.04	.03	1.04	.04	.03	1.04
Residential stability				.07[a]	.04	1.07	.05	.05	1.05	.05	.05	1.05
Abuse/neglect x Residential stability				.17*	.08	1.19	.14	.09	1.15	.14	.09	1.04
Ethnic heterogeneity							-.08	.05	.92	-.08	.06	.92
Abuse/neglect x Ethnic heterogeneity							-.09	.11	.91	-.08	.11	.92
Concentrated advantage										.01	.03	1.01
Abuse/neglect x Concentrated advantage										-.02	.08	.98
Random Effects	*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*	
Intercept (τ_{00})	.46	.26***		.44	.25***		.44	.25***		.44	.25***	
Abuse/neglect (τ_{11})	.27	.50*		.25	.46[a]		.25	.45[a]		.26	.48[a]	
Individual level (σ^2)		5.37			5.39			5.39			5.37	

[a] p<.10 *p<.05 **p<.01 ***p<.001

Note: All equations control for male, non-White, and age.

increase in the slope for abuse/neglect. However, the standard error for the estimate is relatively large indicating that the 95% confidence interval includes zero (*95% CI* = -.03-.09).

The estimated variance among neighborhoods for Model 1 is .26, with a X^2 statistic of 219.11, to be compared to the critical value of X_2 with $J\text{-}1$=149 degrees of freedom. From these results the null hypothesis ($\tau_{00} = 0$) can be rejected and it can be concluded that statistically significant differences in mean number of criminal arrests exist among the 150 neighborhoods, even after controlling for the direct and interaction effects of neighborhood concentrated disadvantage. The estimated variance of the slope for abuse/neglect for Model 1 is .50 with a X^2 statistics of 137.77 and 114 degrees of freedom. The null hypothesis ($\tau_{11} = 0$) can be rejected, indicating that the relationship between abuse/neglect and criminal arrests varies across the population of neighborhoods, even after controlling for the effect of neighborhood concentrated disadvantage.

Using a variant of equation 4.2, the amount of "variance explained" in the intercept when the interaction effect for concentrated disadvantage is added can be calculated.

Equation 4.3

$$\text{Proportion variance explained in intercept} = \frac{\tau_{00}(\text{direct effect only}) - \tau_{00}(\text{direct and interaction effect})}{\tau_{00}(\text{direct effect only})}$$

In addition, another modification of equation 4.2 can be used to calculate the amount of "variance explained" in the slope of abuse/neglect in criminal arrests when the interaction effect is added.

Equation 4.4

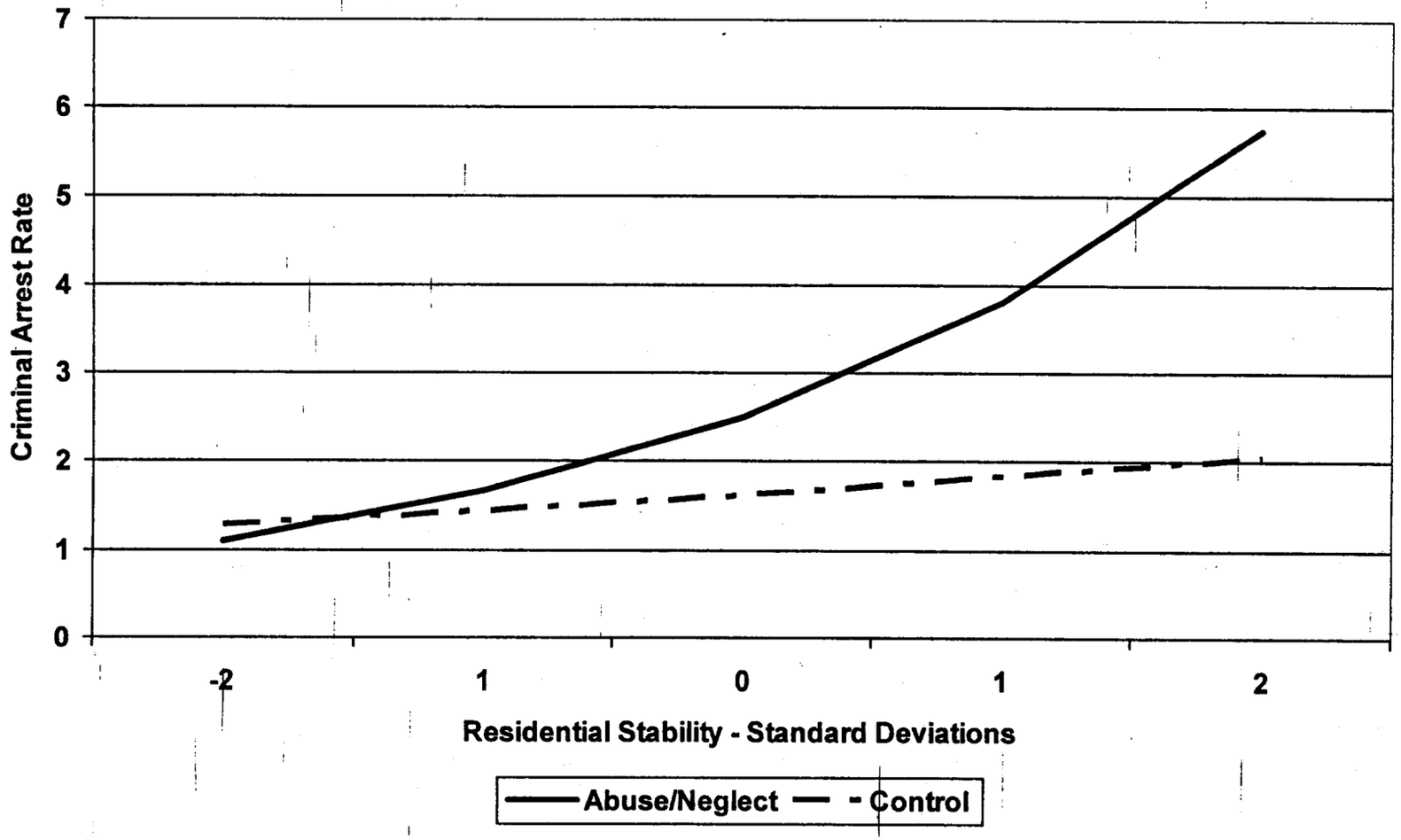
$$\text{Proportion variance explained in abuse/neglect slope} = \frac{\tau_{11}(\text{direct effect only}) - \tau_{11}(\text{direct and interaction effect})}{\tau_{11}(\text{direct effect only})}$$

Adding the interaction effect for concentrated disadvantage reduced the variance in the intercept slope by approximately .04%, and reduced the variance in the abuse/neglect slope by approximately .04%.

Model 2 presents the results with the introduction of *residential stability*. The findings suggest that early child maltreatment has its largest negative impact on individuals from neighborhoods characterized by high levels of residential stability. Put another way, the effect of child abuse and/or neglect is greatest for those individuals from neighborhoods with more residential stability. The estimate for the interaction between abuse/neglect and residential stability (.17) shows that for each one-unit increase in residential stability there is a 19% increase in the slope for abuse/neglect. Figure 2 presents a graphical representation of the relationship between residential stability, abuse/neglect and criminal arrests.

Interestingly, the introduction of residential stability significantly changes the estimate for the interaction between abuse/neglect and concentrated disadvantage, from .03 ($SE = .03, t = 1.14, p = .225$) to .05 ($SE = .03, t = 1.76, p = .007$), respectively. As hypothesized the negative impact of abuse and/or neglect is greatest for those individuals

Figure 2. The Impact of Residential Stability on Criminal Arrests for Abuse/Neglect and Controls



from neighborhoods characterized by high levels of concentrated disadvantage. Again, residential stability appears to play a suppression role between concentrated disadvantage and criminal arrests. Figure 3 presents a graphical representation of the effect of concentrated disadvantage based on the equation presented in Model 2.

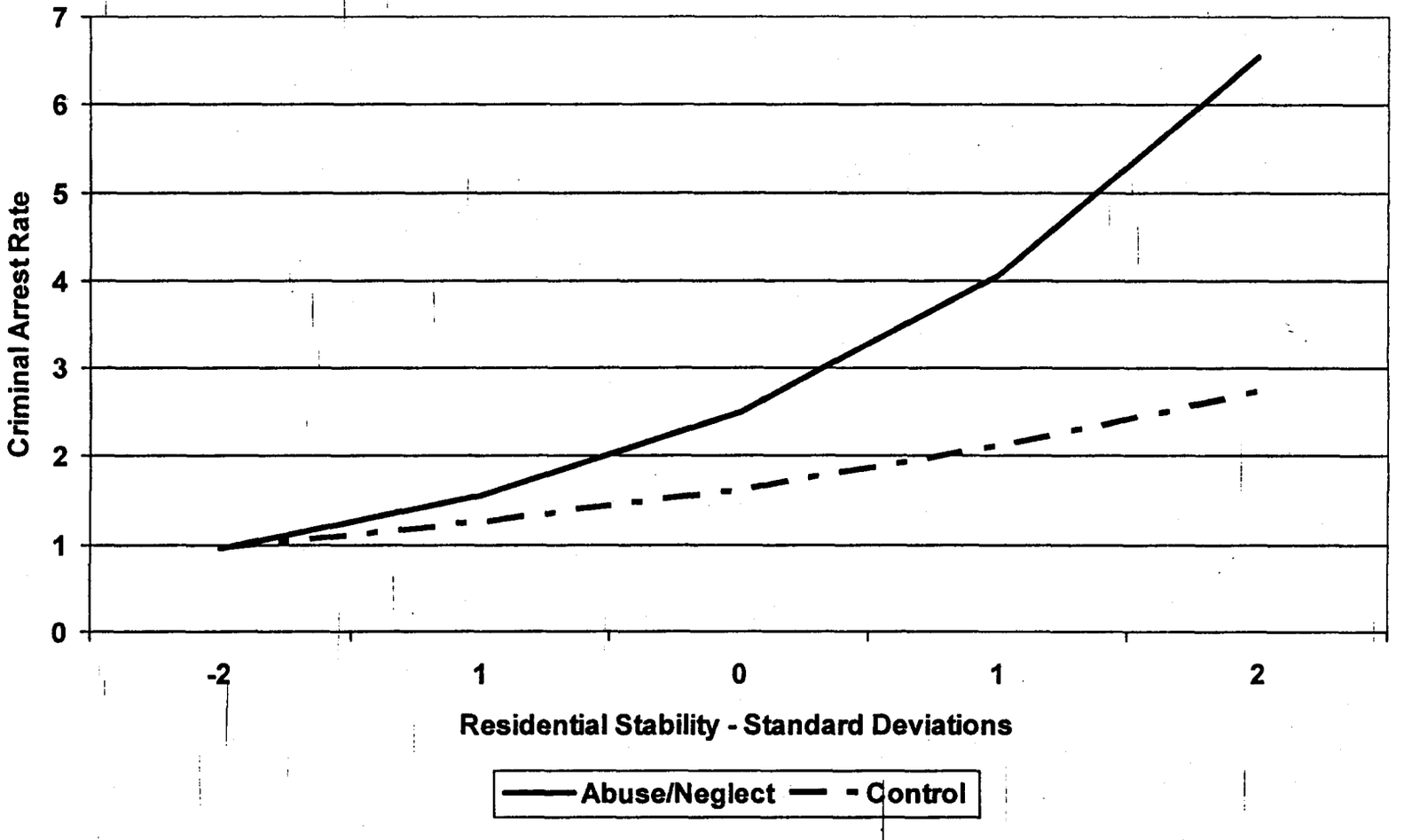
The estimate of the variance of the random effects for the intercept ($\tau_{00} = .25, X^2 = 210.61, df = 149, p = <.001$) remains highly significant indicating that there is still a substantial amount of unexplained variance in neighborhood criminal arrests, even after controlling for both concentrated disadvantage and residential stability. However, the estimate of the variance for the slope for abuse/neglect ($\tau_{11} = .46, X^2 = 134.37, df = 114, p = .065$) is greatly reduced, becoming only marginally significant.

Using equations 4.3 and 4.4 the amount of "variance explained" attributable to the introduction of the interaction effect of residential stability can be calculated; 12% reduction for the abuse/neglect slope variance and .04% reduction in intercept variance. In addition, using variants of equations 4.3 and 4.4 the additional amount of "variance explained" by adding the residential stability (direct and interaction – Model 2) over the model with just concentrated disadvantage (direct and interaction – Model 1) can be calculated:

Equation 4.5

$$\text{Proportion variance explained in intercept} = \frac{\tau_{00}\left[\begin{array}{c}\text{concentrated disadvantage}\\ \text{direct/interaction effects}\end{array}\right] - \tau_{00}\left[\begin{array}{c}\text{concentrated disadvantage}\\ \text{+ residential stability}\\ \text{direct/interaction effects}\end{array}\right]}{\tau_{00}\left[\begin{array}{c}\text{concentrated disadvantage}\\ \text{direct/interaction effects}\end{array}\right]}$$

Figure 3. The Impact of Concentrated Disadvantage on Criminal Arrests for Abuse/Neglect and Controls



Equation 4.6

$$\text{Proportion variance explained in abuse/neglect slope} = \frac{\tau_{11}\,[\text{concentrated disadvantage direct/interaction effects}] - \tau_{11}\,[\text{concentrated disadvantage + residential stability direct/interaction effects}]}{\tau_{11}\,[\text{concentrated disadvantage direct/interaction effects}]}$$

Using these equations, the introduction of residential stability explains an additional .04% of the variance in the intercept and 8% of the variance in the slope associated with abuse/neglect.

Model 3 presents the results with the introduction of *ethnic heterogeneity*. In contrast, to what was hypothesized, the estimate for the interaction between abuse/neglect and ethnic heterogeneity (-.09) indicates that for each unit increase in ethnic heterogeneity there is a corresponding 8% decrease in the slope of abuse/neglect. However, the large standard error and resulting small t-ratio and large p-value indicate that this estimate cannot be statistically distinguished from zero.

The introduction of ethnic heterogeneity changes estimates for the interaction effects for both concentrated disadvantage (from Model 2 - $b = .05$, $SE = .03$, $t = 1.99$, $p = .077$ to Model 3 - $b = .04$, $SE = .03$, $t = 1.37$, $p = .171$) and residential stability (from Model 2 - $b = .17$, $SE = .08$, $t = 1.99$, $p = .047$ to Model 3 - $b = .14$, $SE = .09$, $t = 1.59$, $p = .113$). These changes indicate that concentrated disadvantage, residential stability and ethnic heterogeneity share some variance relative to the effect of abuse/neglect on criminal arrests.

The estimate of random effects variance for the intercept (τ_{00} = .25, X^2 = 209.25, df = 149, p = <.001) remains highly significant indicating that there is still a substantial amount of unexplained variance in neighborhood criminal arrests, even after controlling for concentrated disadvantage, residential stability and ethnic heterogeneity. The estimate of slope variance for abuse/neglect (τ_{11} = .45, X^2 = 132.39, df = 114, p = .072) is slightly reduced. While the introduction of ethnic heterogeneity does not account for any explained variance in the intercept, it does account for an additional .04% in the variance of the abuse/neglect slope.

Model 4 presents the results with the introduction of *concentrated advantage*. The estimate for the interaction is -.02 with a standard error of .08 and a t-ratio of -.26. The relatively large standard error and small t-ratio and large p-value indicate that this estimate is not statically distinguishable from zero. Additionally, the introduction of concentrated advantage over the model introducing ethnic heterogeneity (Model 3) does not account for any additional variance in either the intercept or the slope of abuse/neglect.

The random effects variance estimate for the intercept (τ_{00} = .25, X^2 = 208.07, df = 149, p = <.001) remains highly significant even after controlling for concentrated disadvantage, residential stability, ethnic heterogeneity, and concentrated advantage. These results suggest that there are still unidentified neighborhood level characteristics important in influencing individual criminal behavior. In contrast, the slope estimate of variance for abuse/neglect (τ_{11} = .48, X^2 = 131.09, df = 114, p = .073) remains only marginally significant. This indicates that there may or may not still be some additional variance in the abuse/neglect slope not accounted for by the neighborhood constructs.

