THE IMPACT OF RACE AND NEIGHBORHOOD ON CHILD MALTREATMENT: A MULTI-LEVEL DISCRETE TIME HAZARD ANALYSIS

by

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Abstract

by

MARY ELIZABETH (MOLLY) IRWIN

**Purpose:** This project focused on individual and neighborhood characteristics associated with child maltreatment in Cuyahoga County, Ohio. It sought to better understand risk and protective factors associated with child maltreatment, specifically the roles of race and neighborhood disadvantage. It used an ecological framework that takes into account multiple levels, and incorporated a developmental perspective that suggests that risk and protective factors vary by child age. Particular attention was paid to race and racial disproportionality in the child welfare system.

**Methodology:** This study used a multi-level discrete time hazard model to estimate the effects of individual/household and neighborhood factors on the timing of child maltreatment reports accepted for investigation and indicated/substantiated reports of child maltreatment.

**Findings:** This study showed that younger children are at highest risk of being the subject of a maltreatment report, yet much of this increased risk is explained by mother’s age, marital status, use of alcohol and tobacco during pregnancy, and child’s birth weight and receipt of TANF. Additionally, being born to an African American mother greatly increases the likelihood of being the subject of a maltreatment report. However, once other individual and neighborhood factors are taken into consideration, the increased risk
for Black children drops considerably and is no longer a significant predictor of investigated reports of child neglect or substantiated/indicated reports of maltreatment. This study found the hazard of child maltreatment to be greater among children living in impoverished and instable neighborhoods. Moreover, the impact of neighborhood characteristics was found to exert its strongest effect on reports of child neglect compared to all types of reports or indicated/substantiated reports of maltreatment. Finally, findings suggest that for Black children, the relationship between neighborhood disadvantage and maltreatment is less strong than for White children. In fact, White children living in very impoverished or instable neighborhoods have a higher hazard of being the subject of a maltreatment report than Black and Hispanic children. These findings suggest there may be a differential sensitivity to neighborhood disadvantage.
CHAPTER 1 - Background and Rationale / Scope of the Problem

Introduction

This project will focus on individual and neighborhood characteristics associated with reported and substantiated cases of child maltreatment in Cuyahoga County, Ohio. It aims to better understand risk and protective factors associated with child maltreatment, specifically the roles that race and neighborhood disadvantage play. In addition to using an ecological framework that takes into account multiple levels, from individual to larger socio-environmental factors, this study will also incorporate a developmental perspective that suggests that risk and protective factors may vary by the age and development stage of the child. Particular attention will be paid to race and racial disproportionality in the child welfare system. The study will explore if and how racial status is associated with other factors which are directly related to maltreatment victimization. Household factors such as poverty and factors associated with the neighborhoods in which children live may influence parenting behaviors and/or how child maltreatment is recognized and reported. This study will examine age-specific rates of child maltreatment and attempt to understand the factors that contribute to variations in child maltreatment risk over time. A goal of this research is to provide a deeper understanding of the relationship between race, neighborhoods and the timing of child maltreatment. It will attempt to provide insight into why African American children and very young children are disproportionately represented within the child welfare system, and will provide decision makers information that may be used to direct policy and implement programs to identify and serve all children at risk for, and suffering from,
child maltreatment reports and investigations.

Scope of the Problem

In 2007, approximately 3.2 million child maltreatment referrals (including 5.8 million children) were made to Children’s Protective Services (CPS) agencies (U.S. Department of Health and Human Services Administration for Children and Families, 2009). Approximately two-thirds (62%) of these referrals were accepted for investigation – this yields an estimate of almost 3.6 million children who experienced an investigated child maltreatment report. Of these, 753,357 (22.5%) were found to be victims of maltreatment. The national rate of victimization was 10.6 per 1000 children.

The same report found that in 2007, 59% of victims experienced neglect, 10.8% were physically abused, 7.6% were sexually abused, 4.2% were emotionally or psychologically maltreated, less than 1% were medically neglected, 13.1% were victims of multiple maltreatments, and 4.2% experienced other types of maltreatment such as “abandonment”, and “congenital drug addiction”. Girls were slightly more likely to be victims of maltreatment (51.5% of victims were girls). Younger children were more likely to be victims than older children. The victimization rate among children birth through one year was 22.2 per 1000 for boys and 21.5 per 1000 for girls. The victimization rate for children in the age group of four to seven years was 11.4 per 1,000 for boys and 11.6 per 1000 for girls. Overall, the victimization rates decrease for older age groups. A more detailed discussion of the relationship between child age and maltreatment will follow.
Racial Disproportionality in the Child Welfare System

It is important to define terms. In this paper, I use the term “racial disproportionality” to refer to the differences in the percentage of children of a certain racial or ethnic group in the child welfare system, as compared to their percentage in the population as a whole (Hill, 2006). Thus it tells us the extent to which a group may be over- (or under-) represented in the child welfare system compared to their representation in the general population. It implies a comparison and does not make judgments about, or imply that, the disproportionality should or should not exist. This paper is interested in racial disproportionality in the child welfare system and in understanding, from an ecological perspective, why it exists.

At the national level there is evidence of racial disproportionality in the child welfare system. Research has shown that while children of all racial and ethnic backgrounds are maltreated, children of color are disproportionately represented throughout the child protective system. That is, the percentage of children of color in the child protective systems is significantly greater than their corresponding percentage in the population. For example, census data reveal that in 2000, of the 72,000,000 children in the United States (U.S.) under the age of 18, 39% were children of color (U.S. Census Bureau, 2000), yet 46% of the victims of abuse and neglect were children of color (U.S. Department of Health and Human Services, Administration for Children and Families, 2004), and 62% of children in out-of-home care were children of color (U.S. Department of Health and Human Services Administration for Children and Families, 2002). African American children have the highest reported rate of victimization of all racial categories and they, along with Native American children, are the most
disproportionately represented in the child protective system, as can be seen in Table 1 below.

Table 1: Racial/Ethnic Representation in the Child Protective System

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Percentage of the U.S. Population* Under 18</th>
<th>Percentage of Victims (substantiated or indicated reports)**</th>
<th>Percentage of Out-of-Home Placement***</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>61</td>
<td>54</td>
<td>38</td>
</tr>
<tr>
<td>African American</td>
<td>15</td>
<td>26</td>
<td>40</td>
</tr>
<tr>
<td>Latino/Hispanic</td>
<td>17</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

* U.S. Census 2000
** U.S. Department of Health and Human Service Administration for Child and Families, 2002
*** U.S. Department of Health and Human Service Administration for Child and Families, 2002

A comparison of the experiences of African American children to that of White children, reveals that twice as many African American children are substantiated as victims of abuse and neglect (22 per 1000 African American children in the population are substantiated as victims, compared to 11 per 1000 White children) and African American children are more than four times as likely to be in foster care (21 per 1000 African American children in the U.S. population are in foster care, compared to 5 per 1000 White children) (Child Welfare League of America [CWLA], 2004). Additionally, research shows that African American children are less likely to be reunified with their families (U.S. Children’s Bureau, 2002 as reported in CWLA, 2004), and less likely to be adopted than White children (Ards & Harrell, 1993 as reported in CWLA, 2004).

Child Maltreatment Risk by Age

Data suggest that younger children are subject to more child maltreatment reports and substantiations than older children (U.S. Department of Health and Human Services Administration for Children and Families, 2009). Data from the National Child Abuse
and Neglect Data System (NCANDS) in 2006 show that 24.4% of all substantiated reports of child maltreatment were for children less than one year old, 14.2% were one to three years old, and 13.5% were four to seven years old (U.S. Department of Health and Human Services Administration for Children and Families, 2008). Compared to the population of children living in the US, these numbers indicated that young children are disproportionately involved in the child welfare system. For example, while 14.2% of substantiated reports of maltreatment are for children under the age of one, children under one only represent 5.4% of all children under the age of 18 living in the U.S (Annie E. Casey Foundation, 2009).

Wulczyn, Barth, Yuan, Jones Harden and Landsverk (2005) used data from NCANDS to carry out an age-specific study using data from four states including more than 11 million children under the age of 19 and 64,000 first time victims. They found the rate of reported maltreatment (16 per 1000 children) to be highest for children under age one and more than twice as high as the rate for children between one and two years old. Overall, they found that rates decline with age. Furthermore, they found some slight differences between child neglect and physical abuse. Specifically, they found reports of neglect to be concentrated among very young children. However, with reports of physical abuse, they found in addition to the increased risk at the youngest ages, an increased risk of physical abuse at ages corresponding to school entry and adolescence. Sabol, Coulton and Polousky (2004) and Crampton and Coulton (2008) examined age specific rates of child maltreatment in Cuyahoga County using life table methodology. In both cases they found the age-specific probability of having a report or an indicated or substantiated incident of maltreatment to be highest among children under one year of
age. Furthermore, they found the greatest disparity between Black and White children to be when they were infants (Crampton & Coulton, 2008; Sabol, et al., 2004).

**Consequence of Child Maltreatment**

This over representation of younger children and children of color in the child protective system is of great concern. Many questions remain as to why this disproportionality exists, because all children, regardless of their age, developmental stage, racial or ethnic background, should have an equal chance of receiving appropriate services based on their needs and circumstances. This is critically important because negative outcomes for children as a result of child abuse and neglect are well documented. In the most tragic cases, victims of abuse and neglect lose their lives. In 2007, an estimated 1,760 children (almost five children per day) died due to child abuse or neglect (U.S. Department of Health and Human Services Administration for Children and Families, 2009). Additionally, evidence suggests that children who survive abuse and neglect suffer both short- and long-term negative consequences in the areas of physical and mental health, cognitive skills and educational attainment, and social and behavioral development (Chalk, Gibbons & Scarupa, 2002; English, 1998; Miller-Perrin & Perrin, 2007) and are at increased risk for experiencing intimate partner violence and abusing their own children as adults (U.S. Department of Health and Human Services Administration for Children and Families, 2004). Furthermore, research suggests that being reported for maltreatment - regardless of whether the allegation is substantiated - is in itself a predictor for poor outcomes (Leiter & Myers, 1994), highlighting the importance of examining all child maltreatment reports in addition to those where
maltreatment has been found.

**Importance of this Research for Policy and Practice**

The extent to which disproportionality in child maltreatment rates arise from reporting bias or biased decision-making within the system reflects how well the community and/or the child protective system is meeting the needs of its children. Disproportionality in the system may reflect a failure to address the needs of older, White and middle class children who are at risk of maltreatment or in need of services, as well as disrupt the lives of younger and African American children, who may not be at risk. Examining the disproportionality in the child welfare system using a model that will help disentangle the role of child age, race and neighborhood disadvantage will have important implications for both policy and practice. At the policy level, it will provide a deeper understanding of individual and neighborhood level factors, such as race and neighborhood disadvantage, associated with child maltreatment, and the extent to which these factors, and maltreatment itself, vary by the age of the child. This research has the potential to demonstrate that disproportionate reporting or substantiations of maltreatment are due to some type of systematic bias on the part of the community or reporters. This would underscore the notion that child abuse is neither clinically nor theoretically well defined (Hampton & Newberger, 1985) and as such, subjective judgment, rather than an objective assessment of a child’s risks and needs, determines who gets reported. This knowledge could translate into more consistent definition and screening criteria. This is also critically important to practice. In this arena, this study’s findings could highlight that effective screening criteria and training of mandated
reporters (as well as the larger community) are needed. It may suggest particular age
groups or development periods when reporters or service providers should be most
vigilant. Finally, findings from this study may suggest that individually targeted
prevention efforts may be only one avenue to take in meeting the goal of decreasing child
maltreatment. Community-level efforts that focus on reducing neighborhood level
disadvantage and improving neighborhood resources may also hold promise.
CHAPTER 2 – Theoretical Framework / Literature Review

This chapter begins with a review of factors found in the literature to be related to child maltreatment. First I present a review of the research literature on the relationship between individual/household level factors and child maltreatment. This is followed by a review of the relationship between neighborhood factors and child maltreatment. The final section discusses the gaps in the current literature and includes an overview of the theoretical frameworks that will be used in this study to address those gaps.

Individual/Household Factors

There is a large body of literature that examines individual and household level risk and protective factors associated with child maltreatment. Research has linked child maltreatment to (among others) substance abuse, parental mental illness, domestic violence and parental incarceration (for a comprehensive review of the literature in this area see Hines, Lemon, Wyatt & Merdinger, 2004), and family socio-economic factors such as poverty, parental education and family make-up (i.e., single headed households) (Coulton, Korbin, Su & Chow, 1995; Drake & Pandey, 1996; Gelles, 1992; Hines, et al., 2004). While, there is an extensive body of literature examining factors associated with child maltreatment, this literature review will focus on the factors used in this study. Each of the individual/household factors used in the present study are discussed in turn.
Race

There is a great concern about the large numbers of children of color in the child welfare system (Ards, Myers, Chung, Malkis & Hagerty, 2003; Fluke, Yuan, Hedderson, & Curtis, 2003). Billingsley and Giovannoni (1972) were among the first scholars to bring attention to the over representation of African American children in the child welfare system in their work, “Children of the Storm: Black Children and American Child Welfare.” More than 35 years later, the data still clearly demonstrate that children of color, particularly Black children, are disproportionately represented in the child welfare system (U.S. Department of Health and Human Service Administration for Children and Families, 2009). In 2000, while 39% of children in the U.S. were children of color (U.S. Census Bureau, 2000), 46% of the victims of abuse and neglect were children of color (U.S. Department of Health and Human Services, Administration for Children and Families, 2004), and 62% of children in out-of-home care were children of color (U.S. Department of Health and Human Services, Administration for Children and Families, 2002). Furthermore, compared to White children, twice as many African American children were substantiated as victims of abuse and neglect, and four times as many are in foster care (CWLA, 2004). Sabol, et al., (2003) and Crampton & Coulton (2008) used a life table methodology to examine the cumulative risk of being the subject of a child maltreatment report by age ten. This approach, they argue, captures the “dynamics and full magnitude” of disproportionality over a child’s childhood. In both cases, they found that Black children had an almost 50% chance of being reported compared to a 21% chance for White children. Sabol, et al. (2003) also looked at substantiated and indicated incidents of child maltreatment and found that 33% of
African American children were the subject of a substantiated or indicated report of maltreatment by age ten compared to 11.8% for White children. Magruder & Shaw (2008) also examined the cumulative chances of children becoming involved with the child protective system. They followed a birth cohort of children in California until age seven and found large differences between African American and White children in regard to their contact with various stages of the child welfare system. They found that roughly 39% of all Black children were referred to the child welfare system, 13% had a substantiated referral, and 10% entered foster care by the age of seven. The corresponding figures for White children were roughly 20%, 6% and 3%, respectively.

However, the research literature is somewhat unclear as to why this relationship exists. In a recent review article, Hill (2006) documents that the large majority of child maltreatment research has found African American children to be overrepresented in child maltreatment data. However, the research literature is much less clear as to why this is the case. Attempts to better understand the factors associated with child maltreatment and to uncover the roots of racial disproportionality within the system have attracted considerable research attention. Many studies have examined the interrelationship between race and individual level factors. For example, one of the strongest associations seen is between child maltreatment and poverty (Drake & Pandey, 1996; Garbarino & Sherman, 1980; Gelles, 1992; Zuravin, 1989). Yet a higher proportion of African Americans live in poverty than any other racial or ethnic group in the United States (U.S. Census Bureau, 2004) – making it difficult to tease apart the contribution of race independent of poverty. This is even more difficult because both poor and African American families are more likely to be headed by single females with
low levels of education and/or who are unemployed or in low-wage jobs (Brooks-Gunn, Duncan & Maritato, 1997), all of which are risks factor for maltreatment. However, Drake, Lee, and Jonson-Reid (2008), using data from Missouri, found that Black children were overrepresented in the Missouri child welfare system at a ratio of about 2:1. Yet, they found that when controlling for poverty, Black children were no more likely to be reported to the child welfare system than White children.

Researchers have also examined the role of race and neighborhood in child maltreatment. Neighborhood factors such as economic disadvantage and inequality have been shown to predict community violence (Sampson, Raudenbush & Earls, 1997) and rates of child abuse and neglect (Coulton, Korbin & Su, 1999; Coulton, et al., 1995). The relationship between race, poverty and child maltreatment at the neighborhood level has also been explored. Drake and colleagues (2008) found an interaction between race and neighborhood poverty such that Black children were reported at a higher level than White children in areas with lower poverty, but White children were reported at a higher rate than Black children in higher poverty areas. Similarly, Johnson, Clark, Donald, Pedersen and Pichotta (2007) found that although after controlling for county of residence, county characteristics, family characteristics, and allegation type, Black children were no more likely than White children to be reported for child maltreatment, they found that the reports were more likely to be substantiated. Crampton and Coulton (2008) found a similar result when examining the relationship between race, urbanicity and maltreatment. They found that the racial disproportionality in the cumulative hazard for being the subject of a maltreatment investigation to be greater in suburban areas where African American children were 3.25 time more likely than White children to be
investigated, than in the city where African American children where only slightly more likely to be investigated (51.5% of city dwelling African American children were found to be investigated by age 10, compared to 47.3% of White children). Additionally, Nam, Meezan and Danziger (2006) found that African-American children were less than half as likely to be the subject of a child maltreatment investigation compared to White children when other factors were held constant. These findings suggest that while African Americans are more likely to live in disadvantaged neighborhoods, neighborhood disadvantage may have a weaker effect on maltreatment rates in African American communities than in predominately White communities (Korbin, Coulton, Chard, Platt-Houston & Su, 1998). Based on this, Korbin and colleagues posit that African American communities may have protective factors for families living in impoverished neighborhoods. This notion is supported by literature regarding the strengths of African American families and neighborhoods (Billingsley, 1992), which suggests that some African American neighborhoods, while disadvantaged, display many signs of strength and solidarity. However, other studies do not support this. For example, Wulczyn and colleagues (2005) found Black children are more susceptible to maltreatment reports than White children, even when the poverty level of their county of residence is equivalent.

Researchers have explored the possibility that cases of maltreatment involving African American children are more likely to come to the attention of child protective service agencies independent of their level of risk. One source of data that has been used to examine this is the National Incidence Studies (NIS) funded by the Federal government. These studies were conducted in 1980, 1986, and 1993 to compile incidence of both reported and unreported child abuse and neglect. They provide the best
estimates, and in fact, the only estimates, of the national proportion of children who are abused and neglected, and of those, the proportion that become known to CPS. The National Incidence Studies found no differences by race in the incidence of maltreatment or maltreatment-related injuries in any of the three studies (Sedlak & Broadhurst, 1996). The authors conclude that, “the different races receive differential attention somewhere during the process of referral, investigation, and service allocation, and that the differential representation of minorities in the child welfare population does not derive from inherent differences in the rates at which they are abused or neglected” (p. 9). Other studies using data from the NIS have concluded that the racial differences found in the child welfare system result from differential reporting of child abuse and neglect. For example, Hampton and Newberger (1985) using the NIS-2 data, found that hospital staff failed to report almost half the cases that met the study’s definition of abuse. The cases that were reported were more likely to be African American or Latino. Specifically, 74% of cases involving African American children were reported compared to 61% of those with White children.

Other studies using different data and methodology have found similar results. For example, a study comparing the results of a child fatality review team and death certificate documentation in Colorado between 1990 and 1998, found that only half of the children who died as the result of maltreatment had death certificates that were coded consistently with maltreatment (Crume, DiGuiseppi, Byers, Sirotnak & Garrett, 2002). The authors found that death certificates were more likely to be coded as maltreatment when children where African American than when they were White. This suggests that there may be systematic bias inherent in the conclusions professionals make regarding
whether maltreatment is a contributing factor in the death of a child. Additionally, a number of studies have used vignettes (scenario methodology) to understand if mandated reporters exhibit bias in evaluating child abuse and neglect and in decision-making about reporting it. Studies with physicians (Nalepka, O’Toole & Turbett, 1981) and with psychologists and social workers (Hansen, Bumby, Lundquist, Chandler, Le & Futa, 1997) have found the race of the child to be a significant factor in recognizing and reporting child abuse and neglect. Finally, in their research on neighborhood effects on child maltreatment, Coulton and colleagues (1999) found neighborhood disadvantage to be predictive of substantiated reports of child abuse and neglect, yet they did not see the same pattern when they measured the individual potential for child maltreatment using the Child Abuse Potential Inventory. It is not clear whether it is parenting practices or reporting practices that are influenced by environment. However, this finding that the potential for child maltreatment is more evenly distributed across neighborhoods than are reports of child maltreatment suggests that we should more closely examine the possibility of systematic bias in reporting and the role that neighborhood factors may play in it.

There is also some evidence that race or racial visibility may play a role at the neighborhood level. This “visibility” or “being out of place” hypothesis suggests that systematic bias in reporting may vary by the type of community in which minority children live. Specifically it posits that there is a higher probability of children of color coming to the attention of the child welfare system or receiving services when they live in geographic areas where they are relatively less represented (or more “visible”). This hypothesis has been empirically tested, and some data suggest that African American
children are more likely to be represented in the foster care system than their White counterparts in communities with lower African American populations (Garland, Ellis-MacLeod, Landsverk, Ganger & Johnson, 1998; Jenkins & Diamond, 1985). This hypothesis emerged as an explanation for data showing that over representation of African American children in the foster care system is greater in areas where their population is smaller; however, it has also been observed in child maltreatment reporting and substantiation. For example, using data from counties in Minnesota, Ards and colleagues found that both reporting and substantiation rates were more disproportionate in the state as a whole and in counties with smaller minority populations than in counties with large minority populations (Ards, Myers, Malkis, Sugrue & Zhou, 2003).

Additionally, a qualitative study exploring the over representation of children of color in the child welfare system sponsored by the Federal Children’s Bureau found the visibility of impoverished and minority families to other service systems (such as public health services, TANF and Medicaid) to place them at higher risk for coming to the attention of CPS (Chibnall et al., 2003). However, McDaniel and Shook Slack (2004) found that African-American families living in neighborhoods that had few African-Americans were at no greater risk of being reported for child maltreatment. Drake and colleagues (2008) had mixed results with regard to visibility. They found support of this for White children and for Black children in less poor areas, but not for Black children in areas where more than 15% of Black children were living in poverty.

Similarly, research has indicated that racial segregation – at the neighborhood or county level - may play a role in child outcomes and child maltreatment (Coulton, et al, 1999; Massey & Denton, 1993). Nationally, it is estimated that one third of African
Americans live in areas of intense racial segregation (Massey & Denton, 1993) and more than two thirds of African Americans living in metropolitan areas live in highly segregated areas (Massey, 2004). Massey posits that given the high levels of racial segregation among African Americans, they will experience more neighborhood poverty than other groups as well as be exposed to higher levels of social disorder and violence. The mechanisms by which racial segregation impacts child maltreatment are little understood. Massey hypothesizes that there is a biosocial mechanism that results in poor health and cognitive outcomes among African Americans as a result of long term exposure to social disorder and violence because of segregation (2004). Others suggest that highly segregated, poor neighborhoods lack the resources families need, placing them at higher risk.

**Child Age**

Data suggest that younger children are subject to more child maltreatment reports and investigations than older children (Department of Health and Human Services Administration for Children and Families, 2009). Shook Slack, Holl, McDaniel, Yoo and Bolger (2004) found that as the age of the child increased (in months), the risk of being reported to child protective services for neglect was significantly reduced. Wulczyn et al. (2005) used data from the NCANDS to carry out an age-specific study of using data from four states including more than 11 million children under the age of 19 and 64,000 first time victims. They found that the rate of reported maltreatment (16 per 1000 children) to be highest for children under age one and more than twice as high as the rate for children between one and two years old. Overall, they found that rates declined with age.
Additionally, they looked at the age by county poverty level and found the elevated risk for infants to be consistent across poverty levels, however they found it to be more pronounced in high poverty counties. Specifically, they found in high poverty counties that infants were 2.8 times more likely than one year olds to be the subject of a child maltreatment report, yet infants were only 1.6 times more likely than one year olds in low poverty counties. When taking race into account, they found that the elevated risk of infants is found across racial and ethnic groups, but is most pronounced among African American children living in poor counties. Furthermore, they found some slight differences between child neglect and physical abuse, specifically, that reports of neglect were concentrated among very young children. However, with reports of physical abuse, they found in addition to the increased risk at the youngest ages, an increased risk of physical abuse at ages corresponding to school entry and adolescence.

Sabol et al. (2003), and Crampton and Coulton (2008) examined age specific rates of child maltreatment in Cuyahoga County using life table methodology. In both cases they found the age-specific probability of having a report or an indicated or substantiated incident of maltreatment to be highest among children under one year of age. Furthermore, they found the greatest disparity between Black and White children to be when they were infants, but they also saw a widening disparity when children were between ages five and seven (presumably when they entered school) (Crampton & Coulton, 2008).

Two recent studies have examined age specific disparities in foster care placement among children in different regions and over two time periods (Wulczyn & Lery, 2007; Wulczyn, Lery, & Haight, 2006). These studies found that placement rates
for both groups were highest for babies, yet disproportionality was most striking among infants where the rate for African American babies was nearly three times the rate for White babies in 2005. They also found that over time (between 2000 and 2005), placement rates declined in urban counties and increased in nonurban counties. Moreover they found that the decline in urban counties was greater among African American children, and placement rate increases in nonurban counties was greatest among infants. These findings highlight the importance of taking into consideration the child’s age and characteristics of the neighborhoods when examining disproportionality in the child welfare system.

Child Sex

Research on the relationship between the sex of the children and maltreatment is somewhat mixed and appears to depend on the category of abuse. For example, Berger (2004) found male children to be significantly more likely to be the victims of physical abuse. Other studies, such as the National Incidence Studies, have found girls to be more likely to be victims of sexual abuse than boys, but rates to be about equal between boys and girls with other types of maltreatment (Sedlack & Broadhurst, 1996). It is also important to note that many studies have found no statistically significant relationship between child sex and maltreatment (Coulton, Polousky, Lalich, Withers, Andrade & Shin, 2005).
Poverty

One of the strongest associations seen is between child maltreatment and poverty (Ards, Chung & Myers, 1998; Coulton et al., 1995; Drake & Pandey, 1996; Garbarino & Sherman, 1980; Gelles, 1992; Gil, 1970; Lindsey, 2004; Waldfogel, 1998; Zuravin, 1989). Children in families below the federal poverty level have been found to be seven (Brooks-Gunn & Duncan, 1997) to as much as twenty-two times (Sedlack & Broadhurst, 1996) more likely to experience abuse or neglect compared with children in non-poor families. Furthermore, the 1993 National Incidence Study found family income to be the strongest correlate of child maltreatment, and to be especially related to serious neglect and severe violence toward children (Sedlack & Broadhurst, 1996). This and other research suggests that poverty may have a stronger effect on child neglect than on other types of child maltreatment (Drake & Pandey, 1996; Sedlack & Broadhurst, 1996).

Additionally, research has shown that children in families who receive social service benefits are more likely to be the subject of a child abuse or neglect report. For example, children who receive welfare cash assistance are more likely to come into contact with the child welfare system (Waldfogel, 1998). Wu and colleagues found children who were on Medicaid were 2.1 times more likely to be the subject of a substantiated child maltreatment report between age 3 days and 1 year1 (Wu, Ma, Carter, Ariet, Feaver, Resnick & Roth, 2004). Coulton and colleagues (2005) found that children in Cuyahoga County who were on cash assistance and Medicaid to be 2.9 times more likely, and those on Medicaid alone to be 1.9 times more likely, to be the subject of a substantiated or indicated child maltreatment allegation. However, it is unclear from

1 Wu and colleagues excluded cases that were reported to have been maltreated on or before the second day of life because they assumed these were probably prenatal maltreatments and the risk factors and intervention strategies might differ from postnatal cases (Wu, et al., 2004, p. 1255).
these studies whether it is family poverty that increases the likelihood of being the victim of abuse and neglect or whether poor families are more likely to come to the attention of mandated reporters of child maltreatment due to their involvement in other social service programs.