Gender, Race and Type of Abuse/Neglect Difference - Criminal Arrests

Gender and race differences. Three-way interaction effects were included in the models to test for gender and race differences. None of the 3-way interaction estimates reached marginal statistical significance ($p < .10$). These results indicate that the relationship between abuse/neglect, the neighborhood structural characteristics -- concentrated disadvantage, residential stability and ethnic heterogeneity -- and criminal offending do not differ for males versus females or for Whites, non-Hispanics versus non-Whites. For a complete description of gender and race models see Appendix D.

Type of abuse/neglect differences. Consistent with the analysis strategy the interaction hypothesis analyses were re-calculated by types of abuse. Table 8 presents the results. The results, across all four models, consistently suggest that neighborhood concentrated disadvantage exacerbates the criminal consequences of childhood neglect. The interaction estimates for neglect and disadvantage indicate that for one-unit change in concentrated disadvantage there is a 5% to 6% increase in the slope for neglect. The estimates for physical abuse are positive but do not reach conventional levels of statistical significance. The interaction estimates for sexual abuse are negative and statistically significant across all models. For each unit increase in concentrated disadvantage there is a 13% to 14% decrease in the slope for sexual abuse. Surprising, in this case, the findings suggest that there is some factor associated with concentrated disadvantage that buffers the negative criminal consequences associated with early childhood sexual abuse.

Table 8. The Impact of the Conjoint Influence of Type of Child Maltreatment and Neighborhood Structural Characteristics on Criminal Arrests

	Model 1			Model 2			Model 3			Model 4		
	b	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*
Fixed Effects												
Physical abuse	.03	.17	1.03	.03	.17	1.03	.11	.18	1.12	.04	.22	1.04
Sexual abuse	.38*	.19	1.46	.40*	.19	1.49	.41*	.20	1.51	.36	.26	1.43
Neglect	.42**	.12	1.52	.44***	.12	1.55	.39**	.12	1.48	.39*	.16	1.48
Concentrated disadvantage	.05**	.02	1.05	.06**	.02	1.06	.05**	.02	1.05	.05**	.02	1.05
Physical x CD	.01	.03	1.01	.02	.04	1.02	.05	.05	1.05	.04	.05	1.04
Sexual x CD	-.14**	.05	.87	-.13*	.05	.88	-.13*	.06	.88	-.14*	.06	.87
Neglect X CD	.05*	.02	1.05	.06**	.02	1.06	.05*	.02	1.05	.05*	.02	1.05
Residential stability				.07	.05	1.07	.05	.05	1.05	.05	.05	1.05
Physical x RS				.05	.10	1.05	.13	.12	1.14	.11	.12	1.12
Sexual x RS				.03	.13	1.03	.03	.15	1.03	.03	.15	1.03
Neglect X RS				.10[a]	.06	1.11	.08	.07	1.08	.08	.07	1.08
Ethnic heterogeneity							-.08	.06	.92	-.08	.06	.92
Physical x EH							.23	.20	1.26	.24	.20	1.27
Sexual x EH							.01	.20	1.01	.01	.21	1.01
Neglect X EH							-.10	.09	.90	-.10	.10	.90
Concentrated advantage										.01	.03	1.01
Physical x CA										-.06	.12	.94
Sexual x CA										-.04	.13	.96
Neglect X CA										.01	.08	1.01
Random Effects	*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*	
Intercept (τ_{00})	.41	.30***		.40	.28***		.40	.28***		.40	.28***	
Individual level (σ^2)		5.78			5.81			5.80			5.80	

[a] p<.10 *p<.05 **p<.01 ***p<.001

Note: All equations control for male, non-White, and age.

Summary

In sum, there are several important findings in this chapter that should be elucidated. The results indicate that early childhood abuse and neglect, neighborhood disadvantage, and neighborhood residential stability exert an independent influence on later criminal offending. Experiencing early childhood maltreatment and growing up in neighborhoods with high levels of disadvantage and residential stability increased the likelihood of engaging in later criminal behavior. Importantly, these factors remained significant even after controlling for other key individual and neighborhood characteristics.

The results also suggest that neighborhood disadvantage and residential stability exacerbate the criminal consequences of early childhood abuse and neglect. Abused and/or neglected individuals from neighborhoods characterized by disadvantage and residential stability engaged in criminal activity at a higher rate than abused and/or neglected individuals from neighborhoods with less disadvantage and stability. The exacerbation effects of neighborhood characteristics did not appear to differ for males versus females, or for White, non-Hispanics versus non-Whites. Notably, however, the exacerbation effects of neighborhood characteristics did appear to differ by type of abuse/neglect. Neglected individuals growing up in disadvantaged neighborhoods engaged in more criminal activity than neglected individuals growing up in less disadvantaged neighborhoods. Unexpectedly, sexually abused individuals growing up in neighborhoods with more disadvantage engaged in less criminal activity than sexual abused individuals from less disadvantaged neighborhoods. These findings, as well as their implications, will be discussed in greater detail in the discussion section. In the next

chapter (V) the results of the direct and interaction hypotheses for violent arrests are presented.

CHAPTER V: RESULTS - VIOLENT ARRESTS

This chapter is organized in a fashion similar to that of the previous chapter. The results for violent arrests are divided into four sections – individual level model, direct hypothesis, interaction hypothesis, and gender, race and type of abuse/neglect.

Individual Level Model - Violent Arrests

As with criminal arrests, it was also necessary to develop an appropriate individual level model for violent arrests. The final individual level model for the violent arrest data is as follows:

Individual level

$$\text{Number of violent arrests} = \beta_{0j} + \beta_1 X_{1ij}(\text{Abuse/neglect}) + \beta_2 X_{2ij}(\text{Male}) + \beta_3 X_{3ij}(\text{Non-White}) + \beta_4 X_{4ij}(\text{Age}) + r_{ij}$$

where β_{0j} is the intercept; $\mathbf{X}_1$ is the value of the covariate for abuse/neglect associated with respondent *i* in neighborhood *j*; $\mathbf{X}_2$ is the value of the covariate for male associated with respondent *i* in neighborhood *j*; $\mathbf{X}_3$ is the value of the covariate for non-White associated with respondent *i* in neighborhood *j*; $\mathbf{X}_4$ is value of the covariate for age associated with respondent *i* in neighborhood *j*; β_1 is the log-event rate for abuse/neglect on violent arrests; β_2 is the log-event rate for male on violent arrests; β_3 is the log-event rate for non-White on violent arrests; and β_4 is the log-event rate for age on violent arrests. The error term, r_{ij}, is the unique contribution of each individual, and is assumed to follow the $Y_{ij}|\lambda_{ij} \sim P(\eta_{ij},\lambda_{ij})$ sampling model; and to have a variance of $1/w_{ij}$ where $w_{ij} = \eta_{ij}\lambda_{ij}$.

Neighborhood level

$\beta_{0j} = \gamma_{00} + U_{0j}$,

$\beta_1 = \gamma_{10}$,

$\beta_2 = \gamma_{20}$,

$\beta_3 = \gamma_{30}$,

$\beta_4 = \gamma_{40}$

where γ_{00} is the overall log average number of violent arrests and is assumed to vary across neighborhoods (U_{0j}); γ_{10} is the effect for abuse/neglect and is assumed invariant across neighborhoods; γ_{20} is the effect for male and is assumed invariant across neighborhoods; γ_{30} is the effect for non-White and is assumed invariant across neighborhoods; γ_{40} is the effect for age and is assumed invariant across neighborhoods. The only difference between the baseline model for criminal arrests and that for violent arrests is that the abuse/neglect slope in the violent arrests baseline model is constrained to be invariant across neighborhoods.

Table 9 presents the results of the analysis for the individual model. As expected, being abused and/or neglected significantly increases the rate of violent arrests. The estimate for abuse/neglect (.65) indicates that the rate of arrests for abused and/or neglected respondents is 92% greater than that for the controls. The other individual level covariates, being male ($b = 1.97$, $SE = .16$, $t = 12.29$, $p = <.001$), being a non-White ($b = 1.75$, $SE = .23$, $t = 7.59$, $p = <.001$), and being older ($b = .04$, $SE = .02$, $t = 2.50$, $p = .013$) are all also associated with increased rates of violent arrests.

Table 9. Individual Baseline Model for Violent Arrests

	Violent Arrests		
	b	*SE*	*Exp(b)*
Fixed Effects			
Individual Level			
Abuse/neglect	.65***	.13	1.92
Male	1.97***	.16	7.17
Non-White	1.75***	.23	5.75
Age	.04*	.02	1.04
Neighborhood Level			
Intercept	-1.82***	.11	.16
Random Effects	*Reliability*		*Variance*
Intercept (τ_{00})	.37		.53***
Abuse/neglect (τ_{11})	--		--
Individual level (σ^2)			1.48

[a] p<.10 *p<.05 **p<.01 ***p<.001

The neighborhood variance is .53, with a X^2 statistic of 376.68, to be compared to the critical value of X_2 with $J\text{-}1 = 149$ degrees of freedom. The null hypothesis ($\tau_{00} = 0$) can be rejected and it can be inferred that statistically significant differences in the mean number of violent arrests exist among the 150 neighborhoods. In addition, the results indicate that the intercepts are relatively reliable (.37).

The estimate of the individual-level variance (σ^2) for violent arrests is 1.48. As with the criminal arrests model, the proportion of "variance explained" by the individual level variables can be calculated. Using equation 4.1 presented earlier in Chapter IV, adding abuse/neglect, male, non-White and age reduces individual level variance in violent arrests by 29%.

Direct Hypothesis - Violent Arrests

Table 10 presents the results for the direct hypothesis for violent arrests. Model 1 presents the results with the introduction of *concentrated disadvantage*. As hypothesized, respondents from neighborhoods with higher levels of concentrated disadvantage were more likely to have engaged in activities that resulted in violent arrests. Respondents from highly disadvantaged neighborhoods (+2 *SD*) averaged .32 violent arrests, while respondents from neighborhood with low disadvantage (-2 *SD*) averaged .07 violent arrests. Using equation 4.2 adding concentrated disadvantage reduced the between-neighborhood variance by 25%. However, the random effects component ($\tau_{00} = .40, X^2 = 271.31, df = 149, p = <.001$) indicates that there is still unexplained neighborhood variance association.

Table 10. The Impact of Child Maltreatment and Neighborhood Structural Characteristics on Violent Arrests

	Model 1			Model 2			Model 3			Model 4		
	b	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*
Fixed Effects												
Individual Level												
Abuse/neglect	.65***	.13	1.92	.64***	.13	1.90	.64***	.13	1.90	.64***	.13	1.90
Male	1.94***	.16	6.96	1.94***	.16	6.96	1.94***	.16	6.96	1.94***	.16	6.96
Non-White	1.67***	.23	5.31	1.70***	.23	5.47	1.70***	.23	5.47	1.69***	.23	5.42
Age	.05**	.02	1.05	.05*	.02	1.05	.05*	.02	1.05	.05*	.02	1.05
Neighborhood Level												
Intercept	-1.95***	.12	.14	-1.94***	.12	.14	-1.95***	.12	.14	-1.92***	.12	.15
Concentrated disadvantage	.09***	.02	1.09	.10***	.02	1.11	.10***	.02	1.11	.10***	.02	1.11
Residential stability				.08	.06	1.08	.06	.06	1.06	.06	.06	1.06
Ethnic heterogeneity							-.05	.07	.95	-.06	.08	.94
Concentrated advantage										.04	.05	1.04
Random Effects	*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*	
Intercept (τ_{00})	.31	.40***		.31	.39***		.31	.39***		.31	.39***	
Individual level (σ^2)		1.49			1.50			1.49			1.50	

[a] p<.10 *p<.05 **p<.01 ***p<.001

Model 2 presents the results with the introduction of *residential stability*. Again, converse to the hypothesis, the estimate indicates that as residential stability increases, the rate of violent arrests increases by 8%. However, the standard error for the estimate is relatively large indicating that the 95% confidence interval includes zero (*95% CI* = -.04-.20); thus, reducing certainly that the estimate actually differs from zero.

The slope for neighborhood concentrated disadvantage changes slightly from .09 to .10. Again, this may suggest a suppression effect; however, this effect is relatively small. The cumulative effect of going from a 9% increase to an 11% increase is .32 (Model 1) to .34 (Model 2) at two standard deviations above the mean for concentrated disadvantage. The neighborhood variance component is reduced from .40 to .39. Thus, the introduction of residential stability accounts for an additional .03% of the neighborhood variation in violent arrests. Nonetheless, the random effects component ($\tau_{00} = .39, X^2 = 255.97, df = 149, p = <.001$) indicates there still exists a substantial amount of unexplained neighborhood level variance.

Model 3 presents the results with the introduction of *ethnic heterogeneity*. The estimate indicates that as ethnic heterogeneity increases the rate of violent arrests decrease by approximately 5%. However, the large standard error corresponding small t-ratio, indicates that the null hypothesis that coefficient is actually zero cannot be rejected. In addition, its introduction into the model does not account for any additional neighborhood level variance. The introduction of ethnic heterogeneity does not substantially change the estimate for concentrated disadvantage; however, it does reduce the estimate for residential stability, from .08 to .06. These results suggest that residential stability and ethnic heterogeneity share some variance associated with arrests.

Model 4 presents the results for the introduction of *concentrated advantage*. The estimate indicates for a one-unit change in concentrated advantage the rate of criminal arrests increase by 4%. However, the relatively large standard error and corresponding small t-ratio, indicates that we cannot reject the null hypothesis. While the introduction of concentrated advantage slightly affects the estimates for ethnic heterogeneity (-.06 to -.05) it does not explain any additional neighborhood level variance in violent arrests. Importantly, like the criminal arrests model, the random effects component (τ_{00} = .39, X^2 = 247.62, *df* = 149, p = <.001) indicates that a substantial amount of neighborhood level variance remains, even after introducing concentrated disadvantage, residential stability, ethnic heterogeneity and concentrated advantage.

Even with the introduction of all neighborhood structural characteristics - concentrated disadvantage, residential stability, ethnic heterogeneity and concentrated advantage - being abused or neglected in early childhood remains a significant factor in later violent offending. The estimate for abuse/neglect is .64 with a standard error of .13 and a corresponding t-ratio of 4.85. This indicates that the rate of violent arrests for abused or neglected individuals is approximately 90% greater than that for the controls.

Interaction Hypothesis - Violent Arrests

Table 11 presents the results of the interaction models for violent arrests. Model 1 presents the results with the introduction of *concentrated disadvantage*. The estimate for the interaction between abuse/neglect and concentrated disadvantage (.05) indicated that for each unit increase in concentrated disadvantage there is approximately 5%

Table 11. The Impact of the Conjoint Influence of Child Maltreatment and Neighborhood Structural Characteristics on Violent Arrests

	Model 1			Model 2			Model 3			Model 4		
	b	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*
Fixed Effects												
Abuse/neglect	.42*	.18	1.52	.45*	.18	1.57	.35[a]	.19	1.42	.37	.24	1.45
Concentrated Disadvantage	.09***	.02	1.09	.09***	.02	1.09	.09***	.02	1.09	.09***	.02	1.09
Abuse/neglect x Concentrated disadvantage	.05[a]	.03	1.05	.07*	.03	1.07	.05	.03	1.05	.05	.03	1.05
Residential stability				.06*	.06	1.06	.05	.07	1.05	.05	.07	1.05
Abuse/neglect x Residential stability				.16[a]	.09	1.17	.10	.10	1.11	.10	.10	1.11
Ethnic heterogeneity							-.06	.07	.94	-.07	.07	.93
Abuse/neglect x Ethnic heterogeneity							-.22[a]	.13	.80	-.23[a]	.13	.79
Concentrated advantage										.04	.05	1.04
Abuse/neglect x Concentrated advantage										.02	.11	1.02
Random Effects	*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*	
Intercept (τ_{00})	.32	.42***		.31	.40***		.31	.40***		.31	.40***	
Individual level (σ^2)		1.46			1.47			1.47			1.48	

[a] p<.10 *p<.05 **p<.01 ***p<.001

Note: All equations control for male, non-White, and age.

increase in the slope for abuse/neglect. However, the standard error for the estimate is relatively large indicating that the 95% confidence interval includes zero (*95% CI* = -.01-.11).