*Mother's Age*

Younger maternal age has been found to be related to a higher incidence of child maltreatment in a number of studies. Research has found maternal youth to be associated with physical abuse, sexual abuse, and neglect (Brown, Cohen, Johnson & Salzinger 1998). Coulton et al. (2005) found mothers between 21 and 35 and those over 35 to be 20% and 24%, respectively, less likely to have their child be the subject of a substantiated or indicated report of maltreatment. Needell, Cuccaro-Alamin, Brookhart and Lee (1999) found that children born to mothers who were less than 18 years of age at the time of the birth were 70% more likely to be the subject of a child maltreatment report and 43% more likely to have a case opened than children born to mothers who were at least 30 years old. Additionally research suggests that young mothers are more likely to have their child placed in foster care (Geen, Kortenkamp & Stagner, 2002). However, not all research has confirmed this relationship between maternal age and child maltreatment. For example, Scannapieco & Connell Carrick (2003) found that among low-income families who were reported to child protective services, when other parental characteristics were examined, maternal age was not a significant factor in substantiation of the investigations. This may indicate that maternal age has a stronger effect on child maltreatment reports than it has on substantiations.
Mother’s Marital Status

The research literature has demonstrated a relationship between maternal marital status and child abuse and neglect. For example Berger (2004) found that households headed by single mothers, controlling for other risk factors, are at higher risk for maltreatment events than two parent households. Coulton and colleagues’ research also found this relationship. Specifically they found children of unmarried mothers to be twice as likely to be the victim of a substantiated or indicated report of child maltreatment (Coulton, et al., 2005). Wu and colleagues (2004) found that young children born to single mothers were two times more likely to be the subject of a substantiated child maltreatment report. Furthermore, the National Incidence Studies have found the highest rates of maltreatment among families with low income, single parents, parents not in the labor force, and large numbers of children (Sedlak & Broadhurst 1996). These factors are often hard to disentangle and some studies have found that when controlling for other risk factors, the relationship between single mothers and maltreatment was no longer significant (Berger, 2007).

Mother’s Education

Low maternal education has long been recognized as a factor correlated with child maltreatment (Berger, 2004; Brown, et al., 1998; Gil, 1970). In Cuyahoga County, children born to mothers with a high school education were 43% less likely to be the victim of a substantiated or indicated report of maltreatment (Coulton, et al., 2005). Lower education among parents has also been found to predict the likelihood of foster care entry (Paxson & Waldfogel, 2002). However again, many of these
individual/household level factors tend to coexist within families making it difficult to understand their independent effect, and some studies have found that when controlling for other factors, the direct effect of low education was diminished (Shook Slack et al., 2004).

Mother’s Use of Alcohol and Tobacco During Pregnancy

Substance abuse by the parent or care-giver is strongly associated with child maltreatment. Research has shown that from 50% to 80% of parents involved in the child welfare system were substance abusers (Besinger, Garland, Litrownik, & Landsverk & 1999; Murphy, Jellinek, Quinn, Smith, Poitrast & Goshko, 1991). Furthermore, studies show that children of parents with substance abuse problems have more than twice as high a risk of abuse or neglect (Chaffin, Kelleher & Hollenbert, 1996). Many studies look at all types of substance abuse together; however some have looked specifically at tobacco and alcohol use as will be done in the present study. For example, Wu and colleagues (2004) found young children between age 3 days and 1 year born to mothers who smoked during pregnancy were 2.8 times more likely to be the subject of a substantiated child maltreatment report. Coulton, et al. (2005) found children of mothers who smoked during pregnancy to be 1.9 times more likely to be the victim of a substantiated or indicated report of child maltreatment. They also found children whose mothers used alcohol during pregnancy to be just slightly less likely to be the victim of a substantiated or indicated report of child maltreatment than those whose mothers used tobacco (1.88 times more likely). Additionally, research has shown that maternal alcohol
abuse increases the rate of substantiation by 13% over cases where there is no
documentation of substance abuse (Sun, Shillington, Hohman, & Jones, 2001).

**Child’s Birth Weight**

A number of studies have found child birth weight to be related to child
maltreatment. Wu and colleagues (2004) found that young children born weighing less
than 2500 grams were twice as likely to be the subject of a substantiated child
maltreatment report compared to those born weighting more than 2500. Wulczyn (1994)
found that infants in foster care were five times more likely to be low birth weight (less
than 2500 grams) than those in the general population.

**Neighborhood Effects**

Researchers have also examined the role of neighborhood in child maltreatment.
Research in this area indicates that the neighborhoods in which families live may
contribute to their risk of becoming involved with the child welfare system (Coulton,
Korbin & Su, 1999; Coulton, et al., 1995; Drake & Pandey, 1996; Deccio, Horner &
Wilson, 1994; Ernst, 2000; Garbarino & Sherman, 1980; Zuravin, 1989; or for a review
of the literature review see: Coulton, Crampton, Irwin, Spilsbury & Korbin, 2007 or
Freisthler, Merritt & LaScala, 2006). Neighborhood factors such as economic
disadvantage and inequality have been shown to predict community violence (Sampson,
et al., 1997) and rates of child abuse and neglect (Coulton, et al., 1999; Coulton, et al.,
1995). For example, Coulton and colleagues (1999) found that those communities with
the highest levels of impoverishment, unemployment, female-headed households, racial
segregation, abandoned housing, and population loss to have higher maltreatment rates. Ernst (2001) in a replication of Coulton, et al.’s work, got similar results. Freisthler, Midanik and Gruenwald (2004) also found that neighborhoods with higher levels of poverty, female-headed households, and population loss were correlated with higher rates of child abuse and neglect.

Structural characteristics of neighborhood have been most commonly studied and most consistently found to correlate with child maltreatment. Coulton, et al. (2007), in a comprehensive review of the literature, found neighborhood structural factors, economic in particular, to be most consistently linked to child maltreatment. They found neighborhood processes to be less studied but, where they have been studied, to have weaker associations than structural factors. Freisthler and colleagues (2006) also reviewed the literature regarding the ecology of child maltreatment. They focused primarily on the impact of structural characteristics of neighborhoods and found consistent evidence across studies demonstrating the effect of neighborhood structural conditions on child maltreatment.

Less well understood are the processes through which neighborhoods affect child maltreatment. A number of studies have attempted to examine this, many using a theoretical framework that suggests that structural factors impact formal and informal social networks. Some researchers have studied parental and community members’ perceptions regarding neighborhood characteristics. Garbarino and Sherman (1980) examined neighborhood characteristics such as social impoverishment in high and low maltreatment neighborhoods. They found that neighbors in areas with high maltreatment rates expressed less willingness to exchange child care with neighbors and reported
higher levels of stress. Deccio and colleagues (1994) argued that the difference between neighborhoods with high and low child maltreatment rates is related to social integration. Ernst’s (2001) findings suggest the degree to which neighbors know and rely on each other is related to child maltreatment rates. Finally, Korbin, et al. (1998) found that impoverishment had a weaker effect on maltreatment rates when neighbors were more connected and more likely to support each other’s parenting.

Some studies have found that neighborhood factors (primarily structural) may affect different types of maltreatment differently. For example, in two separate studies Zuravin found a link between neighborhood factors and neglect. Zuravin’s (1986) study indicated that household crowding was more strongly associated with neglect than physical and sexual abuse. In her 1989 study, Zuravin found that residential instability was associated with increased rates of neglect but not abuse. Similarly, Kim (2004) found that low SES and high violent crime rates were significantly associated with neglect, but not with physical abuse. Freisthler, et al. (2004) found that the per capita density of bars was significantly associated with neglect. However they also found that the number of off-premise alcohol outlets (e.g., liquor, grocery, and convenience stores) was associated with physical abuse rates. Additionally Paulsen (2003) found that child neglect is more spatially concentrated than physical abuse. These study findings may indicate that neglect, compared to other types of child maltreatment, is more strongly associated with structural characteristics of neighborhoods (Drake & Pandey, 1996; Kim, 2004; Zuravin, 1989).

Because of the large number of structural factors thought to be associated with maltreatment, and the large number of measures available in census data that are
correlated with each other, a number of studies of neighborhood effects on child maltreatment have used factor analysis to develop neighborhood measures (Coulton, et al, 1995; Ernst, 2000; Lery, 2009). These studies have found a number of social indicators from the Census group to form constructs. The following three factors will be use in this study: Impoverishment, Instability and Childcare Burden.

*Neighborhood Impoverishment*

A number of studies have used factor analysis to develop neighborhood measures of impoverishment or disadvantage (Coulton, et al., 1999; Coulton, et al., 1995; Ernst, 2001; Fromm, 2004; Korbin, et al, 1998; Hyde, 1999; Lery, 2009; Paulsen, 2003; Zuravin, 1986). These factor analyses vary in their specific variables but predictors include female-headed households with children under 18 years old, the percentage of poor persons, the percentage of unemployed residents, the percentage of vacant housing units, measures of population loss, and the percentage of the population classified as African American. These factors generally show that increased economic distress or disadvantage is associated with elevated rates of child maltreatment. Additionally, some research has indicated that the association with neighborhood poverty varies by the type of maltreatment. For example, Drake and Pandey (1996) found the association with neighborhood poverty to be strongest for neglect, somewhat less for physical abuse, and moderate for sexual abuse. Additionally, Kim (2004) found low neighborhood SES and high neighborhood violent crime rates were significantly associated with neglect, but not with physical abuse.
Residential Instability

A number of studies have found an association between residential instability and child maltreatment (Coulton, et al., 1995; Deccio, et al., 1994; Ernst, 2000; Ernst, 2001; Fromm, 2004; Garbarino & Crouter, 1978; Hyde, 1999; Young & Gately, 1988; Zuravin, 1989). Additionally, Lery (2009) examined the relationship between residential instability and entry into foster care and found a similar relationship. Instability is a measure of the degree to which an area is characterized by movement of its residents (Coulton, et al., 1995). It is comprised of measures such as the percentage of the population that moved in the last decade, the percentage of households in current residence less than 10 years, and the percentage of households that moved in the last year.

Childcare Burden

Childcare Burden has also been associated with increased child maltreatment (Coulton, et al., 1999; Coulton, et al., 1995; Korbin, et al., 1998). Lery (2009) also found a correlation between Childcare Burden and entry into foster care. Childcare Burden is thought to reflect the amount of adult supervision and resources available to children in a community (Coulton, et al., 1995). It includes measures such as the ratio of children (age 0 to 12) to the number of adults (age 21+), the ratio of adult males to adult females, and the percentage of the population that is elderly (over 65).
Gaps in the Literature

As the literature review suggests, much is known about the individual/household and neighborhood risk factors for children’s involvement in the child welfare system. However, significant gaps remain. First, few studies have used a methodology that allows for the simultaneous examination of individual and neighborhood factors. This study will employ a multi-level design where individual children and families are nested within neighborhoods to examine the effects of individual/household and neighborhood factors on child maltreatment. Much of the current research has used methods that model child maltreatment at either the individual level (thus ignoring the possible contribution of ecological or macro level influences) or at the aggregate level (thus ignoring the contribution of individual level factors). For example, Coulton, et al. (2007) in their review of the literature found 25 studies that examined the effects of neighborhood characteristics on child maltreatment. Of those, only three used a multi-level model, as will be used in this study, which allows for the simultaneous examination of different ecological levels as well as the interaction among levels.

Secondly, this study will examine the individual and neighborhood factors associated with child maltreatment, including examining the extent to which these factors, and child maltreatment itself, vary by the age or development period of the child. This study will attempt to gain a deeper understanding of when child maltreatment is most likely to occur and how risks vary over time. Few studies have done this. Wulczyn (2005) calculated age-specific rates of child maltreatment using national data, and Sabol, et al. (2003) and Crampton and Coulton (2008) used a life table approach to estimate the

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2 Coulton and colleagues (2007) limited their review to those studies that defined neighborhoods geographically and used them as their primary unit of analysis. They did not include studies that used larger units of analysis such as cities, counties or states.
likelihood that children will become victims of maltreatment from birth to ten years of age in Cuyahoga County. Each of these studies was able to disaggregate by race and some structural aspects of place (residential location or county poverty level) to identify disparities. These studies have advantages over cross-sectional analysis in that they provide an understanding of the condition of children over their childhood years rather than during a single point in time. However, they do not take into account the multiple individual/household and neighborhood factors that are related to child maltreatment. The methodology used in this study will allow for the simultaneous examination of individual and neighborhood factors on the timing and cumulative hazard of maltreatment over the early childhood years.

Finally, as the review of the literature above points out, there are still many outstanding questions about why racial disproportionality in the child welfare system exists. Some evidence suggests that systematic bias may play a role in the over representation of African American children in the child protection system. Literature suggests that “disadvantaged” communities (which are disproportionately African American) have higher rates of reported child maltreatment. Additionally, African American children (compared to White children) may be more likely to enter the child protection system when they live in areas where they are relatively less represented, introducing the possibility that referrals to CPS may be, at least in part, a function of heightened visibility of minority families to authorities and other potential reporters. The converse of this, that African American children are less likely to come to the attention of child welfare services in predominately minority or poor neighborhoods, could suggest that White children are underrepresented in the child welfare system in more affluent or
majority areas or that African American communities may have protective factors for families living in impoverished neighborhoods.

Together, these data suggest that there are multiple pathways by which children come to the attention of CPS agencies and that age and race may play a moderating role. This underscores the notion that an ecological framework is needed to understand the complex constellation of factors that operate at different levels. Few studies have examined neighborhood effects on child maltreatment after controlling for individual factors, and I found no studies that have examined individual and neighborhood factors on the timing of child maltreatment. This project therefore, proposes to fill a gap in the child maltreatment literature by conducting a multi-level discrete time hazard analysis to better understand the risk and protective factors at the individual/household and neighborhood levels associated with the age-specific rates of child maltreatment reporting and substantiation.

Theoretical Perspectives

This study will draw on a number of theoretical perspectives, including an ecological perspective, social disorganization theory, a bio-ecological/life course perspective and a perspective that understands that recognition and reporting may influence how children come to the attention of child welfare services. Each of these is discussed in turn.

Ecological Perspective

There is a growing recognition in the field that an ecological approach, that
considers the contribution of community contextual factors, is needed to best understand child maltreatment. This approach examines how child development and parenting are influenced by the environment, including neighborhoods (Belsky, 1993; Belsky & Jaffee, 2006; Bronfenbrenner, Moen, & Garbarino, 1984; Cicchetti & Lynch, 1993; Garbarino, 1977). As is evident in the literature review, many studies emphasize the importance of neighborhood when studying individual outcomes such as child maltreatment. Furthermore, the National Research Council’s (1993) report on child maltreatment reviewed the literature and suggested that research on maltreatment should employ an ecological perspective that views the etiology of maltreatment as transactions of risk and protective factors at multiple levels of ecology (Cicchetti & Lynch, 1993; National Research Council, 1993). While there is growing attention to the importance of neighborhood and broader contextual factors in studying child maltreatment, still emerging is theory that links neighborhood to these outcomes. The ecological-transactional model provides limited explanation about how neighborhood conditions influence these transactions and about how and why these neighborhood conditions and processes occur.

Social Disorganization Theory

Social disorganization theory (also referred to here as community social organization because it is conceptualized as a continuum) provides an explanation for the relationship between larger community contextual factors (e.g.: economic status, population movement) and individual behaviors. Specifically these macro structural factors are thought to impact formal and informal social networks. Social disorganization
theory examines the relationship between geographic concentrations of social problems and social processes within neighborhoods thought to contribute to social control, such as network ties, shared norms, collective efficacy, institutional resources, and routines (Sampson, Morenoff, & Gannon-Rowley, 2002). It has been used to examine the consequences of concentrated poverty in central city neighborhoods and social isolation as a factor in a number of poor outcomes for children (e.g., Wilson, 1987). In response to this concern, there is tremendous interest in how neighborhoods can be strengthened to support families and to reduce child maltreatment (Melton, 2005; U.S. Advisory Board on Child Abuse and Neglect, 1993). The strength of the social disorganization tradition is that it describes some of the specific social structures and processes within neighborhoods that may be related to child maltreatment and other problems and provides some explanation as to how structure and process are related. However, social disorganization theory provides little specificity about how these neighborhood characteristics might influence the behaviors and development of children and families.

*Bio-Ecological/Life Course Perspective*

Wulczyn and colleagues (2005) used a bio-ecological/life course perspective that theorizes that age and the risk of child maltreatment are linked. This theory suggests that age and risk are related in such a way that risk is elevated during certain time periods or ages which might be the result of the developmental period of the child (babies may be more vulnerable than older children) and/or because of institutions that the child comes into contact with during the period (the hospital at birth or school as children begin school between ages four and six) (Wulczyn, 2005, p. 45). Wulczyn and colleagues
suggest that this perspective calls for age differentiated analysis of child maltreatment. Sabol, et al. (2003) and Crampton and Coulton (2008) use a life course perspective in their examination of child maltreatment rates in Cuyahoga County. Using a life table approach they consider the chances that children will become victims of maltreatment during their childhood by examining age specific rates and cumulative rates of child maltreatment for children through age 10. The consistency in the literature regarding differences in age-specific rates of maltreatment support this approach.

This bio-ecological/life course perspective builds off of and combines two long-standing research perspectives: The bio-ecological perspective and the life course perspective. The bio-ecological perspective on human development (Bronfenbrenner, 1979; Bronfenbrenner & Ceci, 1994) has influenced the study of children and families for more than 30 years. As described above, this perspective posits child development is the result of complex interactions between the child and his or her environment. It considers the interaction between the child and a number of aspects of the child’s environment including: family, society, culture and political environment.

The life course perspective has emerged over the last 40 years as a research perspective that spans disciplines (Elder, 1994 & 1998). “Life course theory and research alert us to this real world, a world in which lives are lived and where people work out paths of development as best they can.” (Elder, 1998). It provides a framework as to how lives are socially organized in biological and historical time, and how the patterns that result from this affects the way people think, feel and act. The focus of life course research is on the timing, sequence and duration of life events over the life course.
Recognition and Reporting

Coulton, et al. (2007) reviewed the literature regarding the association between neighborhoods and child maltreatment, and put forth a framework that outlines mechanisms that could account for observed correlations between neighborhood characteristics and child maltreatment. This framework is drawn from both social disorganization theory and the ecological-transactional model. However, it also includes other mechanisms that could account for observed relationships between neighborhood characteristics and child maltreatment. In their review, they discuss three pathways: 1) behavioral influences reflects the possibility that social processes within neighborhoods are experienced by families and children in ways that result in maltreating behaviors, 2) recognition and reporting theorizes that there are differences in how maltreatment is recognized and reported which may result in differences in measured outcomes, and 3) selection which acknowledges that children and families are not randomly assigned to neighborhoods, and that families with certain characteristics may aggregate in neighborhoods with certain characteristics that are correlated with maltreatment outcomes. Attention to the recognition and reporting pathway is important because the majority of the research literature uses reports of maltreatment as the main outcome of interest. These studies use official child maltreatment data to measure the relationship between neighborhoods and child maltreatment. However, official CPS data do not necessarily measure child maltreatment behavior. The few studies that have tried to measure child maltreatment without using official reports as the outcome suggest that recognition and reporting may play a role (Coulton, et al., 1999; Hampton & Newberger,
Summary

This study will draw on aspects of all these perspectives in developing research questions and hypotheses. It will use an ecological perspective as the overall framework. This perspective views individuals as nested within multiple ecological levels (including individual characteristics such as child age and the context in which they live - the neighborhood). Community social organization provides the theoretical justification for linking the individual and neighborhood level. A bio-ecological/life course perspective that includes age-differentiated analysis will be used to gain an understanding of the age specific patterns of child maltreatment and how age and the risk of child maltreatment are linked. An understanding of the role that recognition and reporting of child maltreatment and of the selection of families into neighborhoods may play suggests that individual factors such as race and poverty and structural factors at the neighborhood level often co-vary and may influence not only parental behaviors but also how those behaviors are acted upon and responded to.

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3 In addition to the studies that have been discussed, a number of studies (Straus & Gelles, 1986, 1990; Straus, Hamby, Finkelhor, Moore & Runyan, 1998) have used the Conflict Tactics Scales (Straus, 1979) or the Parent-Child Conflict Tactics Scales (Straus, et al., 1998) to obtain data on physical and psychological child maltreatment. These studies have found prevalence rate for physical maltreatment as high as 49 per 1,000, much greater than for cases reported to child protective services and greater even than the rate uncovered in a National Incidence Study.
CHAPTER 3 – Research Questions & Hypotheses

While racial disproportionality in the child protection system has attracted considerable research attention, still lacking is a clear understanding of why it exists and how individual/household and neighborhood factors together contribute to how African American children come to the attention of CPS. Furthermore, there are no studies that examine developmental period and individual and neighborhood factors simultaneously. This project therefore proposes to fill a gap in the child maltreatment literature by conducting a multi-level analysis to better understand the risk and protective factors at the individual and neighborhood levels associated with the timing of child maltreatment reports and substantiations.

Research Goals

As the review of the literature above points out, there are number of individual/household and neighborhood factors that increase the risk of children coming to the attention of the child protection system. However, still lacking is a clear understanding of why the over representation of African American children in the child protective system exists. Literature suggests that “disadvantaged” communities (which are disproportionately African American) have higher rates of reported child maltreatment. Poverty may play a role in bringing African American children to the attention of CPS. Poverty itself is a strong risk factor for child maltreatment. The fact that African American families are disproportionately poor and are more likely to live in poor neighborhoods may explain their over representation in the child welfare system.
Additionally, it is clear that the risk of child maltreatment varies by the age of the child. However, the factors that may cause this are not clear.

These data suggest that children come to the attention of CPS agencies through multiple pathways, and that race may play a moderating role. An ecological framework that takes into account individual factors such as the child’s age and race as well as factors associated with his or her family and the neighborhood in which he or she lives is needed to understand the complex constellation of factors that operate at different levels impacting the child’s chances of having a reported or substantiated incident of child maltreatment.

The purpose of this study is to examine racial differences in reported and substantiated cases of child maltreatment in Cuyahoga County, Ohio. Its goal is to better understand the role of neighborhood disadvantage on child maltreatment rates by race and by child age or developmental period. The study will employ a multi-level discrete time hazard model with cross-level interactions in order to simultaneously examine the individual and neighborhood level predictors of being the subject of an investigated report or substantiated/indicated incident of maltreatment for young children. The specific objectives of the study are as follows:

1. To examine the hazard of child maltreatment by age for children up to age six in Cuyahoga County, Ohio.

2. To examine the impact of race on the hazard of child maltreatment.

3. To examine the impact of neighborhood disadvantage on the hazard of child maltreatment.

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4 It’s important to note that the dependent variables are investigated reports of child maltreatment, investigated reports of child neglect and indicated or substantiated reports of child maltreatment. This study uses official reports to estimate maltreatment rates.
4. To understand if the influence of neighborhood disadvantage on the hazard of child maltreatment is moderated by the race of the child.

**Research Questions & Hypotheses:**

The following research question and hypotheses will be addressed to meet the study objectives:

**Objective 1:** To examine the hazard of child maltreatment by age for children up to age six in Cuyahoga County, Ohio.

Q1. Does the risk of child maltreatment vary by the age of the child?

   H1: The hazard of child maltreatment will be greater among younger children.

**Objective 2:** To examine the impact of race on the hazard of child maltreatment.

Q2a. Are African American children disproportionality represented in the child welfare system?

   H2a: African American children will be disproportionality represented in the child maltreatment system.

Q2b. Does the effect of race on the risk of child maltreatment vary by child age?

   H2b: Race will have a stronger effect on the odds of child maltreatment among younger children.

**Objective 3:** To examine the impact of neighborhood disadvantage on the hazard of child maltreatment.
Q3a. Does neighborhood disadvantage increase the risk of child maltreatment?

H3a: The hazard of child maltreatment will be greater among children living in impoverished neighborhoods.

H3b: The hazard of child maltreatment will be greater among children living in instable neighborhoods.

H3c: The hazard of child maltreatment will be greater among children living in neighborhoods with higher child care burden.

Q3b. Do the effects of neighborhood disadvantage on child maltreatment vary by the age of the child?

H3d: Neighborhood Impoverishment will have a stronger effect on the risk of maltreatment among younger children.

H3e: Neighborhood Instability will have a stronger effect on the risk of maltreatment among younger children.

H3f: Childcare Burden will have a stronger effect on the risk of maltreatment among younger children.

Objective 4: To understand if the influence of neighborhood disadvantage on the hazard of child maltreatment is moderated by the race of the child.

Q4. Is the influence of neighborhood disadvantage on the hazard of child maltreatment moderated by the race of the child?

H4a: Neighborhood Impoverishment will have a weaker effect on the hazard of child maltreatment among African American children than among White children.
H4b: Neighborhood instability will have a weaker effect on the hazard of child maltreatment among African American children than among White children.

H4c: Neighborhood Childcare Burden will have a weaker effect on the hazard of child maltreatment among African American children than among White children.
CHAPTER 4 – Methodology

This study uses a multi-level discrete time hazard model to estimate the effects of individual, family and neighborhood factors on child maltreatment. This chapter describes the methods used to answer the following research questions:

Q1. Does the risk of child maltreatment vary by the age of the child?
Q2a. Are African American children disproportionally represented in the child welfare system?
Q2b. Does the effect of race on the risk of child maltreatment vary by child age?
Q3a. Does neighborhood disadvantage increase the risk of child maltreatment?
Q3b. Do the effects of neighborhood disadvantage on child maltreatment vary by the age of the child?
Q4. Is the influence of neighborhood disadvantage on the hazard of having a reported or substantiated incident of maltreatment moderated by the race of the child?

The primary statistical method and approach used to answer these questions, multi-level discrete time hazard modeling, will be described in detail. The chapter is comprised of five sections: 1) sampling and data collection methods, 2) overview of data and research design, 3) statistical methods 4) analysis plan, and 5) protection of human subjects.

Sampling and Data Collection Methods

This study employs secondary data analysis. A subset of a dataset created by the Center for Urban Poverty and Community Development at the Mandel School of Applied
Social Sciences at Case Western Reserve University was utilized. The data were originally obtained as part of separate ongoing research studies conducted by the Center. This dataset contains four data types: Child maltreatment reports, use of public assistance (Temporary Assistance for Needy Families (TANF) and Medicaid), birth certificates, and U.S. Census data. Child maltreatment reports were obtained from computerized files from the Cuyahoga County Department of Child and Family Services. For this analysis, all child maltreatment reports that were accepted for investigation from January 1, 1998 through December 31, 2007 are included. The public assistance usage data were obtained from the Ohio Department of Job and Family Services’ (ODJFS) Client Registry Information System-Expanded (CRIS-E) system. Birth certificate records for Cuyahoga County residents were obtained from the Ohio Department of Health, Center for Vital and Health Statistics. This sample includes children born between January 1, 1998 and December 31, 2001 in Cuyahoga County, Ohio. Census data are from the United States Census Bureau’s public data from the 2000 Census through the Poverty Center’s NEO CANDO database. Child maltreatment reports and use of public assistance data have been matched to birth certificates using probabilistic matching (see Coulton, et al, 2005) and allow for follow up of all children through age five.

Census tracts were chosen as proxies for neighborhoods in this study because they have sufficient density of respondents and adequate reliability for the neighborhood measures (Coulton, Cook & Irwin, 2004). Although census tracts do not necessarily comport with resident definitions of their neighborhoods, they are commonly used in this type of research (Coulton, Korbin, Chan & Su, 2001). Births in the dataset were distributed among 489 census tracts. (11 census tracts were removed from the file
because they had insufficient numbers of residents, such that it resulted in highly skewed factor scores for the neighborhood structural characteristics). The mean number of births per census tract was 169, with a range of 3 to 352. Only 7 of the tracts had fewer than 10 births and I choose to retain all 489 census tracts in the study to enhance statistical power (Snijders, 2005).

The dataset contained a total of 71,432 births. This represents approximately 97% of all births in Cuyahoga County during this time period. The remaining births are those that had missing names and addresses and were therefore suppressed by the State of Ohio for legal reasons. Additionally 2170 births (3%) were removed because they did not have address information, and an additional 18 cases were removed because they lived in tracts with insufficient numbers of residents to construct factor scores for the neighborhood structural characteristics. After removing all cases in tracts with missing or bad census information, 69,236 cases remained. Of those, all children classified as non-Hispanic Black or non-Hispanic White, or Hispanic were included in the sample. 2.7% of children (1891) did not fall into one of those categories and were removed from the dataset. Finally, after removing data missing at random (3.2%), a final analysis sample of N=65,181 was obtained.

The sample includes children born between January 1, 1998 and December 31, 2001 in Cuyahoga County, Ohio. These years were chosen to have sufficient numbers of events to model at the neighborhood level. The years are clustered around the year 2000 because neighborhood and county level data come from the 2000 census. Birth certificates are used to obtain individual/family level variables as well as the neighborhood at birth. Census data are used to obtain neighborhood structural measures.