Model 2 presents the results with the introduction of *residential stability*. Similar to findings for criminal arrests, these results suggest that child maltreatment has its largest impact on individuals from neighborhoods characterized by greater levels of residential stability. The estimate for the interaction (.16) indicates that for each unit increase in residential stability there is approximately a 17% increase in the slope for abuse/neglect. Figure 4 presents a graphical representation of the relationship between abuse/neglect, residential stability and violent arrests.

The introduction of residential stability significantly changes the estimate for the interaction between abuse/neglect and concentrated disadvantage, from .05 (SE = .03, t = 1.86, p = .063) to .07 (SE = .03, t = 2.35, p = .019), respectively. Again, as hypothesized negative criminal consequences associated with early childhood victimization are most pronounced among individuals from neighborhoods with higher levels of disadvantage. Figure 5 presents a graphical representation of the effect of concentrated disadvantage.

Model 3 presents the results with the introduction of *ethnic heterogeneity*. Contrary to what was hypothesized, the effect of child abuse and/or neglect is smaller for individuals from neighborhoods with more ethnic heterogeneity than for individuals from neighborhoods with less ethnic heterogeneity. The estimate for the interaction between abuse/neglect and ethnic heterogeneity (-.22) indicates that for each unit increase in

Figure 4. The Impact of Residential Stability on Violent Arrests for Abuse/Neglect and Controls

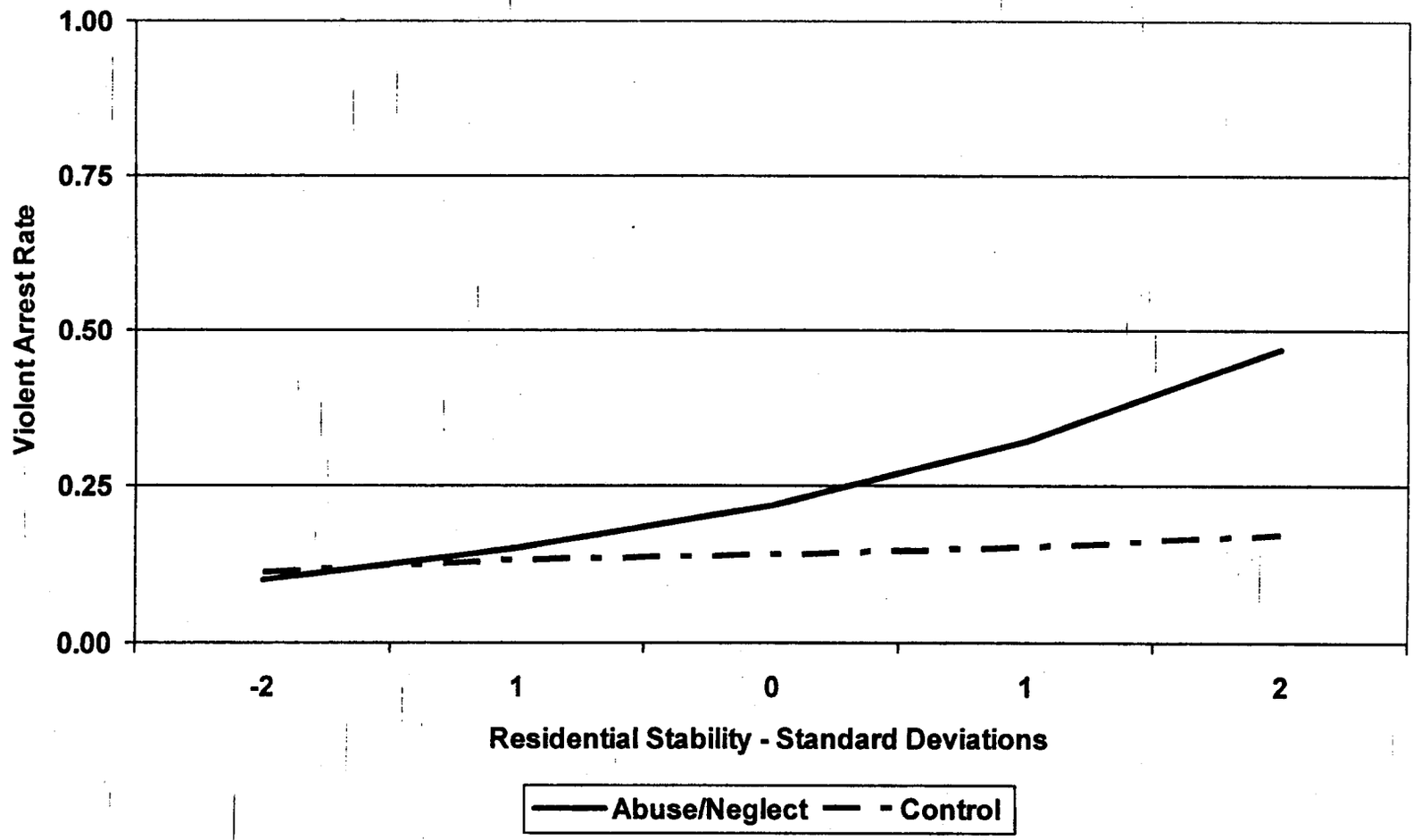


Figure 5. The Impact of Concentrated Disadvantage on Violent Arrests for Abuse/Neglect and Controls

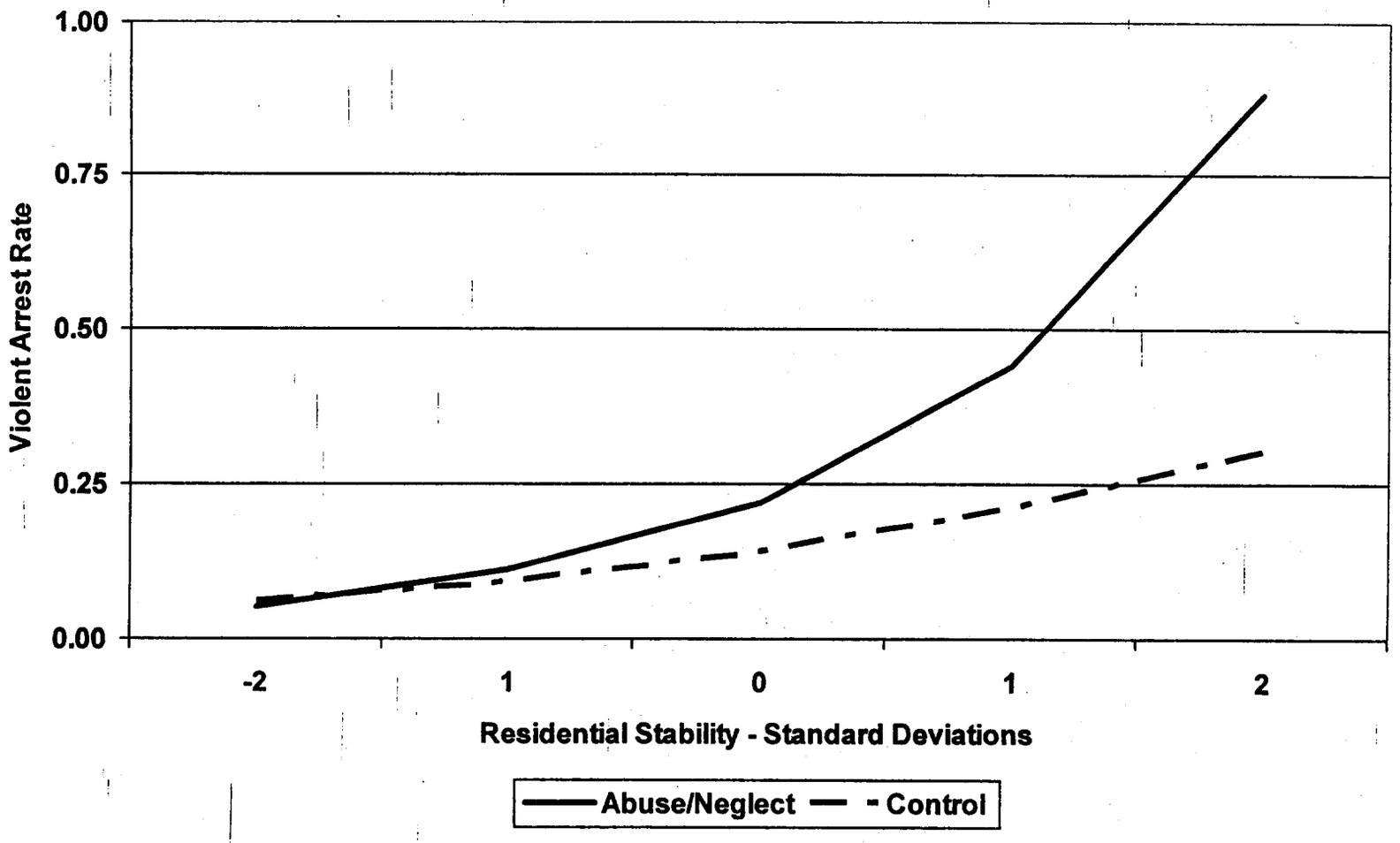
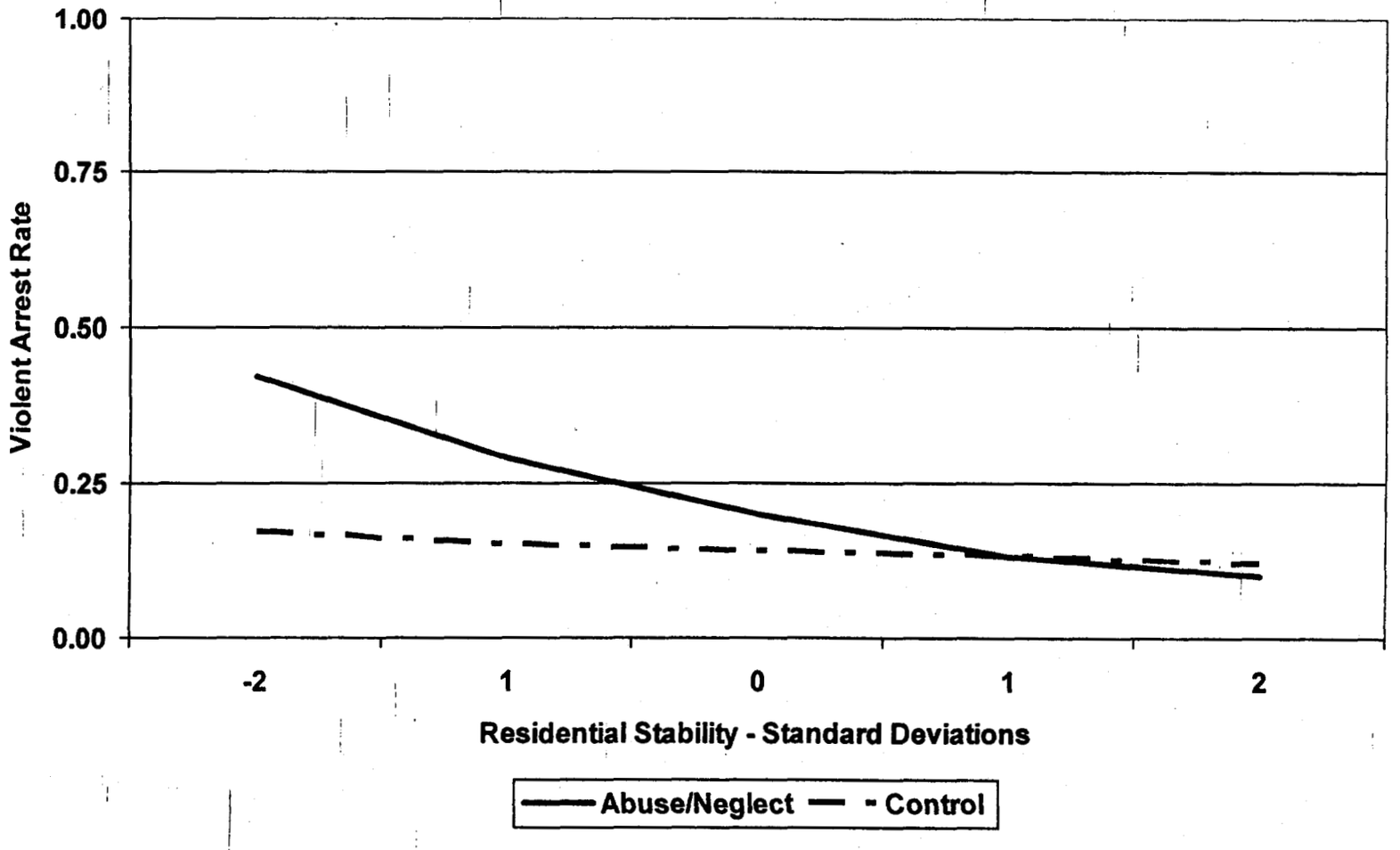


Figure 6. The Impact of Ethnic Heterogeneity on Violent Arrests for Abuse/Neglect and Controls



ethnic heterogeneity there is approximately a 20% decrease in the slope for abuse/neglect. Interestingly, however, the introduction of ethnic heterogeneity significantly reduces estimates of interaction effects for both concentrated disadvantage and residential stability.

Model 4 presents the results with the introduction of *concentrated advantage.* The estimate for the interaction is .02 with a standard error of .11 and a t-ratio of .14. While the estimate indicates that for each unit of concentrated advantage there is approximately a 2% increase in the slope of abuse/neglect, the estimate cannot be statistically distinguished from zero. Importantly, the variance of random effects for the intercept (τ_{00} = .40, X^2 = 248.70, df = 149, p = <.001) remains highly significant indicating that there is a substantial amount of unexplained variance in neighborhood violent arrests, even after controlling for concentrated disadvantage, residential stability, ethnic heterogeneity, and concentrated advantage. These results suggest that there may be additional neighborhood characteristics important in explaining individual violent offending not unspecified in the current model.