Child maltreatment reports that were accepted for investigation from January 1,
1998 through December 31, 2007 are used to allow for following children through age five. I chose to follow children through age five for a number of reasons. First, by following children through age five, I will include those in the population with the highest rate of victimization. Overall, the rate of victimization is inversely related to the age group of the child (U.S. Department of Health and Human Services, Administration for Children and Families, 2009) with the highest rate of victimization being among those children under one. In addition, researchers have found that the severity of child victimization is greater for children younger than age 5 (Dilillo, Tremblay, & Peterson, 2000). Also, in addition to victimization rates varying by the age of the child, it is likely that the impact of neighborhood residence varies across development (Leventhal & Brooks-Gunn, 2003). Yet, most neighborhood research has been cross sectional. The majority of the literature on child maltreatment has relied on point-in-time estimates. That is, counts of children who are maltreated and rates expressed as percentages of the age-specific population in a specific time period. This dataset, with birth certificates matched to child maltreatment data, allows for tracking birth cohorts to determine the probability that a child will be maltreated during his or her childhood (in this case through age five). This allows for the examination of variation in the risk of maltreatment, and the factors associated with it, across different developmental periods.

It is important to consider the time horizon of the effects. This study, and most of the literature on neighborhood effects, is interested in contemporaneous effects. That is, the effect of context on behavior over a limited period of time concurrent with the influenced actions. Measuring contemporaneous effects requires taking measures at the individual level at the same time as measures at the neighborhood level are taken, or
having both time-varying individual and contextual level measures. While time-varying measures at the individual level are common (and available for this study), dynamic measures at the neighborhood level are extremely rare (and only available in this study for those with a child maltreatment event, not for the entire birth cohort). Given that there may be considerable mobility among families and, even among those that do not move, neighborhood structure may change over time, the question then, is how limited the time period must be to expect the neighborhood characteristics to exert an effect. Most scholars either do not consider this or argue that neighborhood factors change only minimally or subjects move among similar neighborhoods. For example, Leventhal and Brooks-Gunn (2003), argue that one of the reasons that the size of neighborhood effects reported in the experimental literature (i.e.: from the Gautreaux Program and Moving to Opportunities Program) are larger than those from non-experimental studies is likely because the changes in neighborhood conditions were larger. In fact, they state that when families, especially low income families, initiate their own moves the changes are usually not so large. Reardon, Brennan and Buka (2002) argue that generally stable characteristics such as neighborhood demographics as measured by the census do not pose a problem. In their study, they assume that factors associated with neighborhood residence measured at one point in time (the 1990 census) did not change substantially in the six years they followed respondents. Furthermore, they assumed that if respondents moved in that time, that they moved among neighborhoods similar to their current neighborhood.

Because of the limits of the data, this study, like most in the neighborhood effects literature, is based on neighborhood residence at a single point in time. It will examine
the impact of neighborhood factors at the time of birth on child maltreatment for children as old as five. However, for those with a child maltreatment event, neighborhood data are available at the time of the incident. Therefore it will be possible to determine 1) among those with a maltreatment event, what percentage live in a different neighborhood than the neighborhood at birth, and, 2) for those who do live in a different neighborhood, to what extent neighborhood characteristics differ.

Some studies have examined lagged effects or effects on current behavior due to a prior neighborhood membership. For example, there is some research to indicate that contextual characteristics at multiple points in the life course may exert independent effects on individual outcomes (Axinn & Yabiku, 2001). Axinn & Yabiku found evidence of both enduring effects of childhood neighborhood context as well as of adult neighborhood context on women’s childbearing behavior. Therefore, while this study isn’t a lagged effects study per se, it will lend some insight into whether neighborhood characteristics at birth have enduring effects on more distant child outcomes such as maltreatment or whether the effect of neighborhood context at birth diminishes with time.

Finally, this time period allows for comparison with result from previous research on this same population. Coulton, et al. (2005) used proportional hazard modeling to understand the risk factors associated with time to first indicated or substantiated report of maltreatment among children through age five in Cuyahoga County. The present study uses many of the same individual level predictors and will therefore lend insight into how their impact changes over developmental periods as well as with the addition of neighborhood level predictors.
Measures

Age in years at first investigated report of child maltreatment and first substantiated report of child maltreatment are the dependent variables. Because of research (Drake & Pandey, 1996) suggesting that neighborhood factors, specifically poverty, have a stronger effect on neglect than on other types of child maltreatment, age at first investigated report of child neglect will also be examined. The models will be run separately for each of the dependent outcomes. The dependent variables will be coded as 1 if a maltreatment (or neglect) report (or substantiation) occurred and 0 otherwise. If a child has more than one reported or substantiated incident of maltreatment, the first substantiated incident will be used.

Child maltreatment is defined by CAPTA, as amended by the Keeping Children and Families Safe Act of 2003, as, at minimum, “any recent act or failure to act on the part of a parent or caretaker which results in death, serious physical or emotional harm, sexual abuse or exploitation; or an act or failure to act which presents an imminent risk of serious harm” (U.S. Department of Health and Human Services, Administration for Children and Families, 2003). Most states (including Ohio) recognize four major types of maltreatment: neglect, physical abuse, sexual abuse, and emotional abuse, and national statistics are compiled using these categories. Because of the small numbers of events at the neighborhood level, in most models all types of child maltreatment will be considered together as a group. However, to better understand if certain neighborhood or individual factors differentially affect neglect, it will also be examined separately.

This study uses official reports to estimate child maltreatment rates. It’s important to note that official reports reflect consequences serious enough to come to the
attention of the agency, as well as individual decisions on the part of reporters and case workers regarding if an event should be reported, investigated and substantiated as maltreatment. Child maltreatment reports are defined as referrals that come to the agency alleging child abuse or neglect and are accepted by the agency for investigation (calls to the hotline may be screened out because they are thought not to be appropriate – these do not appear in the data used here). After investigation, each reported incident is classified as either:

- Substantiated - includes incidents where abuse and/or neglect are confirmed.
- Indicated - includes incidents where abuse and/or neglect is suspected but there is insufficient evidence to confirm it.
- Unsubstantiated - includes incidents that are reported but where no evidence of abuse or neglect is found.

The indicators of child maltreatment for this study will include investigated child maltreatment reports as well as those incidents that are classified as either substantiated or indicated. Reports will be used for two reasons: 1) research suggests that being reported for maltreatment - regardless of whether the allegation is substantiated – is, in itself, a predictor for poor outcomes (Leiter & Myers, 1994), highlighting the importance of examining all child abuse and neglect reports in addition to those that are substantiated, and 2) disproportionality in maltreatment reports may represent a different phenomenon than disproportionality within the child protective system.

Substantiated and indicated reports will be examined together as one group. Substantiated cases are those in which an allegation of maltreatment or risk of maltreatment was supported or founded according to state law or policy. Indicated cases
are those in which an allegation of maltreatment or risk of maltreatment could not be substantiated, but there was reason to suspect maltreatment or the risk of maltreatment, therefore substantiated and indicated reports of maltreatment are commonly looked at together (U.S. Department of Health and Human Services, Administration on Children, Youth, and Families, 2007).

**Individual and Family Level Variables**

While the main purpose of this study is to examine the effects of neighborhood structure on maltreatment reporting, it is important to take into account individual and family level characteristics. Families have choice as to where they live; thus, adjusting for family factors minimizes the possibility that unmeasured individual or family characteristics associated with the neighborhood of residences (referred to as individual selection bias) might account for observed neighborhood effects. Individual and family level risk factors shown in previous research to correlate with maltreatment will therefore be included in the first level of this model. These include: sex, birth weight, maternal tobacco use, maternal alcohol use, race, maternal age, maternal education, marital status, and family income. Individual level variables will be defined and coded as follows:

- **Sex:** This is the sex of the child listed on the birth certificate, coded 0 if the child is female and 1 if male.

- **Low birth weight:** This is whether the child was born weighing less than 2500 grams as reflected on the confidential portion of the birth certificate information provided by the hospital. It was coded 0 if the child is born weighing 2500 grams or more and 1 if the child was born weighing less than 2500 grams.
• **Tobacco use:** This is whether the mother used tobacco during pregnancy as reflected on the confidential portion of the birth certificate information provided by the hospital. It was coded 0 if the mother did not smoke and 1 if she did.

• **Alcohol use:** This is whether the mother used alcohol during pregnancy as reflected on the confidential portion of the birth certificate information provided by the hospital. It was coded 0 if the mother did not use alcohol during pregnancy and 1 if she did.

• **Race** was categorized as non-Hispanic Black, non-Hispanic White and Hispanic. Because race of the child is not reflected on the birth certificate, the race of the mother as reflected on the birth certificate was used. Respondents were first categorized as Hispanic or non-Hispanic. For non-Hispanics, they were then categorized as: White or Black/African American. The race/ethnicity categories were then dummy coded and White was used as the reference group.

• **Mother’s age:** This is the mother’s age at the time of birth as reflected on the birth certificate. Age was centered on its mean and used as a continuous variable.

• **High school graduate:** This is whether the mother graduated from high school by the time of the child’s birth as reflected on the confidential portion of the birth certificate information provided by the hospital. It was coded 0 if the mother was not a high school graduate and 1 if she was.

• **Marital status:** This is the marital status of the mother at the time of birth reflected on the birth certificate. It was coded 0 if the mother was not married and 1 if she was.

• **Family income** - Medicaid and TANF will be used as a proxy for family income. Two variables will be used: 1) if the child received TANF and Medicaid in the first 6
months of life as reflected in computerized records from the Client Registry Information System Enhanced (CRIS-E) provided by Cuyahoga Employment & Family Services, 2) if the child received Medicaid in the first 6 months of life: This is whether the child was a recipient on a Medicaid (but not TANF) case within the first 6 months after birth as reflected in computerized records from the CRIS-E provided by Cuyahoga Employment & Family Services. Both will be coded 1 if the child received Medicaid or TANF and 0 if he or she did not.

**Neighborhood Level Variables**

Neighborhoods will be conceptualized as census tracts. Census tracts are used because: 1) data on population characteristics such as poverty, family structure and racial composition are readily available at the census level, and 2) census tracts have on average 4000 residents and 1500 households (U.S. Census Bureau, 2000), which is small enough to approximate the size of a neighborhood (Coulton, et al., 1995). While there is controversy in the literature surrounding the best way to define and conceptualize neighborhoods, most studies have employed a geographical definition, dividing communities according to municipal boundaries, often census tracts. It should be noted however that concern has been raised that a neighborhood defined in this manner may differ from the conceptualization of the neighborhood that is held by the community's residents (Coulton, et al., 2001). Coulton, et al. (2004) have examined alternate ways to conceptualize neighborhood including resident-defined boundaries. Unfortunately those definitions are not possible with administrative data.

A number of structural characteristics of neighborhoods, found in prior research
to correlate with aggregate measures of child maltreatment, will be used in this study. Coulton and colleagues (1995) found that 12 measures of economic and demographic characteristics of neighborhood from the 1990 U.S. Census formed three factors relevant to maltreatment. They labeled these Impoverishment, Instability, and Childcare Burden. Impoverishment included the percentage of households that are female-headed with children under 18 years old, the percentage of poor persons, the percentage of unemployed residents, the percentage of vacant housing units, the percentage of population loss between 1980 and 1990, and the percentage of the population classified as African American. Instability includes: the percentage of the population that moved between 1985 and 1990, the percentage of households in current residence less than 10 years, and the percentage of households that moved in the last year. Childcare Burden includes: ratio of children (age 0 to 12) to the number of adults (age 21+), the ratio of adult males to adult females, and the percentage of the population that is elderly (over 65).

Based on theory and prior investigation (Coulton, et al., 1995; Ernst, 2001; Lery, 2009; or see Coulton, et al., 2007 or Freisthler, et al., 2006 for a review), I performed principal components analyses on the census-based measures to construct measures of neighborhood-level structural characteristics for each census tract. Using Coulton, et al. (1995) neighborhood child maltreatment study as a guide, I ran the factor analysis using data from the 2000 Decennial Census to explore whether factor loading had changed. I constructed a principal components factor model with varimax rotation to reduce the data, handle multicollinearity, and build constructs that represent neighborhood social structure. Principal components analysis is appropriate for use with exploratory
regression analysis because it reduces a large number of predictors into components representing underlying constructs. Factor scores were calculated for each census tract and dimension of community structure. These factor scores are then used as independent variables in models. (Table 2 shows the mean, standard deviation, minimum and maximum for the measures). I used 11 of the 12 variables used by Coulton and colleagues (1995). Tenure less than ten years was not included because the variable was no longer available through the census data. In a model explaining 77.5% of the variance, I obtained the same three factors with slightly different loadings (see Table 3). The first factor, Impoverishment, includes the percentage of female headed families with children under 18 years old, the percentage of poor persons, the percentage of unemployed residents, the percentage of vacant housing units, and the percentage of residents who are African American. A second factor, Instability, includes the percentage of the population that moved between 1995 and 2000, the percentage of households that moved in the last year, and the percentage of the population age 65 or older. Finally, the third factor, Childcare Burden, includes the ratio of adults (age 21+) to children (age 0 to 12) and the ratio of adult males to adult females. Unlike the factors obtained by Coulton, et al. (1995), the most parsimonious model did not include the percentage of population loss in between 1980 and 1990. In addition, like Lery (2009), the percentage of the population age 65 and older loaded on the Instability factor as opposed to the Childcare Burden factor.
### Table 2. Means & Standard Deviations for Variables Making up Neighborhood Factors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impoverishment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% unemployed residents</td>
<td>8.51</td>
<td>8.05</td>
</tr>
<tr>
<td>% poor persons</td>
<td>16.94</td>
<td>16.33</td>
</tr>
<tr>
<td>% African American residents</td>
<td>34.41</td>
<td>38.51</td>
</tr>
<tr>
<td>% female headed households with children &lt;18</td>
<td>33.93</td>
<td>23.65</td>
</tr>
<tr>
<td>% vacant housing units</td>
<td>8.53</td>
<td>7.00</td>
</tr>
<tr>
<td><strong>Instability</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% households that moved in the last year</td>
<td>17.76</td>
<td>8.78</td>
</tr>
<tr>
<td>% population that moved between 1995 and 2000</td>
<td>41.74</td>
<td>11.98</td>
</tr>
<tr>
<td>% of persons 65 or older</td>
<td>15.17</td>
<td>7.50</td>
</tr>
<tr>
<td><strong>Childcare Burden</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ratio of adults (age 21+) to children (age 0 to 12)</td>
<td>3.59</td>
<td>4.69</td>
</tr>
<tr>
<td>ratio of adult males to adult females</td>
<td>0.91</td>
<td>0.19</td>
</tr>
</tbody>
</table>