Gender, Race, and Type of Abuse/Neglect Differences - Violent Arrests

Gender and race differences. Three-way interaction effects were included in the models to test for gender and race differences. Only one of the 3-way interaction estimates reached marginal statistical significance (p < .10). Table 12 presents the results. The findings suggest that higher levels of concentrated advantage disproportionately increased the rate of violent arrests for the control non-White respondents. Figure 6 presents a graphic representation of the relationship. The rest of

Table 12. The Impact of the Conjoint Influence of Child Maltreatment, Race and Neighborhood Structural Characteristics on Violent Arrests

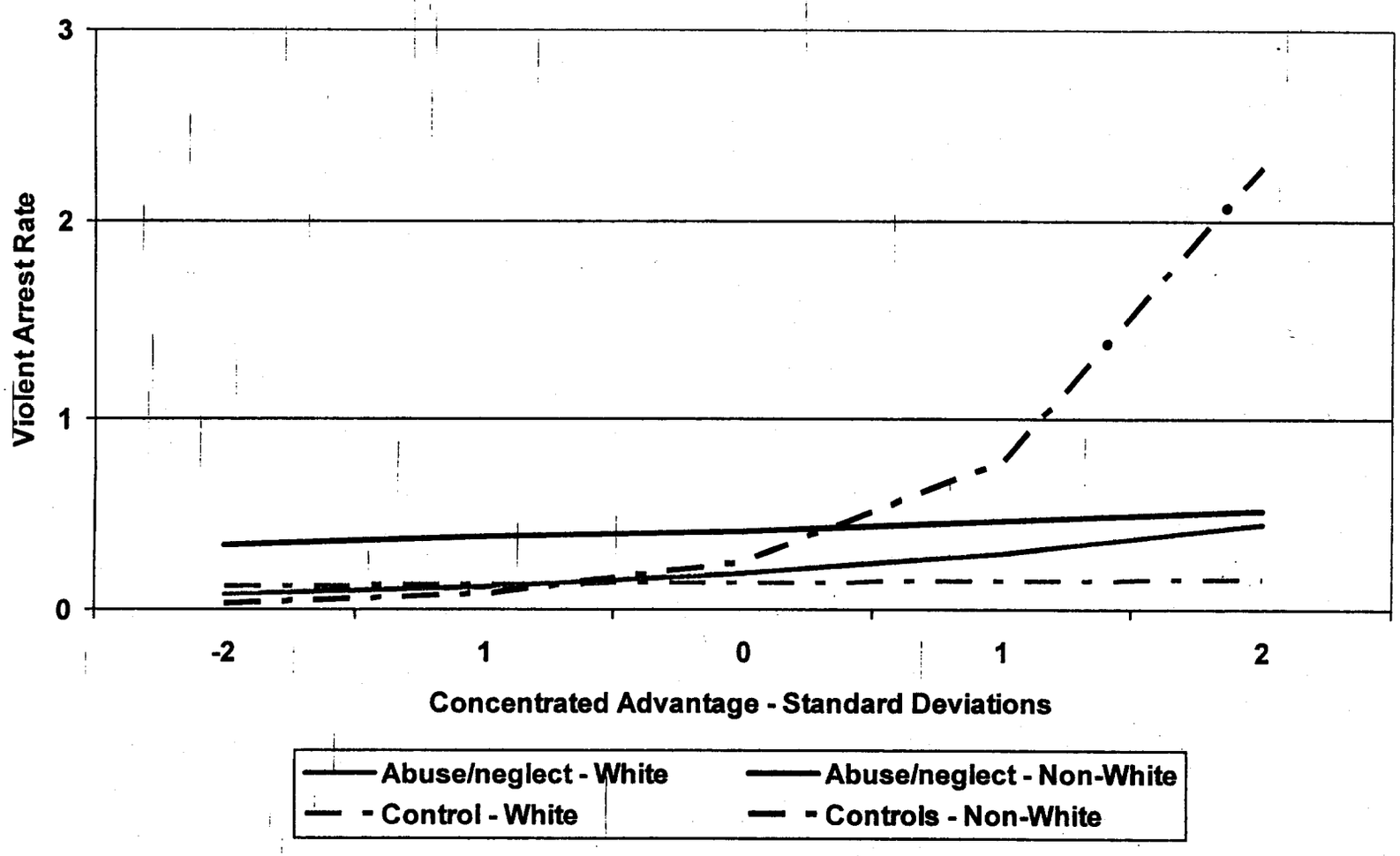
	Violent arrests		
	b	*SE*	*Exp(b)*
Fixed Effects			
Abuse/neglect	.31	.32	1.36
Non-White	.58	.52	1.79
Abuse/neglect x non-White	.21	.54	1.23
Concentrated disadvantage	.09***	.02	1.09
Abuse/neglect x concentrated disadvantage	.03	.11	1.03
Non-White x concentrated disadvantage	.06	.13	1.06
Abuse/neglect x non-White x concentrated disadvantage	-.05	.12	.95
Residential stability	.08	.07	1.08
Abuse/neglect x residential stability	.11	.21	1.12
Non-White x residential stability	-.50[a]	.28	.61
Abuse/neglect x non-White x residential stability	-.01	.24	.99
Ethnic heterogeneity	-.04	.08	.96
Abuse/neglect x ethnic heterogeneity	-.18	.19	.84
Non-White x ethnic heterogeneity	-.14	.28	.87
Abuse/neglect x non-White x ethnic heterogeneity	.03	.28	1.03
Concentrated advantage	.02	.05	1.02
Abuse/neglect x concentrated advantage	.10	.14	1.11
Non-White x concentrated advantage	.29[a]	.54	1.34
Abuse/neglect x non-White x concentrated advantage	-.38[a]	.22	.68

Random Effects	*Reliability*	*Variance*
Intercept (τ_{00})	.31	.39***
Individual level (σ^2)		1.46

[a] p<.10 *p<.05 **p<.01 ***p<.001

Note: All equations control for male and age.

Figure 7. The Impact of Concentrated Advantage on Violent Arrests for White and Non-White Abuse/Neglect and Control Individuals



the 3-way interactions indicate that the relationship between abuse/neglect, neighborhood structural characteristics – concentrated disadvantage, residential stability and ethnic heterogeneity - and violent offending do not differ for males versus females or for Whites, non-Hispanics versus non-Whites. For a complete description of gender and race models see Appendix D.

Type of abuse/neglect differences. Table 13 presents the results for violent arrests by type of abuse. The interaction between childhood neglect and neighborhood concentrated disadvantage, across all four models, is consistently positive and statistically significant. For each unit increase in disadvantage there is a 6% to 8% increase in the slope for neglect. The introduction of the interaction estimate for neglect and ethnic heterogeneity (Model 3) is negative and statistically significant. For each unit increase in ethnic heterogeneity there is a 27% decrease in the slope for neglect. Interestingly, ethnic heterogeneity has the opposite affect on sexual abuse. For each unit increase in ethnic heterogeneity there is an 89% increase in the slope for sexual abuse. Thus, the effect of sexual abuse is more pronounced for individuals from neighborhoods characterized by more ethnic heterogeneity, while the effect of neglect is less pronounced in this group.

Summary

There are several key results in this chapter that need to be summarized. The findings indicate that early childhood abuse and neglect and neighborhood disadvantage independently increase the likelihood of violent offending. Unlike the model for criminal arrests, neighborhood residential stability did not reach conventional levels of statistical significance in the model for violent arrests. However, it is important to note that the estimates for the effects of residential stability are very similar in the two models (violent

arrests $b = .08$, $SE = .06$; criminal arrests $b = .08$, $SE = .04$). The disparity in findings may be attributed to less variance in violent arrests, a stronger relationship between disadvantaged and offending for violent arrests, a lack of statistical power for residential stability on violent arrests, or a combination of the above factors.

The findings also suggest that the violent offending consequences of early childhood abuse and neglect are exacerbated by neighborhood disadvantage and residential stability. Similar to the findings for criminal arrests, the results for violent arrests suggest that abused and/or neglected individuals from disadvantaged and stable neighborhoods engaged in violent behavior at a higher rate than abused and/or neglected individuals from neighborhoods with less disadvantage and stability. However, unlike the model for criminal arrests, the introduction of neighborhood ethnic heterogeneity changes the influence of residential stability for abused and/or neglected individuals. The influence of residential stability is greatly weakened and neighborhood ethnic heterogeneity appears to play a significant role in the development of violent offending. Abused and neglected individuals from neighborhoods with more ethnic heterogeneity engaged in less violent offending than abused and neglected individuals from neighborhoods with less ethnic heterogeneity.

The effects of neighborhood characteristics appeared to differ by race and type of abuse/neglect. The rate of violent arrests for White, non-Hispanic respondents was higher under conditions for more concentrated advantage. Similar to the criminal arrest model, neglected individuals from disadvantaged neighborhoods engaged in more violent offending than neglected individuals growing up in less disadvantaged neighborhoods. Unlike the criminal arrest model, neglected individuals from neighborhood with more

ethnic heterogeneity engaged in violent offending at a lower rate than neglected individuals from neighborhoods with less ethnic heterogeneity. These results suggest that neighborhood ethnic heterogeneity is more important for violent offending than general criminal behavior. While the estimates for sexual abuse under conditions of neighborhood disadvantage in the violent offending models are similar to those in the criminal arrest models, in the violent offending models they did not reach conventional levels of statistical significance. These findings, as well as their implications, will be discussed in greater detail in the final chapter (VII). In the next chapter (VI) the results of neighborhood social mobility hypothesis are presented.

Table 13. The Impact of the Conjoint Influence of Type of Child Maltreatment and Neighborhood Structural Characteristics on Violent Arrests

	Model 1			Model 2			Model 3			Model 4		
	b	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*se*	*Exp(b)*	*b*	*SE*	*Exp(b)*
Fixed Effects												
Physical abuse	.37	.26	1.45	.34	.27	1.40	.48[a]	.28	1.62	.35	.33	1.42
Sexual abuse	.29	.32	1.34	.30	.32	1.35	.32	.32	1.38	.07	.45	1.07
Neglect	.21	.18	1.23	.27	.19	1.31	.09	.20	1.09	.11	.25	1.12
Concentrated disadvantage	.08***	.02	1.08	.09***	.02	1.09	.09***	.02	1.09	.09***	.02	1.09
Physical x CD	.01	.05	1.01	.01	.05	1.01	.03	.06	1.03	.01	.07	1.01
Sexual x CD	-.11	.07	.90	-.09	.07	.91	.01	.08	1.01	-.01	.09	.99
Neglect X CD	.08**	.03	1.08	.09**	.03	1.09	.06[a]	.03	1.06	.06[a]	.03	1.06
Residential stability				.06	.06	1.06	.06	.07	1.06	.05	.07	1.05
Physical x RS				-.04	.13	.96	.01	.15	1.01	-.02	.16	.98
Sexual x RS				.11	.20	1.12	.37	.25	1.45	.39	.26	1.48
Neglect X RS				.16[a]	.08	1.17	.06	.09	1.06	.05	.09	1.05
Ethnic heterogeneity							-.04	.07	.96	-.06	.08	.94
Physical x EH							.28[a]	.27	1.32	.28	.27	1.32
Sexual x EH							.62	.32	1.86	.63*	.32	1.88
Neglect X EH							-.32*	.12	.73	-.33*	.13	.72
Concentrated advantage										.04	.05	1.04
Physical x CA										-.12	.16	.89
Sexual x CA										-.18	.23	.84
Neglect X CA										.02	.12	1.02
Random Effects	*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*	
Intercept (τ_{00})	.33	.43***		.32	.41***		.33	.43***		.33	.43***	
Individual level (σ^2)		1.44			1.44			1.39			1.39	

[a] p<.10 *p<.05 **p<.01 ***p<.001

Note: All equations control for male, non-White, and age.

CHAPTER VI: RESULTS – NEIGHBORHOOD SOCIAL MOBILITY

The results in this chapter are divided into four sections. The first section presents the individual level models for the "restricted" subsample of cases (Equation 1). The second section presents the results for the hypothesized mediators. Equation 2 addresses the question: Does child abuse and/or neglect *significantly increase the likelihood of living in neighborhoods in young adulthood with more negative structural characteristics?* The third and fourth sections focus on the results for the neighborhood social mobility hypothesis on criminal arrests and violent arrests, respectively. Equation 3 addresses the question: Does *downward neighborhood social mobility mediate the relationship between childhood abuse/neglect and criminal behavior*?

Restricted Individual Level Models

Following the analysis strategy, new baseline models (Equation 1) were developed for the "restricted" subsample of cases (individual level $N = 1085$, neighborhood level $N = 145$). Table 14 presents these results. As anticipated, being abused and/or neglected still significantly increases the rate of criminal arrests, even for the subsample of cases. The estimate for abuse/neglect (.54) indicates that the criminal arrest rate for abused and/or neglected individuals is 72% greater than that for controls. As with the non-restricted baseline model for criminal arrests (Table 5) the coefficients for being male ($b = 1.29$, $SE = .11$, t = 11.45, $p = <.001$), being a non-White ($b = .58$, $SE = .19$, $t = 3.11$, $p = .002$), and being older ($b = .04$, $SE = .02$, $t = 2.50$, $p = .013$) are all associated with increased rates of arrests. Interestingly, the coefficient for same neighborhood ($b = .53$, $SE = .19$, $t = 2.81$, $p = .005$) is also associated with increased rates of criminal arrests.

Table 14. Restricted Individual Baseline Models for Criminal and Violent Arrests

	Criminal Arrests			Violent Arrests		
	b	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*
Fixed Effects						
Individual Level						
Abuse/neglect	.54***	.11	1.72	.56***	.15	1.75
Male	1.29***	.11	3.63	1.65***	.17	5.21
Non-White	.58***	.19	1.79	1.47***	.27	4.35
Age	.04*	.02	1.04	.04	.02	1.04
Same neighborhood	.53**	.19	1.70	.66**	.24	1.93
Neighborhood Level						
Intercept	.58***	.08	1.77	-1.80***	.12	.17
Random Effects	*Reliability*		*Variance*	*Reliability*		*Variance*
Intercept (τ_{00})	.35		.26***	.34		.59***
Individual level (σ^2)			5.49			1.31

[a] p<.10 *p<.05 **p<.01 ***p<.001

Table 14 also presents results for the restricted baseline model for violent arrests. Again, as anticipated, being abused and/or neglected significantly increased the rate of violent arrests. The estimate (.56) implies that the violent arrest rate is 75% greater for abused and/or neglected respondents than that for controls. It is important to note that the coefficient for age (b = .04, SE = .02, t = 1.62, p = .104) is somewhat reduced. However, the other individual level coefficients, male (b = 1.65, SE = .17, t = 9.78, p = <.001), non-White (b = 1.47, SE = .27, t = 5.39, p = <.001), and same neighborhood (b = .66, SE = .24, t = 2.76, p = .006) are all associated with increased rates of violent arrests.

Neighborhood Factors as Mediators

Table 15 presents results for change in neighborhood structural characteristics (Equation 2). Model 1 presents the results for *change in concentrated disadvantage*. The estimate for abuse/neglect is .65 with a standard error of .26 and a corresponding t-ratio of 2.45. This estimate suggests that being abused and/or neglected is related to respondents residing in neighborhoods in 1990 with more concentrated disadvantage than their 1970 neighborhoods. Not surprisingly, the coefficient for non-White (b = 4.03, SE = .49, t = 8.27, p = <.001) denotes that non-White respondents were much more likely than Whites to have neighborhood concentrated disadvantage worsen. Interestingly, the coefficient for same neighborhood (b = 3.32, SE = .59, t = 5.66, p = <.001) shows that respondents who resided in the same census tract at time 1 (childhood) and time 2 (young adulthood) were more likely to see neighborhood concentrated disadvantage worsen.

Table 15. The Impact of Child Maltreatment on Change in Neighborhood Structural Characteristics

	Model 1 Change in Concentrated Disadvantage		Model 2 Change in Residential Stability		Model 3 Change in Ethnic Heterogeneity		Model 4 Change in Concentrated Advantage	
	b	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Fixed Effects								
Individual Level								
Abuse/neglect	.65*	.26	-.30*	.12	.12	.08	-.72***	.22
Male	-.03	.26	-.27*	.12	-.03	.08	.11	.18
Non-White	4.03***	.49	-.94***	.22	-.16	.14	-.84*	.38
Age	-.05	.04	-.01	.02	-.01	.01	.06a	.03
Same neighborhood	3.32***	.59	.09	.26	-.33[a]	.17	-1.91***	.32
Neighborhood Level								
Intercept	-.12	.29	-.02	.14	-.10	.18	.14	.17
Random Effects	*Reliability*	*Variance*	*Reliability*	*Variance*	*Reliability*	*Variance*	*Reliability*	*Variance*
Intercept (τ_{00})	.70	8.74***	.74	2.23***	.91	4.27***	.59	2.64***
Individual level (σ^2)		14.43		2.85		1.27		7.57

[a] p<.10 *p<.05 **p<.01 ***p<.001

Model 2 presents the results for *change in residential stability*. The estimate for abuse/neglect (-.30) implies that being abused and/or neglected is associated with change to neighborhoods with less residential stability. Being male (b = -.27, SE = .12, t = -2.32, p = <.020) and being non-White (b = -.94, SE = .22, t = -4.32, p = <.001) are both associated with changes in less neighborhood residential stability. In contrast, residing in the same neighborhood (b = .09, SE = .26, t = .36, p = .717) appears to have little impact on residential stability.

Model 3 presents the results for *change in ethnic heterogeneity*. The estimate for abuse/neglect is .12 with a standard error of .08 and a corresponding t-ratio of 1.54. However, the relatively large standard error and small t-ratio and large p-value indicate that the estimate is not distinguishable from zero. The only coefficient even marginally associated with change in ethnic heterogeneity is same neighborhood (b = -.33, SE = .17, t = -1.91, p = <.055). Respondents who resided in the same census tract at time 1 (childhood) and time 2 (young adulthood) were more likely to see neighborhood ethnic heterogeneity decrease.