### Table 3. Final Rotated Factor Loadings with Variance Explained

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>% Variance Explained</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impoverishment</strong></td>
<td>0.859</td>
<td>0.132</td>
<td>0.017</td>
<td>44.65</td>
</tr>
<tr>
<td>% unemployed residents</td>
<td>0.858</td>
<td>0.336</td>
<td>-0.013</td>
<td></td>
</tr>
<tr>
<td>% poor persons</td>
<td>0.856</td>
<td>-0.064</td>
<td>-0.129</td>
<td></td>
</tr>
<tr>
<td>% African American residents</td>
<td>0.852</td>
<td>0.305</td>
<td>-0.191</td>
<td></td>
</tr>
<tr>
<td>% female headed households with children &lt;18</td>
<td>0.759</td>
<td>0.326</td>
<td>0.253</td>
<td></td>
</tr>
<tr>
<td>% vacant housing units</td>
<td>0.311</td>
<td>0.776</td>
<td>0.291</td>
<td></td>
</tr>
<tr>
<td>% population that moved between 1995 and 2000</td>
<td>0.260</td>
<td>0.774</td>
<td>0.263</td>
<td></td>
</tr>
<tr>
<td>% of persons 65 or older</td>
<td>-0.065</td>
<td>-0.737</td>
<td>0.154</td>
<td></td>
</tr>
<tr>
<td><strong>Instability</strong></td>
<td>0.012</td>
<td>-0.033</td>
<td>0.950</td>
<td>21.63</td>
</tr>
<tr>
<td>ratio of adults (age 21+) to children (age 0 to 12)</td>
<td>-0.094</td>
<td>0.214</td>
<td>0.860</td>
<td></td>
</tr>
<tr>
<td>ratio of adult males to adult females</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Childcare Burden</strong></td>
<td>0.012</td>
<td>-0.033</td>
<td>0.950</td>
<td>11.21</td>
</tr>
<tr>
<td>Total Variance Explained</td>
<td></td>
<td></td>
<td></td>
<td>77.49</td>
</tr>
</tbody>
</table>
Overview of Data and Research Design

This study will use a multi-level discrete time hazard model to estimate the effects of individual, family and neighborhood effects on child maltreatment. Discrete time hazard modeling is a type of event history analysis. It is used here to understand factors associated with child abuse and neglect reports and substantiations, including if and how the risk varies across ages and developmental periods of childhood. A multi-level model is used in order to better understand the risk and protective factors at the individual, family and neighborhood level associated with child maltreatment reports and substantiations. Much of the current research has used methods that model child maltreatment at either the individual level (thus ignoring the possible contribution of ecological or macro level influences) or at the aggregate level (thus ignoring the contribution of individual level factors). This study will use a two-level design in which individuals are nested within neighborhoods. Neighborhoods are geographically bounded groupings of population and institutions socially connected through structures and processes (Coulton, et al, 1999). In this case, neighborhood will be operationalized as census tracts. Variables will be measured on the individual and family as well as on the neighborhood. Individual and family level factors will be modeled at level one and neighborhood factors will be modeled at level two.

Because event hazard modeling requires the data to be organized into a person-period dataset, I used age in years at the time of the child maltreatment event to construct a person-period dataset. Longitudinal data are usually stored as a person-oriented dataset, which stores individual’s data as a single record. This study followed the example of Willett and Singer (1993a) to convert a person-oriented dataset to a person-period
dataset. I did this in the following way: For each child, in addition to the individual and neighborhood level variables, the dataset contained the child’s age at the time of maltreatment report (or substantiation). This was used to create a variable indicating if he or she ever experienced a report (or substantiation), the age at which that happened. Additionally these data contain an event variable indicating whether the child ever experienced a child maltreatment report or substantiation and a censoring status variable which indicates if the child did not experience a maltreatment event during the study period. Table 4 displays some sample data.

Table 4. Sample Data

<table>
<thead>
<tr>
<th>Subject ID</th>
<th>Neighborhood ID</th>
<th>Was Censored at the End of Period</th>
<th>Ever Experienced a CAN Report</th>
<th>Age at First Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Yes</td>
<td>No</td>
<td>.</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>No</td>
<td>Yes</td>
<td>1-2</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>No</td>
<td>Yes</td>
<td>0-1</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>No</td>
<td>Yes</td>
<td>5-6</td>
</tr>
</tbody>
</table>

To estimate a discrete time hazard model, the data are converted to person-period dataset. A person-period dataset has one line of data for each period the individual is observed. For each child, the last age that appears in the dataset is the year in which a child maltreatment event occurred or the final age period (5 to 6) at which time the child was censored. For example, individual 3 below has only one line of data. This is because he or she experienced a report of child abuse or neglect before age one. Once an event has occurred, the individual is no longer at risk for a first event and is therefore no longer observed. Individual 1, on the other hand has observations for each year through age five, but did not ever experience a child abuse or neglect report, indicating that he or she was censored at the end of the final age period. The person-period dataset created for
this study has the following information (as shown in Table 5 below):

- The **age groups** (time indicators), a set of dummy variables which indicate the age in years of the child during which the record was taking place. For this study, time periods will be grouped as follows: from birth to less than age one, from age one to less than age two, from age two to less than age three, from age three to less than age four, from age four to less than age five and from age five to less than age six. I chose these time periods to be consistent with how child maltreatment data are usually reported. Most studies of child maltreatment by age focus on child age in years or in grouped years. For example, child abuse statistics kept and reported by the Department of Health and Human Services, Administration for Children and Families (Department of Health and Human Services, Administration for Children and Families, 2009) are reported in the following age groupings 0-1, 2-3, 4-7, 8-11, etc.

- The **event** indicator (whether the child ever experienced a child maltreatment report or substantiation) is the outcome variable described above which indicates if a maltreatment event has occurred for individual in each time period.

- The **predictors** which are the individual level covariates described (not shown in Table 5).

Three person-period datasets were constructed, one for each outcome of interest. For the child maltreatment reports outcome, the dataset contained a total of 354,706 records (or person years). For the child neglect reports outcome, the dataset for contained a total of 365,903 records (or person years). For the substantiated or indicated child maltreatment incidents outcome, the dataset for contained a total of
369,210 records (or person years).

Table 5. Person-Period Data Set

<table>
<thead>
<tr>
<th>Subject ID</th>
<th>Neighborhood ID</th>
<th>Age Dummy Variables</th>
<th>Ever Experienced a CAN Report</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>0-1 1-2 2-3 3-4 4-5 5-6</td>
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</tr>
<tr>
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<td>1</td>
<td>1 0 0 0 0 0</td>
<td>No</td>
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<td>1</td>
<td>1</td>
<td>0 1 0 0 0 0</td>
<td>No</td>
</tr>
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Statistical Methods

This study uses a multi-level discrete time hazard model to estimate the effects of individual, family and neighborhood effects on child maltreatment. A multi-level discrete time hazard model builds on and combines a number of statistical modeling approaches.

Cox Proportional Hazard Modeling

Cox proportional hazard modeling (usually referred to as Survival analysis) (Cox, 1972) is a method of statistical modeling that deals with the occurrence and timing of
events in a longitudinal dataset. It is a powerful statistical method because it is able to work with the censoring of data and time-dependent covariates (Allison, 1995). It is useful to answer research questions where the variable of interest is either onset or cessation. It is commonly used in Epidemiology and Demography to describe mortality, fertility, onset of certain behaviors (such as smoking or sexual activity). One of the most important reasons for using Cox proportional hazards modeling is the ability to censored an observation in a study. Censoring occurs when an observation’s exact failure time is not known (Allison, 1995). However, two key assumptions are that time is measured on a continuous scale and the hazard is equal over time (or proportional).

**Discrete Time Hazard Modeling**

In a series of articles, Singer and Willett (1991, 1993b) presented a discrete time hazard analysis model originally developed by Cox (1972). They describe how discrete time hazard models that are analogous to Cox proportional hazards model for continuous time can be applied and the impact of various factors on event occurrence can be estimated. Discrete time hazard analysis studies the survival function (the curve of probabilities of surviving until a particular time, provided the subject has not experienced the event under study in prior time periods). The discrete time hazard probability is the conditional probability that an individual will experience the event of interest in a specific time interval given that the individual has not experienced the event of interest in any earlier time intervals (Singer & Willett, 1993b). Discrete time hazard modeling is a method of modeling the time until the occurrence of an event of interest that occurs in discrete time intervals. In this way, discrete time hazard models can be viewed as
Discrete time hazard modeling has a number of advantages, including: it is well suited to analyze longitudinal data, it can handle time-invariant and time-variant predictors, violations of the model can easily be tested and corrected and censored observations can be handled (Willett & Singer, 1991). It offers several practical advantages over continuous time approaches including the ability to handle tied durations, time-varying covariates and non-proportional hazards straightforwardly. Additionally, according to Willett & Singer (1991), discrete time hazard models are more easily generalized to allow for the complexities found in real event history data. Furthermore, in discrete time, hazard is a probability (rather than a rate, as in continuous time), and therefore interpretation of the parameters is straightforward and it can be fitted easily using standard logistic regression analysis software and HLM.

The continuous time proportional hazards model (Cox regression) is predicated on what according to Willett & Singer (1993) is an often unrealistic assumption that the effect of a predictor on event occurrence is constant over time. Unlike Cox regression, the discrete time approach allows for the examination of the shape of the hazard function. In Cox regression, because of the proportionality assumption, the shape of the hazard function is ignored. Willett & Singer (1993) argue that the shape of the hazard function in critical to understanding when an event is most likely to occur and how risks vary over time. They, therefore, strongly believe that descriptions of the shapes of hazard functions have an important role to play.

Discrete time hazard modeling answers the question of whether and, if so, when an event occurred. Discrete time hazard models allow for the exploration of whether the
effect of any predictor varies over time by including the statistical interaction between
time and the predictor in the hazard model. An interaction between a predictor and time
shows that effect of the predictor on the hazard profile differs across time periods.
Interactions between predictors and time are not simply methodological nuisances, but
they can lead to richer substantive interpretation (Willett, Singer & Martin, 1998), and are
easily incorporated in discrete time survival analyses.

*Hierarchical Linear Modeling*

Hierarchical linear and non-liner modeling is appropriate for nested data. It
provides estimates of the variance components between and within neighborhoods, and
models the variation between and within neighborhoods using factors at the individual
and neighborhood level – thus allowing for the examination of neighborhood factors
independent of individual factors. Additionally, hierarchical modeling allows
researchers to test the possible interactions between levels of data.

*Multi-Level Discrete Time Hazard Modeling*

Multi-level discrete time hazard models are a combination of discrete time hazard
analysis and hierarchical linear modeling. Combining these two methods allows for the
examination of the effects of social context (neighborhood) on the occurrence and timing
of outcomes of interest.

*Analysis Plan*

Two general steps composed the analysis plan. First, preliminary analyses of the
study’s variables were conducted. Second, multivariate analyses were conducted in order to assess the research questions and hypotheses.

**Preliminary Analyses**

Univariate frequencies and descriptive statistics (mean, standard deviation, range, skewness and kurtosis) were utilized to describe each study variable and to assess its suitability for the multivariate analyses (i.e., variables were assessed for their distribution patterns and variance).

Bivariate analyses were also conducted. Of primary interest were the significant bivariate relationships between the independent variables of interest and the dependent variables. Bivariate correlation analyses were conducted assessing the magnitude and the direction of relationship between all of the study variables. This step has two main purposes: (a) the bivariate analysis will identify very high ($r \geq .80$) correlations, in order to avoid multicollinearity problems and (b) the bivariate analysis will allow a preliminary assessment of the association (magnitude and direction) between the research variables.

**Assessment of the Research Questions and Hypotheses**

The analysis uses the recently developed multi-level discrete time hazard modeling techniques (Barber, Murphy, Axinn & Maples, 2000; Reardon, et al., 2002). In this study, I was interested in understanding the influence of both individual/household and neighborhood factors on children’s involvement in the child welfare system at each age. Because the dependent variable is categorical and children in the sample are nested within neighborhoods, I used hierarchical generalized linear models
(HGLM). Hierarchical linear models have been developed to deal with issues specific to nested or multilevel data including aggregation bias, mis-estimation of errors, and the unit of analysis problem (Raudenbush & Bryk, 2002). They allow modeling of the variation between and within neighborhoods using factors at the individual and neighborhood level, as well as for examination of neighborhood factors independent of individual factors. Factors hypothesized to explain differences among individuals are modeled at level one. Factors hypothesized to explain variation among neighborhoods are modeled at level two.

The main approach to the analysis is to build a multi-level logistic (Bernoulli) model estimating the log odds that a child living in a given neighborhood will have a report of child maltreatment. Following the example of Reardon, et al. (2002), I estimate a set of progressively more complex models (shown below). Each is estimated using the person-period data set described above. I do this in stages, beginning with a null model with no predictors to estimate the over-all between neighborhood variance of child maltreatment reports. Second, I estimate the level 1 model with individual predictors. In this and all subsequent models, I centered all of the continuous individual level predictors on the grand mean and left all the remaining (dummy) variables uncentered. This controls for differences in children and households between neighborhoods, allowing the intercept to provide an estimate of the expected neighborhood outcome for the “typical” child in each neighborhood. Next, I estimated a series of models to test whether there was variation in the regression coefficients (i.e. slopes) across neighborhoods. None of the individual level variables had a significant estimated parameter variance and the slopes were, therefore, fixed in all subsequent analysis. The next step in the model
building was to add neighborhood level predictors to the model. Next, I tested a number of cross level interactions to examine the extent to which certain neighborhood conditions might differ in their impact on child maltreatment reports depending on the race/ethnicity of the respondent.

**Models**

It is useful to begin by estimating a set of models for comparison purposes. The first model is an unconditional means model with no predictors at either level. Its purpose is to help partition the total outcome variance. At level 1, the model uses a binomial sampling model and a logit link. Model 0 is represented by equation 0:

\[
\eta_{ijt} = \ln\left(\frac{h_{ijt}}{1 - h_{ijt}}\right) = \sum_{j \in J} \gamma_j
\]

Where \( h_{ijt} \) is the hazard of experiencing a report of child abuse or neglect for person \( i \) in neighborhood \( j \) at age \( t \) and \( \gamma_j \) is the neighborhood-specific intercept for neighborhood \( j \).