Model 4 presents the results for *change in concentrated advantage*. Being abused and/or neglected is associated with change to neighborhoods with less concentrated advantage. Again, and not surprising, being a non-White (b = -1.91, SE = .32, t = -5.95, p = <.001) was associated with changes in less neighborhood concentrated advantage. However, being older (b = .06, se = .03, t = 1.91, p = .055) was associated with change to more neighborhood concentrated advantage. The coefficient for same neighborhood (b = -1.91, se = .32, t = -5.95, p = <.001) denotes that respondents who resided in the same

census tract at time 1 (childhood) and time 2 (young adulthood) were also more likely to see neighborhood concentrated advantage worsen.

Random effects components of all four models (Model 1 – $\tau_{00} = 8.74, X^2 = 903.53, df = 144, p = <.001$; Model 2 – $\tau_{00} = 2.23, X^2 = 971.48, df = 144, p = <.001$; Model 3 – $\tau_{00} = 4.27, X^2 = 1915.28, df = 144, p = <.001$; and Model 4 – $\tau_{00} = 2.64, X^2 = 427.41, df = 144, p = <.001$) show significant variation in neighborhood structural change scores. These variance estimates suggest that there is at least one significant factor associated with the 1970 neighborhoods that impacts later change in neighborhood structural characteristics. By modeling random effects, analyses correct for the bias associated with this clustering effect. In addition, it is important to note that all of the reliability estimates are well within acceptable levels.

Criminal Arrests

Table 16 presents results of the effect of the mediators – change in concentrated disadvantage, residential stability, ethnic heterogeneity, and concentrated advantage – on criminal arrests (Equation 3). Model 1 introduces *changes in concentrated disadvantage.* As hypothesized, change to a neighborhood with more concentrated disadvantage is associated with higher rates of criminal arrests, even after controlling for abuse/neglect, male, non-White, age and residing in the same neighborhood. Interestingly, the effect for non-White is greatly reduced by the addition of change in concentrated disadvantage, from 1.29 in the

Table 16. The Impact of Change in Neighborhood Structural Characteristics on Criminal Arrests

	Model 1			Model 2			Model 3			Model 4		
	b	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*
Fixed Effects												
Individual Level												
Abuse/neglect	.51***	.11	1.67	.51***	.11	1.67	.50***	.10	1.65	.47***	.11	1.60
Male	1.29***	.11	3.63	1.28***	.11	3.60	1.27***	.11	3.56	1.28***	.11	3.60
Non-White	.38[a]	.19	1.46	.36[a]	.20	1.43	.32	.19	1.38	.40*	.20	1.49
Age	.04**	.02	1.04	.04**	.02	1.04	.04**	.02	1.04	.04**	.02	1.04
Same neighborhood	.33[a]	.20	1.39	.35[a]	.20	1.42	.31	.19	1.36	.32[a]	.19	1.38
Change in Neighborhood												
Intercept	.57***	.08	1.77	.57***	.08	1.77	.54***	.08	1.72	.52***	.08	1.68
Concentrated disadvantage	.04***	.01	1.04	.04***	.01	1.04	.04**	.01	1.04	.01	.02	1.01
Residential stability				-.02	.03	.98	-.05[a]	.03	.95	-.06[a]	.03	.94
Ethnic heterogeneity							-.25***	.07	.78	-.24**	.07	.79
Concentrated advantage										-.08**	.03	.92
Random Effects	*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*		*Reliability*	*Variance*	
Intercept (τ_{00})	.35	.26***		.35	.27***		.36	.27***		.36	.27***	
Individual level (σ^2)		5.46			5.44			5.24			5.24	

[a] p<.10 *p<.05 **p<.01 ***p<.001

restricted baseline model to .38 in Model 1 – Table 16. The effect for same neighborhood is also reduced, from .43 in the restricted baseline model to .33 in Model 1-Table 15. Estimates for male and age are positive, significant, and remain unchanged from the restricted baseline model.

The estimate for abuse/neglect changes only slightly suggesting that changes in concentrated disadvantage are probably not mediating the relationship between abuse/neglect and criminal arrests. The new estimate for abuse/neglect is .51 with a standard error of .11 and a corresponding t-ratio of 4.80. While there is some reduction in the abuse/neglect coefficient from the restricted baseline model, the reduction is well within one standard error.

Model 2 introduces *change in residential stability*. The estimate for change in residential stability and criminal arrests is -.02 with a standard error of .03 and a corresponding t-ratio of -.84. While this finding indicates that change to more residential stability is associated with less crime, the estimate is not statistically distinguishable from zero.

Model 3 introduces *change in ethnic heterogeneity*. Change to neighborhoods with more ethnic heterogeneity is associated with lower rates of criminal arrests. The introduction of change in ethnic heterogeneity has a substantial impact on the coefficient for change in residential stability, from -.02 to -.05. This may indicate a suppression effect. Interestingly, the addition of change in ethnic heterogeneity further decreased the estimate for non-White.

Model 4 introduces *change in concentrated advantage*. The estimate for change in concentrated disadvantage is -.08 with a standard error of .03 and a corresponding t-

ratio of -2.78. Change to neighborhood with more concentrated advantage is associated with lower rates of criminal arrests. The introduction of change in concentrated advantage substantially modifies the estimate for change in concentrated disadvantage, from .04 to .01.

These results suggest changes in neighborhood structure may be an additional pathway through which early childhood abuse and neglect impact criminal behavior. However, looking across the four models, none of the estimates for abuse/neglect showed a significant reduction (i.e., from .54 in Table 15 to .47 in Model 4 – Table 16). While it is supported that early childhood victimization has an indirect effect on later criminal offending through changes in neighborhood structural characteristics, these findings do not support a mediation relationship.

The random effects components of all four models (Model 1 – $\tau_{00} = .26, X^2 = 268.80, df = 144$, p = <.001; Model 2 – $\tau_{00} = .27, X^2 = 271.76, df = 144, p = <.001$; Model 3 – $\tau_{00} = .27, X^2 = 284.73, df = 144, p = <.001$; and Model 4 – $\tau_{00} = .27, X^2 = 285.35, df = 144, p = <.001$) still show some significant variation in the criminal arrest rate for 1970 neighborhoods. These variance estimates indicate that there is still some significant factor associated with the 1970 neighborhoods that affect differences in the criminal arrest rates.

Violent Arrests

Table 17 presents the results of the effect of the mediators on violent arrests (Equation 3). Model 1 introduces *change in concentrated disadvantage*. As with criminal arrests, change to neighborhoods with more concentrated disadvantage is

Table 17. The Impact of Change in Neighborhood Structural Characteristics on Violent Arrests

	Model 1			Model 2			Model 3			Model 4		
	b	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*	*b*	*SE*	*Exp(b)*
Fixed Effects												
Individual Level												
Abuse/neglect	.51**	.15	1.67	.50**	.15	1.65	.49**	.15	1.63	.48**	.16	1.62
Male	1.63***	.17	5.10	1.61***	.17	5.00	1.60***	.17	4.95	1.60***	.17	4.95
Non-White	1.29***	.29	3.63	1.25***	.29	3.49	1.23***	.29	3.42	1.28***	.30	3.60
Age	.04[a]	.02	1.04	.04[a]	.02	1.04	.04[a]	.02	1.04	.04[a]	.02	1.04
Same neighborhood	.47[a]	.26	1.60	.51*	.25	1.67	.49[a]	.26	1.63	.49[a]	.26	1.63
Change in Neighborhood												
Intercept	-1.79***	.12	.17	-1.80***	.12	.17	-1.81***	.12	.16	-1.81***	.12	.16
Concentrated disadvantage	.04*	.02	1.04	.04*	.02	1.04	.04*	.02	1.04	.02	.03	1.02
Residential stability				-.05	.04	.95	-.07[a]	.04	.93	-.07[a]	.04	.93
Ethnic heterogeneity							-.15	.10	.86	-.14	.10	.87
Concentrated advantage										-.04	.05	.96
Random Effects	*Reliability*		*Variance*	*Reliability*		*Variance*	*Reliability*		*Variance*	*Reliability*		*Variance*
Intercept (τ_{00})	.33		.57***	.34		.58***	.33		.57***	.33		.57***
Individual level (σ^2)			1.37			1.34			1.36			1.37

[a]p<.10 *p<.05 **p<.01 ***p<.001

associated with higher rates of violent arrests, even after controlling for abuse/neglect, male, non-White, age, and residing in the same neighborhood. Unlike the criminal arrest model, introduction of the change variable did not have a significant effect on the estimates for male or non-White.

Model 2 introduces *change in residential stability*. The estimate for change in concentrated disadvantage is -.05 with a standard error of .04 and a corresponding t-ratio of –1.33. The estimate indicated that as residential stability increases, the rate of violent arrests decreases; however, the 95% confidence interval contains zero (*95% CI* = -.13-.03).

Model 3 introduces *change in ethnic heterogeneity*. The estimate for change in ethnic heterogeneity is -.15 with a standard error of .10 and a corresponding t-ratio of –1.57. The estimate indicated that as change in ethnic heterogeneity increases, the rate of violent arrests decreases; however the 95% confidence interval contains zero (*95% CI* = -.35-.05). Interestingly, the addition of change in ethnic heterogeneity significantly modifies the estimate for change in residential stability, from -.05 to -.07 respectively.

Model 4 introduces *change in concentrated advantage*. The estimate for change in concentrated disadvantage and criminal arrests is -.04 with a standard error of .05 and a corresponding t-ratio of -.99. The estimate indicates that as change in concentrated advantage increases the rate of violent arrests decrease, again however the 95% confidence interval contains zero (*95% CI* = -.14-.06); thus reducing the certainty that the estimate actually is different from zero.

The random effects components of all four models (Model 1 – $\tau_{00} = .57, X^2 = 301.49, df = 144, p = <.001$; Model 2 – $\tau_{00} = .58, X^2 = 312.19, df = 144, p = <.001$; Model

3 – τ_{00} = .57, X^2 = 305.86, df = 144, p = <.001; and Model 4 – τ_{00} = .57, X^2 = 303.95, df = 144, p = <.001) still show significant variation in the violent arrest rate for 1970 neighborhoods. Similar to the findings for criminal arrests, these variance estimates indicate that there are still unexplained factors associated with the 1970 neighborhoods that may affect individual's violent arrest rate.

As with criminal arrests, estimates for the relationship between abuse/neglect and violent arrests were not significantly reduced when neighborhood structural characteristics were added. These results suggest that while changes in neighborhood characteristics may be part of an indirect relationship between child maltreatment and violent offending, they do not mediate the direct relationship between early childhood victimization and later violent behavior.

Summary

There are several key findings in this chapter that should be highlighted. The results suggest that being abused and/or neglected is significantly related to change to neighborhoods with more concentrated disadvantage, less residential stability and less concentrated advantage. Abuse and neglect appear to have its greatest influence on change to neighborhoods with less advantage. Notably, individuals who were in the same census tract at time 1 (childhood) and time 2 (young adulthood) were very likely to see neighborhood economic resources worsen – both increases in neighborhood disadvantage and decreased in neighborhood advantage.

All of the neighborhood change variables were related to individual criminal offending, however, only changes in residential stability, ethnic heterogeneity and concentrated advantage independently influenced criminal behavior. Not surprising, this

finding suggests that changes in these neighborhood factors are related to one another. The neighborhood change variables did not appear to be as strongly related to violent offending as they were to general criminal behavior. Only change in neighborhood concentrated disadvantage appeared to consistently play a noteworthy role in violent offending. Importantly, the estimates for abuse and neglect were not significantly reduced when the neighborhood change variables were introduced. While it appears that abuse and neglect may indirectly influence criminal behavior though neighborhood changed, these models fail to meet the criteria for a mediation relationship put forth by Baron and Kenny (1986). In the next these results, as well as, the results presented in chapters IV and V are discussed in greater detail.

CHAPTER VII: DISCUSSION AND CONCLUSIONS

This dissertation focused on whether early childhood abuse and neglect experiences, and particularly whether childhood maltreatment in conjunction with neighborhood structural characteristics, are associated with demonstrable effects on later criminal behaviors. Of particular interest was the conjoint contribution of childhood maltreatment and neighborhood structural characteristics. Drawing on an ecological framework, these results indicated that certain neighborhood characteristics influence the long-term criminal outcomes associated with early childhood abuse and neglect. This is the first empirical demonstration that variations in neighborhood conditions produce different criminal and violent outcomes for abuse and neglected individuals. Several conclusions seem warranted.

The Role of Child Maltreatment in Criminal Offending

The present results underscore the importance of early childhood maltreatment in criminal and violent offending. Previous research using Widom's (1989c) child abuse and neglect data established a direct effect of child maltreatment on later criminal behavior. Present findings extend the past research by demonstrating that the association continues to exist; (a) when neighborhood structural factors are controlled; (b) using a different statistical technique, and (c) with different sub-samples of individuals.

Although this study demonstrates an association between child maltreatment and offending, it is important to note that many of the maltreated youth do not go on to engage in criminal and violent behavior. Many of the individuals are "resilient" with respect to criminal and violent behavior. Protective factors for maltreated individuals are likely to parallel protective factors for other 'at risk groups' (Rutter, 1987; Werner &

Smith, 1990). For example, social competence, problem solving, compensating parental support, social support, autonomy, sense of purpose, and envisioning a future have all been linked to resilience and have a potential to protect maltreated youth (Herrenkohl, Herrenkohl, & Egolf, 1994; Kendziora & O'Leary, 1993; Kruttschnitt, Ward, & Sheble, 1987). Since there is no research on child maltreatment resilience that looks specifically at criminal offending, additional research is needed to identify the specific buffering factors that can help maltreated youth avoid the negative criminal consequences associated with their experiences. Interventions for maltreated children that can target such protective factors may be able to prevent the harmful consequences of these early victimizations.

The Importance of Neighborhood Context

The present findings provide support for the hypothesis that particular aspects of neighborhood context are associated with later criminal offending over and above key individual and family characteristics. Specifically, higher levels of concentrated disadvantage increase the rate of both criminal and violent offending. *Most important, the negative effect of neighborhood disadvantage remained evident even when gender, race, age and other neighborhood structural characteristics were considered.* The effect of disadvantage was slightly more pronounced for violent arrests than criminal arrests.

Concentrated disadvantage has long been a key construct in the ecological study of crime and delinquency (Kornhauser 1978; Bursik 1988). Many researchers have heavily emphasized the detrimental effects of neighborhood economic disadvantage. In a recent review of neighborhood effects, Leventhal and Brooks-Gunn (2000) found that of all the neighborhood characteristics, low-socioeconomic status neighbors was the most

consistent factor in the development of externalizing behaviors (acting out and aggression) and mental health problems.

By definition, neighborhoods with high concentrated disadvantage lack resources, such as time, money and influence. However, the exact mechanism(s) by which this risk is translated into the development of antisocial behavior remains unknown. The most predominant view comes from social disorganization theory. From this perspective, the effect of concentrated disadvantage is hypothesized to operate through formal and informal controls as reflected in organizational participation, community supervision and presence of risk (Leventhal & Brooks-Gunn, 2000).

Contrary to the existing literature, the results from this study suggest that neighborhood residential stability may increase the rate of criminal offending. That is, more residential stability was associated with higher rates of offending. One possible explanation for this contradictory finding is the relationship between residential stability and concentrated disadvantage. As traditionally hypothesized by Shaw and McKay (1942) residential stability decreases crime by allowing the development of community social networks (Kornhauser, 1979). Stability allows the development of extensive friendship networks, kinship bonds, and local associational ties, which are viewed as building blocks of effective informal social control.