The next model is a null model with no predictors to estimate the over-all between neighborhood variance child maltreatment reports. It is a simple discrete time hazard model that includes only the set of age dummy variables and no intercept. Because the age dummy variables act as multiple intercepts, one for each time period, a single intercept term is not necessary. Model 1, represented by equation 1,
(1) \[ \eta_{ijt} = \ln \left( \frac{h_{ijt}}{1 - h_{ijt}} \right) = \sum \alpha_t (AGE_{ijt}) \]

specifies that \( h_{ijt} \) is the hazard of experiencing a report of child abuse or neglect for person \( i \) in neighborhood \( j \) at age \( t \), and \( AGE_{ijt} \) is a dummy variable for age \( t \) for person \( i \) in neighborhood \( j \) (neighborhood is not considered in this model, but subscript \( j \) is used here for consistency). The estimated \( \alpha_1, \alpha_2, \ldots, \alpha_6 \) provide the shape of the baseline logit-hazard curve.

The next step is to add in the individual and family level variables. (Model 2 is represented by equation 2).

(2) \[ \eta_{ijt} = \sum \alpha_t (AGE_{ijt}) + \beta X_{ij} \]

Where \( X_{ij} \) is a vector of individual level covariates. I run this model twice. Because the impact of race is of primary interest, I run it first with just the race variables. Second, I add all the individual level variables (sex, birth weight, maternal tobacco use, maternal alcohol use, race, maternal age, maternal education, marital status, and family income) for person \( i \) in neighborhood \( j \). This model estimates the effect of \( X_{ij} \) on the logit hazard curve without taking into account neighborhood residence or neighborhood factors. Because of this, many of the individual level covariates may be biased since they are often highly correlated with factors associated with the neighborhood of residence. Thus the next step in model building tests whether ignoring neighborhood biases the effects of...
the individual level covariates on the hazard of experiencing a report of child abuse and neglect. To do this, a conditional logit discrete time model is estimated. Here I add the neighborhood level covariates, and we view each neighborhood mean as an outcome varying randomly around a grand mean. The statistical model, model 3 is represented by equation 3.

\[
\eta_{ijt} = \alpha_{j0} + \sum \alpha_{jt} \left(AGE_{ijt}\right) + \beta X_{ij}
\]

\[
\alpha_{j0} = \gamma_{01} Z_j + u_{j0}
\]

\[
\alpha_{jt} = \gamma_{t0} \quad \forall t \in \{1,6\}
\]

Where \(X_{ij}\) is a vector of individual/family level covariates for person \(i\) in neighborhood \(j\), and \(Z_j\) is a vector of neighborhood level covariates (Instability, Impoverishment and Childcare Burden) for neighborhood \(j\). Because there is no omitted age dummy variable (and therefore the age variables function as the intercepts), model 3 does not include a \(\gamma_{00}\) intercept term in the equation.

Estimating a two level model (as in model 3) calls for the careful examination of three proportionality assumptions that must be tested. The first, the level-one proportional odds assumption, assumes that the effects of \(X_{ij}\) on the log-odds of child maltreatment are the same at all time points. This is the standard discrete time proportional odds assumption (Singer & Willett, 1993b). This can be relaxed and tested by an entering interaction between each level one predictor and age. The second assumption is the level-two proportional odds assumption. This assumes that the effects
of $Z_j$ on the log-odds of child maltreatment are the same at all time points, and can be relaxed and tested by an entering interaction between each level two predictor and age. Finally, the level two proportional errors assumption assumes that the neighborhood level error terms for neighborhood $j$ is constant across ages. That is to say that controlling for $X$ and $Z$, the baseline logit hazard curves in the $J$ neighborhoods are parallel. This assumption can be relaxed and tested by allowing the slopes of the age variables to vary across neighborhoods. Each of these assumptions will be tested in turn.

Each of the three proportionality assumptions can be tested using the dataset with the six dummy age variables. However for the first two, $T-1$ interaction terms must be created for each level one and level two predictor. This creates very small sample sizes and may affect the precision of the estimates of the effect of the covariates at each age (Reardon, et al. 2002). Additionally the third assumption may be very difficult to estimate because if the $u_{jt}$s are highly correlated, the estimation algorithm may not converge (Reardon, et al. 2002). Reardon and colleagues also suggest that testing the assumptions in this way may relax the proportionality assumptions too much. They suggest in addition to the $T$ age dummy variables, adding in a continuous age variable and its square, and using the age dummy variables to define the shape of the baseline hazard curve and the continuous variables to test the proportionality assumption. Thus, following the example of Reardon, et al. (2002), I test the three proportionality assumption in models 4, 5 and 6.

Model 4, represented by equation 4, allows me to test the level one proportional odds assumption, and to determine if the effects of race on the log-odds of child maltreatment are the same at all time points.
This tests the null hypothesis that $\beta_1$ and $\beta_2$ are equal to zero. Here AGEC is continuous age in years and AGECSQ is the quadratic, or AGEC squared.

Model 5, represented by equation 5, allows me to test the level two proportional odds assumption, and to determine if the effects of Impoverishment, Instability and Childcare Burden on the log-odds of child maltreatment are the same at all time points.

\[
\begin{align*}
\eta_{ijt} &= \alpha_{j0} + \alpha_{j1}(AGEC_{ijt}) + \alpha_{j2}(AGECSQ_{ijt}) + \sum \alpha_{jt}(AGE_{ijt}) + \beta_{ij}
\end{align*}
\]

\[
\alpha_{j0} = \gamma_{01}Z_{j} + u_{j0}
\]

\[
\alpha_{j1} = \gamma_{11}Z_{j}
\]

\[
\alpha_{j2} = \gamma_{21}Z_{j}
\]

\[
\alpha_{jt} = \gamma_{t0} \quad \forall t \in \{1,6\}
\]

This tests the null hypothesis that $\gamma_{11}$ and $\gamma_{12}$ are equal to zero.

To relax the level two proportional errors assumption, I allow the neighborhood level error terms for neighborhood $j$ to vary smoothly with age. This model (model 6) is represented by equation 6
where $\delta_j$ are level two random effects. If one or both of the $\delta$ s have non zero variance after controlling for the level one and two covariates, then the adjusted logit-hazard curves in different neighborhoods are not parallel.

Finally, deal with potential problems with very small cell sized and in order to simplify as a parametric specification of the baseline hazard, I use a quadratic function of time (omitting the age dummy variables and only using AGEC and AGECSQ) to test the proportional errors assumption. Here, I make the assumption that the shape of the baseline hazard curve is quadratic. I therefore, omit the six dummy age variables and instead use only the two continuous age variables. Model 7 is represented by equation 7.

\begin{align*}
(6) \quad \eta_{ijt} &= \alpha_{j0} + \alpha_{j1}(AGEC_{ijt}) + \alpha_{j2}(AGECSQ_{ijt}) + \sum \alpha_{jt}(AGE_{ijt}) + \beta X_{ij} \\
\alpha_{j0} &= \gamma_{00} + \gamma_{01}Z_j + \delta_{j0} \\
\alpha_{j1} &= \gamma_{10} + \delta_{j1} \\
\alpha_{j2} &= \gamma_{20} + \delta_{j2}
\end{align*}

\begin{align*}
(7) \quad \eta_{ijt} &= \alpha_{j0} + \alpha_{j1}(AGEC_{ijt}) + \alpha_{j2}(AGECSQ_{ijt}) + \beta X_{ij} \\
\alpha_{j0} &= \gamma_{00} + \gamma_{01}Z_j + \delta_{j0} \\
\alpha_{j1} &= \gamma_{10} + \delta_{j1} \\
\alpha_{j2} &= \gamma_{20} + \delta_{j2}
\end{align*}
Using the final model 7 as a base (i.e.: using the quadratic function of time instead of the age dummy variables), I will include a number of cross-level interaction terms in the final model (Model 8). This will allow me to explore research objective 4: To understand if the influence of neighborhood disadvantage on the probability of having a reported or substantiated incident of maltreatment is moderated by the race of the child by creating an interaction term between individual race and neighborhood Impoverishment, neighborhood Instability and neighborhood Childcare Burden. If the findings are significant and show that neighborhood disadvantage has a weaker effect on African American children, this would support Korbin, et al (1998) findings, and suggest that African American communities may have protective factors for families living in impoverished neighborhoods.

In a multiple regression model, statistical interaction can be represented by a term that is the product of the two variables that are hypothesized to interact (Cohen & Cohen, West, & Aiken, 2003). However, often the product term is highly correlated with the individual variables. Therefore, the interaction may present the problem of multicollinearity to the models. To avoid this problem, the two variables included in the interaction term will be centered (by subtracting the sample mean from the raw scores) prior to creating the product term. Furthermore, all other variables included in the models will be centered in order to simplify the interpretation of the intercept (Cohen et al., 2003). Centering will be conducted in the person-oriented data set (prior to creating the person period data set). This is due to the fact that the person-period data set contains an unbalanced number of observations for each individual which would result in calculations of the grand or group mean being weighted by the number of years each
individual in the sample survives (Reardon, et al., 2000). In order to interpret the statistically significant interaction effects the interactions will be plotted. Following Cohen, et al. (2003) recommendation, the regression will be plotted by calculating the interaction at +1 SD, mean-centered-x (i.e., when the centered-x variable equals zero), and -1 SD on both centered-x (e.g., MH/SU problems) and centered-z (QoR). Adding the effect at mean-centered-x to the graph aims to communicate that the decomposing of the interaction represents linear-by-linear interactions between centered variables.

**Protection of Human Subjects**

This study will conduct secondary data analysis. Participants in the study are children born in Ohio, between January 1, 1998 and December 31, 2001. Study participants are identified from Ohio birth certificates. These data will be linked to Cuyahoga County Department of Children and Family Services (DCFS) data as well as to census data. Participants will not be recruited directly or otherwise contacted about the study. Case Western Reserve University has obtained Institutional Review Board (IRB) approval for this study.

Individual identifiers will be used to match birth certificates with DCFS data to create a single data file. Once this file is created, all identifying information will be removed and replaced with a single case code number assigned by the researcher. The file which contains the linking information will be stored separately. Confidential data in electronic form will be stored on a secure research server maintained by the Mandel School of Applied Social Sciences. The school’s network administrators control access to the directories and drives that contain confidential data.
There are no known risks to participants in the research. The data analysis will be conducted in the aggregate and will not involve the display or reporting of any of the individual data elements. No individual data will be available to the public -- only aggregate counts of data will be reported. There are no known benefits to participants in the research. However, to the extent that this study contributes to our understanding of child maltreatment, these individuals could benefit from improved policy or enhanced services in the future.
CHAPTER 5 – Results

This chapter will present an overview of the study findings. I will begin by describing the characteristics of the person level sample (N=65,181). This will be followed by bivariate analysis in order to assess the relationship among study variables. In next section, I begin building discrete time hazard models using the person-period data. I begin with a simple individual level discrete time hazard model to assess the relationship between child age and child maltreatment reports. The next section describes the multivariate model building using the child maltreatment report outcome. This is followed by an examination of the impact of the key variables on each additional outcome (indicated/substantiated events and child neglect reports). Next, I will examine the extent to which children lived in a different neighborhood at the time of birth (when neighborhood measures used in this study are taken) and at the time of their first child maltreatment report. The final section is a review of the research goals and hypotheses.

Characteristics of the Sample

Univariate frequencies and descriptive statistics (mean, standard deviation, range, skewness and kurtosis) were assessed for each of the study variables. For all of the study variables, skewness and kurtosis were within normal limits (skewness < 2.0, kurtosis <7.0). Descriptive statistics for the study variables at the individual/ household and neighborhood levels are presented in Table 6 below.
Nearly equal proportions of males and females are represented in the sample. The race and ethnicity of the mother was used as a proxy for the race and ethnicity of the child: 62.2% were White, 33.2% were Black or African American and 4.6% were Hispanic. The age of the mother at the birth of the child ranged from 12 to 55 with the average age being 27.6 (SD = 6.29). In terms of education, over 82% of mothers were high school graduates at time of the birth of the child. In the sample, 12.7% of mothers reported using tobacco during pregnancy and less than 1% reported using alcohol. Almost 9% of children were born low birth weight (less than 2500 grams). Because the birth certificate does not contain family income information, receipt of Medicaid and

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5 It’s important to note, the race of the child may not match that of the mother. For example, among those children with a maltreatment report whose race is recorded in their case file, over 2% of children classified as White have a mother who is not classified as White. Likewise over 5% of children who are classified as Black have a mother who is not classified as Black. Father’s race was not used because it was missing in approximately 30% of births.
TANF were used as a proxy for family poverty status. 22.1% of children received Medicaid and TANF in the first 6 month of life and 17.4% received Medicaid (without TANF) in the first 6 months of life.

With respect to neighborhood characteristics (presented in Table 7), three measures of neighborhood-level structural characteristics for each census tract were created using principal components factor analysis. The first factor, Impoverishment, includes the percentage of female headed families with children under 18 years old, the percentage of poor persons, the percentage of unemployed residents, the percentage of vacant housing units, and the percentage of residents who are African American. A second factor, Instability, includes the percentage of the population that moved between 1995 and 2000, the percentage of households that moved in the last year, and the percentage of the population age 65 or older. Finally, the third factor, Childcare Burden, includes the ratio of adults (age 21+) to children (age 0 to 12) and the ratio of adult males to adult females. Each factor score was centered on its mean. The means, standard deviation, minimum and maximum are presented below in Table 7.