However, researchers have recently argued that the most disadvantaged neighborhoods have both high rates of poverty and high rates of stability (Wilson 1987; 1996). This is often referred to as the *social isolation hypothesis*. According to this perspective, stability is particularly bad for those individuals in economically disadvantaged neighborhoods because they are unable to escape to safer and more

economically advantaged places (South & Crowder, 1997). These disadvantaged neighborhoods are viewed as the neighborhoods of "last resort, where people remain, not because they choose to, but because they have no other options" (Warner & Pierce, 1993, p.494). For individuals trapped in disadvantaged neighborhoods, rather than building cohesiveness, residential stability may actually build resentment, frustration and isolation (Anderson, 1992; Jargowsky, 1997). Even if residential stability is associated with the increased presence of informational social ties, the networks developed under these conditions may not necessarily reduce crime (Pattillo, 1998) or work collectively for the common good (Ross, Reynolds, & Geis, 2000).

The current findings indicate that ethnic heterogeneity and concentrated advantage do not exert an independent effect, over and above other individual, family, and neighborhood characteristics of criminal or violent offending. In its original conceptualization, ethnic heterogeneity was thought to increase the likelihood of crime by thwarting the ability of residents to achieve consensus (Sampson & Grove, 1989). However, researchers have recently questioned the viability of this theoretical perspective. Hagan and Palloni (1999) have argued that the relationship between immigration and crime is confounded by the characteristics of the immigrants. Immigrants are more likely to be male and young. This means that immigrants disproportionately possess characteristics that are related to criminal offending, regardless of citizenship status or ethnic background. Hagan and Palloni (1999) suggest that these characteristics, such as gender and age, drive the relationship between immigration and crime. If this is true, then ethnic heterogeneity is only related to

criminal offending to the degree to which immigrants disproportionately possess other criminogenic characteristics[13].

The present analysis did not reveal an independent effect for concentrated advantage. Concentrated advantage was an attempt to examine the importance of the upper tail of the socioeconomic distribution. Like concentrated disadvantage, advantage is theoretically linked to the development of social networks, collective efficacy and presence of risk. One possible reason for the lack of findings in this study, relative to other studies, may be related to the idea of a 'tipping point' (Gladwell, 2000). That is, there may be a threshold for the influence of concentrated advantage. From this perspective, influence does not always correspond to linear change; rather, what is important is the 'tipping point' or threshold at which a phenomenon begins to exert influence. In these situations, there is no effect until a certain threshold is reached and then an explosive change occurs. Because the 1970 neighborhoods in this study had relatively low levels of advantage, that threshold may not have been reached.

The neighborhood effects by themselves do not account for much variation in criminal or violent offending. Nevertheless, given the uncertainty of how well census tracts measures reflect neighborhoods, and the time lag between childhood neighborhood and offending, these effects are not trivial. In fact, it is notable that general structural characteristics of neighborhoods in early childhood continue to exert an independent

[13] This idea is not completely inconsistent with Shaw and McKay's (1942) original conceptualization of ethnic heterogeneity. That is, the presence of different ethnic groups breeds fear and mistrust and reduces the necessary social interaction for building consensus and networks of informal social control. Traditionally, ethnic heterogeneity is thought to create barriers through differences of language and culture. However, it may be that the disproportional overrepresentation of other characteristics creates barriers to building networks.

influence on behavior well into adulthood. This research highlights the lasting impact of these important earlier childhood experiences.

The Conjoint Influence of Child Maltreatment and Neighborhood Context

Another important conclusion that should be drawn from this research is that child maltreatment is embedded within a larger set of forces in the neighborhood, and that the interplay between these ecological factors is intricately linked to the manifestation of deviant behavior. Consistent with the ideas proposed by Bronfenbrenner (1988), these findings emphasize the complex relations between the family and environment in children's behavioral development. These results suggest that the intersection between family functioning and neighborhood context provides a more complete understanding of later behavioral development than either factor alone.

The study findings consistently suggest residential stability exacerbates the criminal and violent outcomes for maltreated children. That is, maltreated children who resided in more stable neighborhoods were more likely to engage in later offending. One possible explanation for this finding may be linked to the social isolation hypothesis. For maltreated children, the prospects of an economically disadvantaged stable neighborhood may be doubly damaging. Researchers have suggested that child maltreatment carries with it a degree of shame and stigma (Finkelhor & Browne, 1985). For these abused and neglected individuals, residential stability may not only represent a "neighborhood of last resort", where residents remain not out of choice but because that cannot escape, but also a place of continual shame and stigma.

The study findings also suggest that neighborhood concentrated disadvantage exacerbates the development of criminal behavior associated with early childhood

victimization. Victims of early child abuse and neglect that resided in disadvantaged neighborhoods engaged in criminal activity at higher rates than abused and neglected individuals from less disadvantaged neighborhoods. The effect of neighborhood disadvantage on the criminal behavior associated with child maltreatment was more pronounced for violent offending than general criminal offending.

The results suggest that neighborhood ethnic heterogeneity modifies the development of violent offending associated with child maltreatment. Abused and neglected individuals from neighborhoods with more ethnic heterogeneity were less likely to engage in violent offending than victims of maltreatment from neighborhoods with less ~~ethnic~~ heterogeneity. One possible explanation for this finding may be related to the association between one of the indicators of ethnic heterogeneity, percent foreign born and the indicators of concentrated advantage -- percent middle class neighbors, percent affluent neighbors, percent professional and managerial, and percent college degree. Percent foreign born is positively associated with the measures of concentrated advantage (see Appendix C). In this study, the findings regarding ethnic heterogeneity may be a product of the strong link between percent foreign born and the measures of neighborhood affluence.

While it was not possible to test specific mechanisms through which the interaction of child maltreatment and concentrated disadvantage increased the risk of negative behavioral development, some of the ideas proposed by Bronfenbrenner (1988) and presented earlier may provide important insight. According to the ecological perceptive, neighborhood characteristics may exacerbate the harmful effects of child maltreatment. Neighborhood concentrated disadvantage may represent a lack of

neighborhood "collective efficacy" (social control and social cohesion) and/or increased presence of risk (violence, victimization, and/or presence of harmful substances) which may intensify the manifestation of physiological damage, social learning, failure of attachment, maladaptive coping, and changes in self-concept or attribution styles associated with child maltreatment.

Again, while it was not possible to test specific mechanisms, the differential findings for specific types of abuse and neglect may highlight some of these potential processes. The findings indicate that the moderation effects of the neighborhood structural characteristics may differ by type of abuse. Neglected children showed the greatest susceptibility to the interaction effect of concentrated disadvantage. Neglect is a distinctive form of maltreatment because it is not identified by inappropriate contact between the child and adult, but rather the lack of basic care by the caretaker (Garbarino & Eckenrode, 1997). Neglect is more passive than active. By definition, neglectful parents are not providing the basic needs necessary for their children to become healthy productive adults. According to Furstenberg and his colleagues (Furstenberg, Cook, Eccles, Elder, & Sameroff, 1999, p.12) "parents play an essential role in managing the external world by monitoring, locating, and cultivating the social contacts in which their children engage outside the household." Neglectful parents may be the ones least able to play this important role. They may be the ones least able to protect their children from dangerous neighborhood influences and least able to access critical neighborhood resources on behalf of their children. Unfortunately and not surprisingly, these results suggest that children from the most disadvantaged neighborhoods suffer the greatest consequences of parental neglect.

The interaction effect of concentrated disadvantage and physical abuse is questionable. The effect is smaller for physical abuse than neglect, and the estimate does not reach conventional levels of statistical significance. Nevertheless, sample size may play an important role in this distinction because there are far fewer cases of physical abuse than neglect. In contrast to neglect, physical abuse cases include injuries such as bruises, welts, burns, abrasions, lacerations, wounds, cuts, bone and skull fractures and other evidence of physical injury. A number of researchers have pointed out the similarity of physical abuse to physical punishment (Straus, 1994; Trickett, 1993; Wolfe, 1993; Peterson & Brown, 1994). Researchers have suggested that physical abuse may reflect an extreme of normative parenting (Crittenden, 1998). Parents are parenting, but not necessarily parenting well. This may explain the smaller effect of concentrated disadvantage on criminal consequences for physically abused children. Unlike neglectful parents, physically abusing parents may still be able to play some role in moderating environmental influences on their child. In fact, researcher suggest that there may be a relationship between neighborhood safety and harsh parenting practices (Jenkins & Bell, 1997). That is, parents in dangerous neighborhoods may be more likely to use harsher punishment because the consequences of misbehavior are so much greater.

Thus, while far from conclusive, the differential effects for neglect and physical abuse in disadvantaged neighborhoods lends some support to the idea that parents may play an important role in negotiating the environmental context for their children. Consistent with prior theoretical specification of the consequences of neglect and physical abuse, children of neglectful parents do far worse in disadvantaged neighborhoods than children of physically abusive parents. This fact is consistent with

ideas regarding the meaning of neighborhood proposed by Sampson and his colleagues (1992; 1997; Sampson et al., 1999) and Leventhal and Brooks-Gunn (2000).

Unexpectedly, the results indicate sexually abused individuals from more disadvantaged neighborhoods were much less likely to engage in criminal behavior than sexual abused individuals from less disadvantaged neighborhoods. The National Center on Child Abuse and Neglect (NCAAN, 1978, p.2) defines sexual abuse as "contacts or interactions between a child and an adult when the child is being used for sexual stimulation of the perpetrator or another person when the perpetrator is in a position of power or control over the victim." One possible explanation for this finding may be related to the consequences of sexual abuse under conditions of extreme disadvantage. While sexual abuse has been shown to be a risk factor in later offending, the sexual abuse-criminal offending relationship is by far the weakest for all the types of abuse and neglect. Sexual abuse under extreme conditions of disadvantage may be more likely to influence the development of internalizing disorders such as depression, self-esteem and social isolation than externalizing disorders like criminal offending. The development of certain types of internalizing disorders such as social isolation may in fact decrease the likelihood criminal and violent offending. In situations of extreme disadvantage, sexual abuse may be related to the development of internalizing disorders that in turn decrease the likelihood of externalizing disorders. If this is true, researchers must be careful in understanding how neighborhood disadvantage affects different outcomes.

Reduced Upward Neighborhood Social Mobility

It appears that that child maltreatment may have an indirect effect on later criminal offending through reduced upward neighborhood social mobility. The present

results suggest that child maltreatment is a barrier to upward mobility; and that the inability to move to better neighborhoods is related to criminal offending. Being abused or neglected was significantly related to change to more disadvantaged neighborhoods, less stable neighborhoods, and less advantaged neighborhoods. In turn, change to less advantaged neighborhoods was related to more criminal offending. However, results do not support the hypothesis that neighborhood social mobility is a mediator between early maltreatment and criminal offending.

These results must be interpreted with caution. Unfortunately, this study cannot disentangle the effects of crime and neighborhood social mobility. One possibility is that reduced upward mobility is related to later criminal offending, or as likely a scenario is that engagement in criminal offending is related to changes in neighborhood social mobility. Nevertheless, this research points to the need to consider neighborhood mobility as an important consequence of child maltreatment. While, change in neighborhood structural characteristics does not appear to mediate the relationship between maltreatment and criminal offending, it does seem to be effected by abuse and neglect.

Limitations

Despite the strengths of this study, there are some limitations. Caution must be used in generalizing from these findings. The data are from cases of childhood victimization taken from official records, which are likely to represent the most extreme cases processed in the system (Groeneveld & Giovannoni, 1977). Therefore, these findings are not generalizable to unreported or unsubstantiated cases of child abuse and neglect (Widom, 1989a). Furthermore, officially reported cases of child abuse and

neglect are generally skewed toward the lower end of the socioeconomic spectrum. Because these abuse and neglect cases (and the matched controls) are predominantly from the lower socioeconomic classes, these findings cannot be generalized to childhood abuse and neglect cases involving middle- or upper-class children. Additionally, these findings are not generalizable to cases of neglected and abused children who were adopted in infancy or early childhood because they were excluded from the sample.

There is an important distinction between structural neighborhood characteristics and neighborhood causal processes. The dimensions of neighborhood characteristics used in this research assess structural aspects of neighborhoods such as income, household composition, employment rates, etc., but they do not directly evaluate the social organizational aspects of neighborhoods such as informal social control, social cohesion, and the presence of risk. Theoretically, structural and causal processes of neighborhoods should be related. However, the neighborhood measures used in this study provide only a "black-box" estimate of the role of neighborhood for abused and neglected children.

Conclusions

Many children in the United States today experience child maltreatment. In the past few decades, increasing attention has been paid to the long-term consequences of these early childhood experiences. A growing body of research suggests that being maltreated increases the risk of negative behavioral consequences during childhood, adolescence and adulthood. While maltreatment is not inevitability linked to the development of negative behavior, the association between child abuse and neglect and later delinquency, adult offending and violence has been documented repeatedly (e.g.

English et al., 2001; McCord, 1983; Maxfield & Widom, 1996; Smith & Thornberry, 1995; Widom, 1989b; Zingraff et al. 1993).

However, child maltreatment does not occur in isolation. Child maltreatment is embedded in a larger social context. Child abuse and neglect is often intertwined with a number of negative neighborhood conditions – economic disadvantage, violence, drug trafficking, and house deterioration (Coulton et al., 1995). While research suggests that these neighborhood conditions are linked to the occurrence of maltreatment (e.g, Coulton, Korbin, & Su, 1999; Garbarino & Kostelny, 1992), it is also likely that theses conditions continue to interact and influence the long-term consequences of maltreatment.

Both families and neighborhoods can play a role in understanding the development of criminal offending. This research on the effects of the conjoint influence of families and neighborhoods expands prior conceptual and methodological research in child maltreatment beyond those from research focused only on the individual child and his or her family. According to this research, such conceptualization masks important variances in the criminal outcomes for maltreated children.

In terms of theory and research, the current finding that child maltreatment interacts with neighborhood concentrated disadvantage to result in increased antisocial behavior, lends empirical evidence for the need of criminology to follow an ecological model. It suggests that either family or neighborhood explanations alone are inadequate accounts of criminal and violent behavior. In addition, it highlights the importance of early childhood experiences in the development of later maladaptive behavior.

In terms of policy, these findings also suggest that preventative interventions with high-risk children should involve the broader physical and social environments. These

results highlight possible avenues for intervention and provide evidence to justify the need to intervene in the lives of children growing up in the context of "socially toxic environments" (Garbarino, 1995). If individuals who experience risk situations at multiple ecological levels are at higher risk for the development of antisocial behavior, then it follows that individuals in these multiple risk situations should be targeted for intervention. In order to effectively target multiple risk levels, interventions should focus on interorganizational collaboration that builds cooperation among government organizations and private child-serving agencies to strengthen families and neighborhoods.

Future Research

These analyses represent only a first step toward understanding the relevance of the conjoint influence of family functioning and neighborhood structural characteristics on individuals' antisocial behavior. Future research should continue to focus on the transactional nature of family functioning and neighborhood context. Three specific areas require particular consideration. First, these findings need to be replicated. While these findings support a conjoint influence of child maltreatment and neighborhood context, the results needs replicated for different samples in different time periods and locations. As pointed out earlier in this chapter, this sample did not have high levels of neighborhood concentrated advantage. This fact is probably a reflection of the location (Midwest) and time period (1970s) of the data. Future research should replicate is study, in order to assess the generalizability of these findings.

Second, researchers should focus on testing the processes or pathways through which neighborhood context influences the development of criminal and violent behavior

for abused and neglected children. Census data cannot provide such information. Researchers need to use other methods such as community surveys or systematic social observations to accurately measure neighborhood processes relevant to abused and neglected children.

Third, there should be more development of substantive theory in understanding the long-term conjoint influences of child maltreatment and neighborhood context. While in recent years, there have been great strides in understanding the long-term consequences of child maltreatment and neighborhood context separately, there is virtually no substantive theory on the conjoint influences. Based on current theory this researcher ~~hy~~pothesized that the intersection of family practices and neighborhood context should influence the development of antisocial behavior. While this research supports these findings, current theory may not be inadequate in explaining the pathways or processes by which the conjoint influences of child maltreatment and neighborhood context affect antisocial outcomes. Future researchers need to focus on developing theories that can explain why neighborhood context exacerbates the antisocial consequences of child maltreatment. Future theories should focus on explaining and delineating the causal processes involved in effects that are both additive (child maltreatment + neighborhood context) and multiplicative (child maltreatment x neighborhood context).

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APPENDIX A: UNCONDITIONAL MEANS MODELS

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In order to assess whether hierarchical linear modeling (HLM) is necessary a model must be estimated with no individual or neighborhood level variables. This allows for estimating the variances in the dependent variable at the individual and neighborhood levels and testing whether there are significant differences between level-2 units (in this case neighborhoods). Tables A1 and A2 show the results for criminal arrests and violent arrests.

Another way of thinking about the sources of variation in criminal arrests is to estimate the intraclass correlation, ρ. This is equivalent to expressing the variance-covariance matrix in correlation form. The intraclass correlation (ρ) indicates what portion of the total variance occurs between level-2 units (or in this case neighborhoods):

$$\rho = \frac{\hat{\tau}_{00}}{\hat{\tau}_{00} + \sigma^2}$$

For criminal arrests, the intraclass correlation, p, is .03 and the intraclass correlation for violent arrests is .16. Thus, 3% of the variance in criminal arrests and 16% of the variance for violent arrests occurred between neighborhoods. This reveals some clustering of criminal and violent arrests within neighborhoods. These results suggest that that ordinal least squares (OLS) estimates of the data would likely yield misleading results.

Table A1. Unconditional Means Model for Criminal Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Intercept	.88	.07	12.42	<.001	2.41

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.33	.25	246.83	<.001
Individual level (σ^2)		8.59		

Table A2. Unconditional Means Model for Violent Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Intercept	-1.26	.10	-13.23	<.001	.28

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.28	.38	232.20	<.001
Individual level (σ^2)		2.07		

APPENDIX B: INDIVIDUAL LEVEL MODEL

Table B1. Criminal Arrest Individual Level Model Building with Random Effect for Abuse/Neglect

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.46	.12	3.71	<.001	1.58
Male	1.49	.10	15.23	<.001	4.44
Non-White	.77	.15	5.04	<.001	2.16
Age	.06	.01	4.99	<.001	1.06
Neighborhood Level					
Intercept	.54	.07	7.37	<.001	1.72

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.48	.30	265.63	<.001
Abuse/neglect (τ_{11})	.25	.45	141.07	.038
Individual level (σ^2)		5.45		

Note: The chi-square statistics reported above are based on only 114 of 150 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Table B2. Criminal Arrest Individual Level Model Building with Random Effect for Abuse/Neglect and Male

	b	*SE*	*t*	*e*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.45	.12	3.63	.001	1.57
Male	1.41	.10	13.67	<.001	4.10
Non-White	.78	.15	5.08	<.001	2.18
Age	.06	.01	4.95	<.001	1.06
Neighborhood Level					
Intercept	.56	.07	8.06	<.001	1.75

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.43	.24	179.24	<.001
Abuse/neglect (τ_{11})	.27	.45	116.32	.044
Male	.05	.05	101.96	.224
Individual Level (σ^2)		5.47		

Note: The chi-square statistics reported above are based on only 93 of 150 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Table B3. Criminal Arrest Individual Level Model Building with Random Effect for Abuse/Neglect and Non-White

	b	*se*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.48	.12	3.92	<.001	1.62
Male	1.48	.10	15.33	<.001	4.39
Non-White	.80	.19	4.32	<.001	2.23
Age	.06	.01	5.01	<.001	1.06
Neighborhood Level					
Intercept	.53	.07	7.15	<.001	1.70

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.58	.32	68.63	<.001
Abuse/neglect (τ_{11})	.32	.48	31.58	>.500
Non-White	.29	.53	39.92	.159
Individual level (σ^2)		5.24		

Note: The chi-square statistics reported above are based on only 33 of 150 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Table B4. Criminal Arrest Individual Level Model Building with Random Effects for Abuse/Neglect and Age

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.46	.12	3.76	<.001	1.58
Male	1.49	.10	15.31	<.001	4.44
Non-White	.76	.15	5.01	<.001	2.14
Age	.07	.01	5.32	<.001	1.07
Neighborhood Level					
Intercept	.54	.07	7.23	<.001	1.72

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.50	.31	254.40	<.001
Abuse/neglect (τ_{11})	.24	.45	120.42	.144
Age	.04	.01	75.12	>.500
Individual level (σ^2)		5.39		

Note: The chi-square statistics reported above are based on only 106 of 150 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Table B5. Violent Arrest Individual Level Model Building with Random Effect for Abuse/Neglect

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.37	.18	2.03	.042	1.45
Male	1.96	.15	13.02	<.001	7.10
Non-White	1.71	.22	7.92	<.001	5.53
Age	.04	.02	2.58	<.001	1.04
Neighborhood Level					
Intercept	-1.85	.11	-17.17	<.001	.16

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.41	.49	216.62	<.001
Abuse/neglect (τ_{11})	.25	.99	116.52	.391
Individual Level (σ^2)		1.28		

Note: The chi-square statistics reported above are based on only 114 of 150 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Table B6. Violent Arrest Individual Level Model Building with Random Effect for Male

	b	*se*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.66	.13	4.97	<.001	1.93
Male	2.04	.16	12.72	<.001	7.69
Non-White	1.76	.23	7.66	<.001	5.81
Age	.04	.02	2.47	.014	1.04
Neighborhood Level					
Intercept	-1.84	.12	-15.69	<.001	.16

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.35	.61	238.77	<.001
Male	.01	.04	71.38	>.500
Individual level (σ^2)		1.46		

Note: The chi-square statistics reported above are based on only 106 of 150 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Table B7. Violent Arrest Individual Level Model Building with Random Effect for Non-White

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.66	.13	5.04	>.001	1.93
Male	1.93	.16	12.28	>.001	6.89
Non-White	1.69	.29	5.85	>.001	5.42
Age	.04	.02	2.44	>.001	1.04
Neighborhood Level					
Intercept	-1.82	.11	-16.06	>.001	.16

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.47	.55	115.35	<.001
Non-White	.24	.95	35.76	>.500
Individual level (σ^2)		1.12		

Note: The chi-square statistics reported above are based on only 38 of 150 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

Table B8. Violent Arrest Individual Level Model Building with Random Effect for Age

	b	*se*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.65	.13	4.99	<.001	1.92
Male	1.96	.16	12.54	<.001	7.10
Non-White	1.73	.23	7.61	<.001	5.64
Age	.05	.02	2.59	<.001	1.05
Neighborhood Level					
Intercept	-1.83	.11	-16.22	<.001	.16

	Reliability	***Variance***	X^2	***p***
Random Effects				
Intercept (τ_{00})	.41	.55	357.09	<.001
Age	.09	.01	97.09	>.500
Individual level (σ^2)		1.40		

Note: The chi-square statistics reported above are based on only 128 of 150 units that had sufficient data for computation. Fixed effects and variance components are based on all the data.

APPENDIX C: NEIGHBORHOOD FACTORS

Figure C1. The Relationship Between Residential Stability and Concentrated Disadvantage for the 1970 Neighborhoods ($N = 150$)

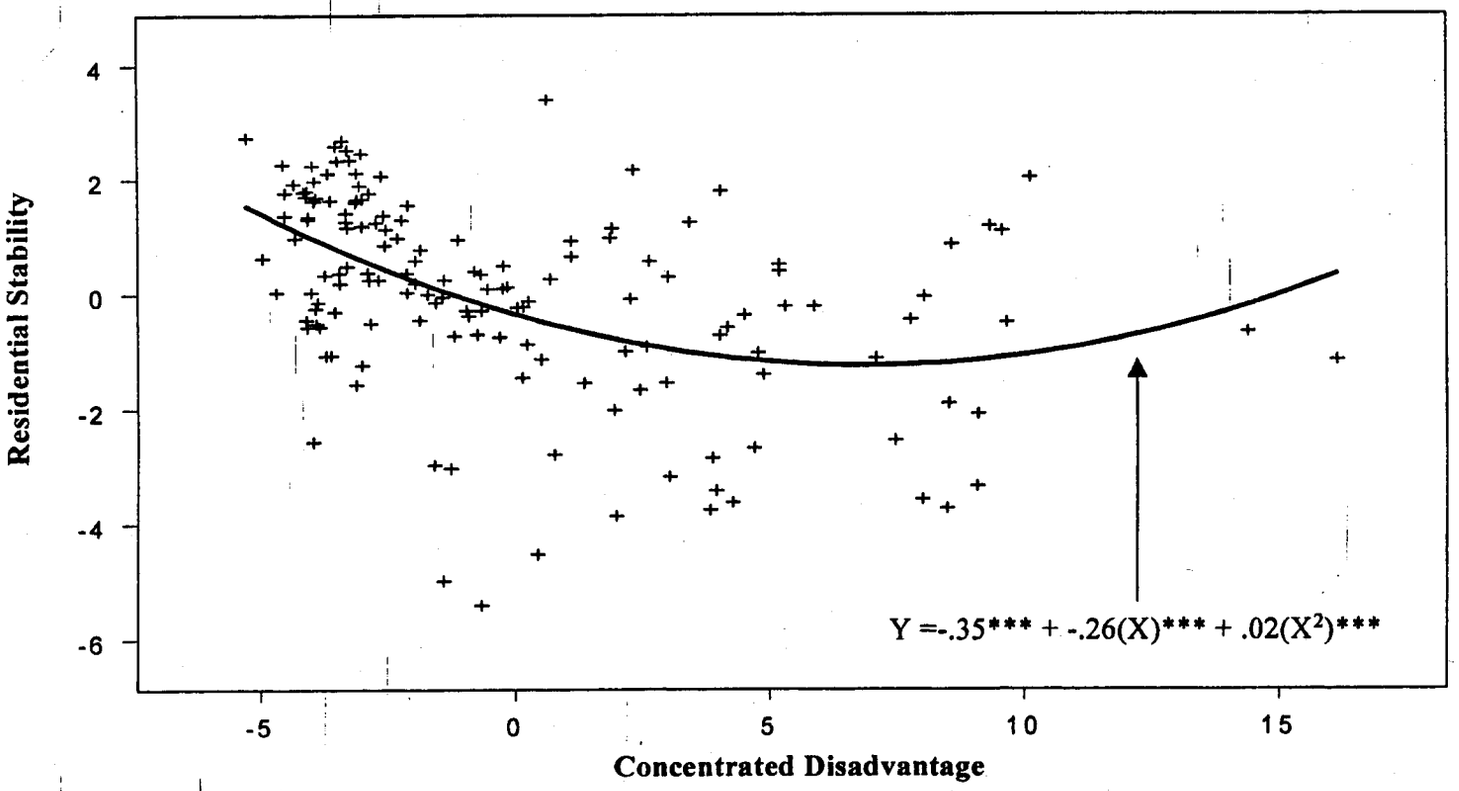

Table C1. Principal Components Factor Analysis with Varimax Rotation Results for 1970 Neighborhood Structural Characteristics

	Factor 1	Factor 2	Factor 3
Percent poverty	.865	-.293	-.021
Percent AFDC	.875	-.184	.065
Percent Unemployed	.766	-.373	.210
Percent female-headed household	.892	-.186	-.100
Percent black	.825	.014	-.231
Percent foreign	-.276	.410	.562
Percent Spanish speaking	.086	-.027	.902
Percent middle class neighbors	-.183	.868	.085
Percent affluent neighbors	-.036	.821	-.036
Percent professional or managerial	-.369	.849	.110
Percent college	-.232	.920	.095
Eigenvalues	5.41	1.99	1.21
Percent of variance	35.28	31.43	11.55

APPENDIX D: GENDER AND RACE REPLICATION

Table D1. Gender Replication with the Introduction of Concentrated Disadvantage for Criminal Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.78	.24	3.26	.002	2.18
Male	1.93	.22	8.86	<.001	6.89
Non-White	.75	.15	5.06	<.001	2.12
Age	.06	.01	5.00	<.001	1.06
Neighborhood Level					
Intercept	.42	.08	5.22	<.001	1.52
Concentrated disadvantage	.06	.02	4.07	<.001	1.06
Interaction Effects					
A/N x concentrated disadvantage	-.01	.04	-.07	.947	.99
Sex x concentrated disadvantage	-.06	.04	-1.66	.097	.94
A/N x sex	-.48	.26	-1.87	.061	.62
A/N x sex x concentrated disadvantage	.05	.04	1.03	.303	1.05

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intereept (τ_{00})	.46	.27	219.59	<.001
Abuse/neglect (τ_{11})	.27	.49	136.83	.055
Individual level (σ^2)		5.33		

Table D2. Gender Replication with the Introduction of Residential Stability for Criminal Arrests

	b	*se*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.79	.24	3.29	.001	2.20
Male	1.92	.22	8.76	<.001	6.82
Non-White	.75	.15	5.01	<.001	2.12
Age	.06	.01	4.85	<.001	1.06
Neighborhood Level					
Intercept	.43	.08	5.27	<.001	1.54
Concentrated disadvantage	.07	.02	4.31	<.001	1.07
Residential stability	.07	.05	1.41	.159	1.07
Interaction Effects					
A/N x concentrated disadvantage	.03	.05	.53	.593	1.03
A/N x residential stability	.20	.14	1.42	.157	1.22
Sex x concentrated disadvantage	-.05	.04	-1.18	.238	.95
Sex x residential stability	.05	.13	.39	.695	1.05
A/N x sex	-.46	.26	-1.79	.072	.63
A/N x sex x concentrated disadvantage	.03	.05	.67	.501	1.03
A/N x sex x residential stability	-.05	.15	-.35	.723	.95

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.45	.26	212.56	<.001
Abuse/neglect (τ_{11})	.25	.46	133.99	.068
Individual level (σ^2)		5.34		

Table D3. Gender Replication with the Introduction of Ethnic Heterogeneity for Criminal Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.70	.25	2.76	.006	2.01
Male	1.91	.23	8.41	<.001	6.75
Non-White	.75	.15	5.00	<.001	2.12
Age					
Neighborhood Level					
Intercept	.40	.08	4.88	<.001	1.49
Concentrated disadvantage	.06	.02	3.44	.001	1.06
Residential stability	.04	.05	.78	.434	1.04
Ethnic heterogeneity	-.09	.06	-1.41	.158	.91
Interaction Effects					
A/N x concentrated disadvantage	.01	.05	.18	.855	1.01
A/N x residential stability	.16	.15	1.05	.295	1.17
A/N x ethnic heterogeneity	-.20	.19	-1.03	.303	.82
Sex x concentrated disadvantage	-.05	.05	-1.09	.277	.95
Sex x residential stability	.06	.14	.43	.668	1.06
Sex x ethnic heterogeneity	-.01	.16	-.09	.927	.99
A/N x sex	-.39	.27	-1.43	.152	.68
A/N x sex x concentrated disadvantage	.04	.05	.84	.404	1.04
A/N x sex x residential stability	-.02	.16	-.14	.887	.98
A/N x sex x ethnic heterogeneity	.14	.20	.70	.486	1.15

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.45	.27	212.27	<.001
Abuse/neglect (τ_{11})	.25	.46	132.95	.067
Individual level (σ^2)		5.32		

Table D4. Gender Replication with the Introduction of Concentrated Advantage for Criminal Arrests

	b	*se*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.62	.28	2.26	.024	1.86
Male	1.87	.24	7.80	<.001	6.49
Non-White	.76	.15	5.02	<.001	2.14
Age	.06	.01	4.83	<.001	1.06
Neighborhood Level					
Intercept	.41	.08	4.89	<.001	1.51
Concentrated disadvantage	.07	.02	3.47	.001	1.07
Residential stability	.04	.05	.75	.452	1.04
Ethnic heterogeneity	-.09	.06	-1.50	.134	.91
Concentrated advantage	.02	.03	.60	.550	1.02
Interaction Effects					
A/N x concentrated disadvantage	-.01	.05	-.05	.960	.99
A/N x residential stability	.16	.15	1.06	.289	1.17
A/N x ethnic heterogeneity	-.15	.20	-.75	.457	.86
A/N x concentrated advantage	-.09	.13	-.70	.481	.91
Sex x concentrated disadvantage	-.06	.05	-1.25	.212	.94
Sex x residential stability	.07	.14	.48	.633	1.07
Sex x ethnic heterogeneity	.02	.17	.12	.905	1.02
Sex x concentrated advantage	-.07	.10	-.66	.512	.93
A/N x sex	-.32	.30	-1.06	.289	.73
A/N x sex x concentrated disadvantage	.06	.06	1.00	.317	1.06
A/N x sex x residential stability	-.03	.16	-.17	.866	.97
A/N x sex x ethnic heterogeneity	.10	.21	.45	.651	1.11
A/N x sex x concentrated advantage	.09	.14	.65	.515	1.09

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.45	.27	211.20	<.001
Abuse/neglect (τ_{11})	.26	.49	133.11	.058
Individual Level (σ^2)		5.31		

Table D5. Gender Replication with the Introduction Concentrated Disadvantage for Violent Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.86	.40	2.13	.033	2.36
Male	2.38	.38	6.35	<.001	10.80
Non-White	1.67	.23	7.33	<.001	5.31
Age	.05	.02	2.48	.013	1.05
Neighborhood Level					
Intercept	-1.98	.13	-14.89	<.001	.14
Concentrated disadvantage	.09	.02	3.62	.001	1.09
Interaction Effects					
A/N x concentrated disadvantage	.08	.07	1.03	.302	1.08
Sex x concentrated disadvantage	.01	.07	.152	.880	1.01
A/N x sex	-.54	.44	-1.23	.220	.58
A/N x sex x concentrated disadvantage	-.02	.08	-0.29	.773	.98

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.32	.43	278.08	<.001
Individual Level (σ^2)		1.50		

Table D6. Gender Replication with the Introduction of Residential Stability for Violent Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.83	.40	2.09	.036	2.29
Male	2.30	.37	6.21	<.001	9.97
Non-White	1.67	.23	7.22	<.001	5.31
Age	.04	.02	2.34	.019	1.04
Neighborhood Level					
Intercept	-1.97	.13	-15.07	<.001	.14
Concentrated disadvantage	.10	.03	3.92	<.001	1.11
Residential stability	.12	.07	1.65	.099	1.13
Interaction Effects					
A/N x concentrated disadvantage	.10	.08	1.19	.233	1.11
A/N x residential stability	.17	.24	.71	.480	1.19
Sex x concentrated disadvantage	-.01	.08	-.13	.897	.99
Sex x residential stability	-.17	.24	-.71	.478	.84
A/N x sex	-.47	.44	-1.07	.285	.63
A/N x sex x concentrated disadvantage	-.02	.09	-.26	.792	.98
A/N x sex x residential stability	-.03	.26	-.10	.921	.97

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.31	.41	262.73	<.001
Individual level (σ^2)		1.50		

Table D7. Gender Replication with the Introduction of Ethnic Heterogeneity for Violent Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.77	.42	1.85	.064	2.16
Male	2.29	.38	5.96	<.001	9.87
Non-White	1.65	.23	7.13	<.001	5.21
Age	.04	.02	2.22	.027	1.04
Neighborhood Level					
Intercept	-1.98	.13	-14.84	<.001	.14
Concentrated disadvantage	.09	.03	3.43	.001	1.09
Residential stability	.11	.08	1.35	.178	1.12
Ethnic heterogeneity	-.05	.09	-.50	.619	.95
Interaction Effects					
A/N x concentrated disadvantage	.10	.08	1.20	.230	1.11
A/N x residential stability	.17	.26	.65	.513	1.19
A/N x ethnic heterogeneity	-.10	.30	-.34	.736	.90
Sex x concentrated disadvantage	.01	.08	.08	.939	1.01
Sex x residential stability	-.14	.25	-.58	.562	.87
Sex x ethnic heterogeneity	.02	.27	.08	.937	1.02
A/N x sex	-.53	.46	-1.15	.251	.59
A/N x sex x concentrated disadvantage	-.05	.09	-.61	.541	.95
A/N x sex x residential stability	-.10	.27	-.35	.727	.90
A/N x sex x ethnic heterogeneity	-.16	.32	-.51	.607	.85

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.31	.41	258.24	<.001
Individual level (σ^2)		1.50		

Table D8. Gender Replication with the Introduction of Concentrated Advantage for Violent Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.72	.47	1.51	.130	2.05
Male	2.39	.41	5.86	<.001	10.91
Non-White	1.64	.23	7.12	<.001	5.16
Age	.04	.02	2.25	.024	1.04
Neighborhood Level					
Intercept	-1.99	.14	-13.75	<.001	.14
Concentrated disadvantage	.10	.03	3.36	.001	1.11
Residential stability	.11	.08	1.39	.166	1.12
Ethnic heterogeneity	-.05	.10	-.49	.623	.95
Concentrated advantage	.01	.06	.02	.988	1.01
Interaction Effects					
A/N x concentrated disadvantage	.11	.09	1.25	.212	1.12
A/N x residential stability	.14	.26	.54	.588	1.15
A/N x ethnic heterogeneity	-.12	.31	-.39	.699	.89
A/N x concentrated advantage	.01	.22	.03	.979	1.01
Sex x concentrated disadvantage	.02	.08	.28	.778	1.02
Sex x residential stability	-.17	.25	-.66	.507	.84
Sex x ethnic heterogeneity	-.03	.28	-.10	.922	.97
Sex x concentrated advantage	.13	.17	.73	.467	1.14
A/N x sex	-.43	.51	-.84	.400	.65
A/N x sex x concentrated disadvantage	-.06	.09	-.69	.489	.94
A/N x sex x residential stability	-.07	.28	-.25	.801	.93
A/N x sex x ethnic heterogeneity	-.16	.33	-.48	.630	.85
A/N x sex x concentrated advantage	.02	.23	.08	.941	1.02

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.32	.42	257.50	<.001
Individual level (σ^2)		1.49		

Table D9. Race Replication with the Introduction of Concentrated Disadvantage for Criminal Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.29	.15	1.90	.057	1.34
Male	1.49	.10	15.27	<.001	4.44
Non-White	.25	.32	.80	.425	1.28
Age	.06	.01	5.17	<.001	1.06
Neighborhood Level					
Intercept	.48	.08	6.35	<.001	1.62
Concentrated disadvantage	.05	.01	3.60	.001	1.05
Interaction Effects					
A/N x concentrated disadvantage	.01	.04	.24	.810	1.01
Non-White x concentrated disadvantage	.03	.06	.57	.567	1.03
A/N x non-White	.63	.34	1.87	.061	1.88
A/N x non-White x concentrated disadvantage	-.03	.06	-.513	.608	.97

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.45	.26	217.90	<.001
Abuse/neglect	.23	.40	131.68	.099
Individual level (σ^2)		5.44		

Table D10. Race Replication with the Introduction of Residential Stability for Criminal Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.36	.16	2.31	.021	1.43
Male	1.48	.10	15.28	<.001	4.39
Non-White	-.01	.34	-.01	.990	.99
Age	.06	.01	5.08	<.001	1.06
Neighborhood Level					
Intercept	.48	.07	6.39	<.001	1.62
Concentrated disadvantage	.06	.02	4.10	<.001	1.06
Residential stability	.09	.04	2.01	.044	1.09
Interaction Effects					
A/N x concentrated disadvantage	.07	.06	1.13	.258	1.07
A/N x residential stability	.21	.13	1.59	.112	1.23
Non-White x concentrated disadvantage	.01	.07	.213	.831	1.01
Non-White x residential stability	-.30	.17	-1.73	.084	.74
A/N x non-White	.51	.34	1.48	.139	1.67
A/N x non-White x concentrated disadvantage	-.07	.07	-.928	.354	.93
A/N x non-White x residential stability	-.08	.17	-.47	.641	.92

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.44	.25	209.07	<.001
Abuse/neglect	.23	.40	128.44	.124
Individual level (σ^2)		5.38		

Table D11. Race Replication with the Introduction of Ethnic Heterogeneity for Criminal Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.34	.16	2.12	.034	1.40
Male	1.48	.10	15.32	<.001	4.39
Non-White	-.02	.35	-.07	.944	.98
Age	.06	.01	5.03	<.001	1.06
Neighborhood Level					
Intercept	.47	.08	6.14	<.001	1.60
Concentrated disadvantage	.06	.02	3.38	.001	1.06
Residential stability	.07	.05	1.44	.151	1.07
Ethnic heterogeneity	-.06	.05	-1.20	.229	.94
Interaction Effects					
A/N x concentrated disadvantage	.07	.07	.99	.325	1.07
A/N x residential stability	.20	.14	1.37	.171	1.22
A/N x ethnic heterogeneity	-.06	.14	-.44	.663	.94
Non-White x concentrated disadvantage	-.03	.08	-.37	.710	.97
Non-White x residential stability	-.39	.19	-2.00	.046	.68
Non-White x ethnic heterogeneity	-.17	.21	-.80	.423	.84
A/N x non-White	.36	.38	.95	.345	1.43
A/N x non-White x concentrated disadvantage	-.07	.08	-.88	.380	.93
A/N x non-White x residential stability	-.10	.18	-.55	.584	.90
A/N x non-White x ethnic heterogeneity	-.12	.23	-.53	.598	.89

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.44	.25	207.73	<.001
Abuse/neglect	.24	.41	126.43	.136
Individual level (σ^2)		5.36		

Table D12. Race Replication with the Introduction of Concentrated Advantage for Criminal Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.33	.21	1.55	.122	1.39
Male	1.48	.10	15.28	<.001	4.39
Non-White	-.04	.36	-.11	.914	.96
Age	.06	.01	5.02	<.001	1.06
Neighborhood Level					
Intercept	.47	.08	5.94	<.001	1.60
Concentrated disadvantage	.06	.02	3.30	.001	1.06
Residential stability	.07	.05	1.42	.156	1.07
Ethnic heterogeneity	-.07	.06	-1.21	.228	.93
Concentrated advantage	.01	.03	.21	.832	1.01
Interaction Effects					
A/N x concentrated disadvantage	.06	.07	.92	.356	1.06
A/N x residential stability	.19	.15	1.32	.187	1.21
A/N x ethnic heterogeneity	-.06	.14	-.40	.686	.94
A/N x concentrated advantage	-.01	.09	-.12	.908	.99
Non-White x concentrated disadvantage	-.01	.09	-.03	.975	.99
Non-White x residential stability	-.41	.20	-2.03	.042	.66
Non-White x ethnic heterogeneity	-.20	.21	-.921	.358	.82
Non-White x concentrated advantage	.11	.12	.862	.389	1.12
Abuse x non-White	.37	.40	.92	.356	1.45
A/N x non-White x concentrated disadvantage	-.09	.09	-1.08	.281	.91
A/N x non-White x residential stability	-.08	.19	-.41	.682	.92
A/N x non-White x ethnic heterogeneity	-.05	.24	-.21	.833	.95
A/N x non-White x concentrated advantage	-.12	.16	-.79	.430	.89

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.44	.25	205.92	<.001
Abuse/neglect	.25	.44	127.38	.110
Individual level (σ^2)		5.36		

Table D13. Race Replication with the Introduction of Concentrated Disadvantage for Violent Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.14	.20	.72	.471	1.15
Male	1.94	.16	12.39	<.001	6.96
Non-White	.78	.41	1.88	.060	2.18
Age	.05	.02	2.61	.009	1.05
Neighborhood Level					
Intercept	-1.92	.12	-16.47	<.001	.15
Concentrated disadvantage	.08	.02	4.08	<.001	1.08
Interaction Effects					
A/N x concentrated disadvantage	-.03	.07	-.42	.674	.97
Non-White x concentrated disadvantage	.06	.08	.70	.484	1.06
A/N x non-White	.85	.42	2.04	.041	2.34
A/N x non-White x concentrated disadvantage	.02	.08	.29	.770	1.02

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.32	.41	280.96	<.001
Individual level (σ^2)		1.44		

Table D14. Race Replication with the Introduction of Residential Stability for Violent Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.23	.22	1.04	.298	1.26
Male	1.92	.16	12.34	<.001	6.82
Non-White	.49	.47	1.05	.297	1.63
Age	.04	.02	2.52	.012	1.04
Neighborhood Level					
Intercept	-1.92	.12	-16.55	<.001	.15
Concentrated disadvantage	.09	.02	4.37	<.001	1.09
Residential stability	.10	.06	1.56	.119	1.11
Interaction Effects					
A/N x concentrated disadvantage	.04	.10	.38	.701	1.04
A/N x residential stability	.18	.19	.93	.351	1.20
Non-White x concentrated disadvantage	.04	.10	.34	.730	1.04
Non-White x residential stability	-.34	.23	-1.51	.130	.71
A/N x non-White	.70	.43	1.62	.104	2.01
A/N x non-White x concentrated disadvantage	-.02	.11	-.17	.869	.98
A/N x non-White x residential stability	-.06	.22	-.30	.765	.94

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.31	.39	262.12	<.001
Individual level (σ^2)		1.44		

Table D15. Race Replication with the Introduction of Ethnic Heterogeneity for Violent Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.17	.23	.76	.448	1.19
Male	1.93	.16	12.30	<.001	6.89
Non-White	.54	.48	1.13	.257	1.72
Age	.04	.02	2.40	.016	1.04
Neighborhood Level					
Intercept	-1.93	.12	-16.34	<.001	.15
Concentrated disadvantage	.09	.02	3.98	<.001	1.09
Residential stability	.09	.07	1.30	.196	1.09
Ethnic heterogeneity	-.04	.08	-.49	.626	.96
Interaction Effects					
A/N x concentrated disadvantage	.01	.10	.08	.936	1.01
A/N x residential stability	.11	.21	.52	.604	1.12
A/N x ethnic heterogeneity	-.16	.19	-.83	.409	.85
Non-White x concentrated disadvantage	-.01	.12	-.10	.918	.99
Non-White x residential stability	-.43	.26	-1.64	.100	.65
Non-White x ethnic heterogeneity	-.08	.28	-.28	.781	.92
A/N x non-White	.46	.49	.94	.347	1.58
A/N x non-White x concentrated disadvantage	.01	.11	.08	.936	1.01
A/N x non-White x residential stability	-.05	.24	-.20	.843	.95
A/N x non-White x ethnic heterogeneity	-.10	.28	-.37	.713	.90

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.31	.39	255.90	<.001
Individual level (σ^2)		1.45		

Table D16. Race Replication with the Introduction of Concentrated Advantage for Violent Arrests

	b	*SE*	*t*	*p*	*Exp(b)*
Fixed Effects					
Individual Level					
Abuse/neglect	.31	.32	.96	.336	1.36
Male	1.92	.16	12.23	<.001	6.82
Non-White	.58	.52	1.11	.266	1.79
Age	.04	.02	2.41	.016	1.04
Neighborhood Level					
Intercept	-1.93	.13	-15.29	<.001	.15
Concentrated disadvantage	.09	.02	3.98	<.001	1.09
Residential stability	.08	.07	1.22	.224	1.08
Ethnic heterogeneity	-.04	.08	-.55	.582	.96
Concentrated advantage	.02	.05	.31	.759	1.02
Interaction Effects					
A/N x concentrated disadvantage	.03	.11	.30	.764	1.03
A/N x residential stability	.11	.21	.52	.604	1.12
A/N x ethnic heterogeneity	-.18	.19	-.93	.353	.84
A/N x concentrated advantage	.10	.14	.69	.492	1.11
Non-White x concentrated disadvantage	.06	.13	.41	.680	1.06
Non-White x residential stability	-.50	.28	-1.78	.074	.61
Non-White x ethnic heterogeneity	-.14	.28	-.50	.616	.87
Non-White x concentrated advantage	.29	.17	1.68	.092	1.34
A/N x non-White	.21	.54	.40	.692	1.23
A/N x non-White x concentrated disadvantage	-.05	.12	-.44	.657	.95
A/N x non-White x residential stability	-.01	.24	-.06	.956	.99
A/N x non-White x ethnic heterogeneity	.03	.28	.12	.906	1.03
A/N x non-White x concentrated advantage	-.38	.22	-1.75	.080	.68

	Reliability	*Variance*	X^2	*p*
Random Effects				
Intercept (τ_{00})	.31	.39	251.93	<.001
Individual level (σ^2)		1.46		