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<th>Mean</th>
<th>SD</th>
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<th>Max</th>
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<td>Instability</td>
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<td>Childcare Burden</td>
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</table>

Overall, 18.2% of children were the subject of a child abuse or neglect report before they turned six. Of those, 65.8% were for child neglect, 18.5% were for physical abuse, 6.0% were for sexual abuse, and 9.8% were for emotional maltreatment. Among
reports, 30.1% were substantiated, 21.5% were indicated, and 48.3% were unsubstantiated. As a percentage of all the children in the sample, 11.9% experienced a report of child neglect before turning six years old, and 9.4% had a substantiated or indicated report of maltreatment (see Table 8).

| Table 8: Percentage of Children Experiencing a Child Maltreatment Event Before Age Six |
|-----------------------------------------------|-----------------------------------------------|
| Percentage of those with a Report            | Percentage of all Children                   |
| Child Maltreatment Report Before Age 6        | 18.2                                         |
| Abuse                                         | 18.5                                         |
| Neglect                                       | 65.8                                         |
| Sexual Abuse                                  | 6.0                                          |
| Emotional Maltreatment                        | 9.8                                          |
| Substantiated                                 | 30.1                                         |
| Indicated                                    | 21.5                                         |
| Unsubstantiated                               | 48.3                                         |
| Child Neglect Report Before Age 6             | 11.9                                         |
| Indicated/Substantiated Maltreatment Report   | 9.4                                          |
| Before Age 6                                  |                                              |

N= 65,181 children

**Bivariate Analysis**

Bivariate correlation analysis was conducted to assess the magnitude and the direction of relationship among all of the study variables (See Table 9). The bivariate analysis showed that there were no very high ($r \geq .80$) correlations among any two variables, thus indicating no multicollinearity problems. As can be seen in Table 9, all the variables, with the exception of child sex, are related to having a report of child
Table 9: Pearson Correlations

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<td>6. Hispanic</td>
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<td>9. High School Grad</td>
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<td>-.180</td>
<td>-.025</td>
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<td>.441</td>
<td>-.112</td>
<td>.247</td>
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<tr>
<td>10. Married</td>
<td>.003</td>
<td>-.164</td>
<td>-.033</td>
<td>-.089</td>
<td>.525</td>
<td>.065</td>
<td>.525</td>
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<td>.397</td>
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<tr>
<td>11. TANF + Medicaid</td>
<td>-.001</td>
<td>.111</td>
<td>.028</td>
<td>.057</td>
<td>-.344</td>
<td>.046</td>
<td>-.458</td>
<td>.451</td>
<td>-.321</td>
<td>-.518</td>
<td>1.000</td>
<td></td>
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<tr>
<td>12. Medicaid Only</td>
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<td>.102</td>
<td>.013</td>
<td>.038</td>
<td>-.246</td>
<td>.075</td>
<td>-.126</td>
<td>.096</td>
<td>-.177</td>
<td>-.269</td>
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<td>1.000</td>
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<td></td>
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<td></td>
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<tr>
<td>13. Impoverishment</td>
<td>-.007</td>
<td>.046</td>
<td>.031</td>
<td>.101</td>
<td>-.359</td>
<td>-.006</td>
<td>-.710</td>
<td>.734</td>
<td>-.325</td>
<td>-.549</td>
<td>.520</td>
<td>.131</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>14. Instability</td>
<td>.002</td>
<td>.102</td>
<td>.007</td>
<td>.013</td>
<td>-.155</td>
<td>.167</td>
<td>-.061</td>
<td>-.011</td>
<td>-.167</td>
<td>-.149</td>
<td>.135</td>
<td>.102</td>
<td>.045</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Childcare Burden</td>
<td>.002</td>
<td>.011</td>
<td>-.005</td>
<td>-.040</td>
<td>.114</td>
<td>.042</td>
<td>-.338</td>
<td>.098</td>
<td>.197</td>
<td>-.193</td>
<td>-.032</td>
<td>-.309</td>
<td>-.029</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. CAN Report</td>
<td>.006</td>
<td>.194</td>
<td>.052</td>
<td>.063</td>
<td>-.260</td>
<td>.014</td>
<td>-.235</td>
<td>.236</td>
<td>-.319</td>
<td>-.351</td>
<td>.342</td>
<td>.127</td>
<td>.312</td>
<td>.126</td>
<td>-.105</td>
<td>1.000</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed).  * Correlation is significant at the 0.05 level (2-tailed).
maltreatment. The factors most strongly associated with child maltreatment reports include mother’s age \( (r = -0.260, p < 0.01) \), White race \( (r = -0.235, p < 0.01) \), Black race \( (r = -0.236, p < 0.01) \), being a high school graduate \( (r = -0.319, p < 0.01) \), mother being married at the time of the birth \( (r = -0.351, p < 0.01) \), receiving TANF and Medicaid \( (r = 0.342, p < 0.01) \), and living in an impoverished neighborhood \( (r = 0.312, p < 0.01) \).

Being of African American or Black race is correlated with a number of factors, including: being a high school graduate at the time of the child’s birth \( (r = -0.205, p < 0.01) \), being married at the time of the birth \( (r = -0.511, p < 0.01) \), being on TANF and Medicaid \( (r = 0.451, p < 0.01) \), living in an impoverished neighborhood \( (r = 0.734, p < 0.01) \), and the level of childcare burden in the neighborhood \( (r = -0.338, p < 0.01) \). The strength of relationship between these same variables and being White was very similar, but in the opposite direction. While the relationship between these variables and being of Hispanic ethnicity was in most cases less strong but in the same directions as we observed in the case of Black subjects.

The percentages (for categorical variables) and means and standard deviations (for continuous variables) are represented in Table 10 for each of the dependent variables (child maltreatment reports, reports of child neglect, and substantiated/indicated child maltreatment events). As compared with the total sample, children with a maltreatment event of any kind are more likely to be Black. For example, while 33.2% of the whole sample is Black, 56.8% of children who are the subject of a report of maltreatment are Black, 59.7% of those subject to a child neglect report are Black and 61.0% of those who are the subject of a substantiated or indicated report of maltreatment are Black. Additionally, children with an event are far less likely to be born to married mothers.
(60.2% in the total sample, 23.7% of those with a maltreatment report, 20.7% of those with a neglect report, and 19.7% of those with a substantiated/indicated event were born to married mothers). High school graduation rates show a similar pattern being highest in the whole sample (82.3%) and lowest among those with a substantiated or indicated child maltreatment incident (52.0%). Use of tobacco and alcohol during pregnancy were, respectively, almost 2.5 times and more than 3 times greater among mothers who had children who were the subject of substantiated/indicated child maltreatment reports compared to those in the general population. Low birth weight children and children in poor families (those who were on Medicaid and TANF in the first six months of life) were also more likely to have a child maltreatment event. Mother’s age was slightly lower among those with an event, and child sex did not appear to be different.
### Table 10. Percentages and Mean (SD) of Individual/Household Predictors by Outcome

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>With a CAN Report</th>
<th>With a Child Neglect Report</th>
<th>With an Indicated/Substantiated CAN Event</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#(%) or M(SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>65,181</td>
<td>11,832 (18.2)</td>
<td>7780 (11.9)</td>
<td>6108 (9.4)</td>
</tr>
<tr>
<td>Child Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boy</td>
<td>33,140 (50.8)</td>
<td>6088 (51.5)</td>
<td>4020 (51.7)</td>
<td>3119 (51.1)</td>
</tr>
<tr>
<td>Girl</td>
<td>32,041 (49.2)</td>
<td>5744 (48.5)</td>
<td>3760 (48.3)</td>
<td>2989 (48.9)</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>40,564 (62.2)</td>
<td>4496 (38.0)</td>
<td>2806 (36.1)</td>
<td>2131 (34.9)</td>
</tr>
<tr>
<td>Black/ African American</td>
<td>21,632 (33.2)</td>
<td>6723 (56.8)</td>
<td>4645 (59.7)</td>
<td>3723 (61.0)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2985 (4.6)</td>
<td>613 (5.2)</td>
<td>329 (4.2)</td>
<td>254 (4.2)</td>
</tr>
<tr>
<td>Mother’s Age</td>
<td>27.61 (6.29)</td>
<td>24.14 (6.12)</td>
<td>24.03 (6.13)</td>
<td>24.18 (6.26)</td>
</tr>
<tr>
<td>Marital Status – Mother is Married</td>
<td>39,239 (60.2)</td>
<td>2803 (23.7)</td>
<td>1611 (20.7)</td>
<td>1202 (19.7)</td>
</tr>
<tr>
<td>Mother is High School Graduate</td>
<td>53,651 (82.3)</td>
<td>6684 (56.5)</td>
<td>4153 (53.4)</td>
<td>3179 (52.0)</td>
</tr>
<tr>
<td>Mother Used Tobacco During Pregnancy</td>
<td>8306 (12.7)</td>
<td>3136 (26.5)</td>
<td>2213 (28.4)</td>
<td>1830 (30.0)</td>
</tr>
<tr>
<td>Mother Used Alcohol During Pregnancy</td>
<td>482 (0.70)</td>
<td>200 (1.7)</td>
<td>148 (1.9)</td>
<td>150 (2.5)</td>
</tr>
<tr>
<td>Child Born Low Birth Weight (&lt;2500 grams)</td>
<td>5596 (8.6)</td>
<td>1460 (12.3)</td>
<td>1013 (13.0)</td>
<td>894 (14.6)</td>
</tr>
<tr>
<td>Family Poverty</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child received Medicaid and OWF</td>
<td>14,423 (22.1)</td>
<td>6184 (52.3)</td>
<td>4322 (55.6)</td>
<td>3499 (57.3)</td>
</tr>
<tr>
<td>Child received Medicaid (but not TANF)</td>
<td>11,330 (17.4)</td>
<td>3265 (27.6)</td>
<td>2103 (27.0)</td>
<td>1608 (26.8)</td>
</tr>
</tbody>
</table>

N= 65,181 children

Finally, before turning to the person-period data, Table 11 presents the child maltreatment report by age patterns of the 65,181 children in the sample. The first column shows the child’s age in the current period. The three columns that follow show the number of children in each year who were not the subject of a report in a prior year, the number of children censored at the end of the year, and the number who were the subject of a report in that year. Censored children are those who were not the subject of the report by the end of the study period. The proportion of children who were the subject of a report in each year (who were not the subject of a report in prior years) is
presented in the fifth column. 3383 children (5.2%) were the subject of a report of maltreatment in their first year of life, 2196 (3.6%) were the subject of a maltreatment report between ages one and two, 1962 (3.3%) were the subject of a maltreatment report between ages two and three, 1690 (2.9%) were the subject of a maltreatment report between ages three and four, 1415 (2.5%) were the subject of a maltreatment report between ages four and five, and 1186 (2.2%) were the subject of a maltreatment report between ages five and six. The information presented in the final column is also known as the cumulative survival probability. It shows the cumulative proportion of children surviving through the current interval without a report of child maltreatment. It diminishes with time, and is 81.8% in the final year (indicating that 18.2% of children in the sample experienced a report of child maltreatment by the time they reached age six).

<table>
<thead>
<tr>
<th>Child Age</th>
<th>Number Entering Interval</th>
<th>Number Censored at End of Interval</th>
<th>Number with a Maltreatment Report</th>
<th>Proportion with a Maltreatment Report</th>
<th>Cumulative Proportion Without a Report at End of Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>65181</td>
<td>0</td>
<td>3383</td>
<td>0.052</td>
<td>0.948</td>
</tr>
<tr>
<td>1-2</td>
<td>61798</td>
<td>0</td>
<td>2196</td>
<td>0.036</td>
<td>0.914</td>
</tr>
<tr>
<td>2-3</td>
<td>59602</td>
<td>0</td>
<td>1962</td>
<td>0.033</td>
<td>0.884</td>
</tr>
<tr>
<td>3-4</td>
<td>57640</td>
<td>0</td>
<td>1690</td>
<td>0.029</td>
<td>0.858</td>
</tr>
<tr>
<td>4-5</td>
<td>55950</td>
<td>0</td>
<td>1415</td>
<td>0.025</td>
<td>0.837</td>
</tr>
<tr>
<td>5-6</td>
<td>54535</td>
<td>53349</td>
<td>1186</td>
<td>0.022</td>
<td>0.818</td>
</tr>
</tbody>
</table>

Table 11: Life Table: Child Maltreatment Reports

*Reports of Child Maltreatment*

The primary goal of this study is to examine the effect of individual/household and neighborhood effects on the timing of child maltreatment incidents. To do this, I estimating a set of models for each outcome using the person-period datasets. I begin by presenting the results for the child maltreatment report outcome. For the child
maltreatment outcome the person-period dataset includes 354,706 records, or person years. Before turning to the models and examining estimated hazard rates controlling for the individual and neighborhood level factors, it is useful to examine the observed patterns of child abuse and neglect reports in the data.

Figures 1 and 2 show the hazard and cumulative failure curves observed in the data. The hazard curve (Figure 1) shows the observed proportion of children who are the subject of a report of child abuse or neglect in each year since their birth, given that they were not the subject of a report in an earlier year. So, for example, you can see that the proportion of children who are the subject of a report drops with age. Approximately 5.5% of children are the subject of a maltreatment report in their first year of life. 3.7% of those who were not reported in their first year of life were the subject of a report between ages 1 and 2. The rate continues to fall and in the last time period 2.2% of those not reported in previous years were the subject of the report between ages 5 and 6. The cumulative failure curve (Figure 2), shows the cumulative proportion of children who were the subject of a report by year. You see here that by age six, over 20% of children are the subject of a maltreatment report.
Because one of the primary interests in this study is the impact of race on child maltreatment, I looked at the hazard and cumulative failure curves by race. Figure 3 and 4 below show that both Black and Hispanic children have a higher hazard of child maltreatment reports at all ages. Additionally, it appears that the impact of race on child maltreatment reports varies by the age of the child, and the biggest difference between the curves is among children between birth and age one. Here we see that the effect of being born to an African American mother on the likelihood of being the subject of a child maltreatment report is more than twice that of children born to Hispanic mothers (0.106 compared to 0.045), and 3.5 times that of being born to a White mother (0.106 compared to 0.030). The cumulative failure curve shows that the cumulative hazard of being a victim of child maltreatment before age six is almost 40% for Black children. This is more than three times as high as it is for White children, whose cumulative hazard by age six is under 12%. The hazard over the first six years of life for Hispanic children is 23%. However, without controlling for other variables, it is unclear whether these differences may be accounted for by other individual and/or neighborhood level factors that co-vary with race. This relationship will be explored more fully in models below.
Multivariate Analysis

The next step is to examine the effect of both individual and neighborhood variables on the hazard of child maltreatment. To do this, I estimated a set of progressively more complex models. Models are estimated using the HGLM procedure in HLM version 6.06 (Raudenbush, Bryk, Cheong & Congdon, 2004). Models are built using the logistic (Bernoulli) procedure to estimate the log odds that a child living in a given neighborhood will have a report of child maltreatment in a given year. Each model is estimated using the person-period data which includes 354,706 records or person-years. For each model, I present the final population average model with robust standard errors. Raudenbush & Bryk (2002) recommend comparing model-based and robust standard errors because inferences about precision of the regression coefficient estimates are not sensitive to departure of the data from assumptions about the distribution of random effects. I begin by presenting the results for the child maltreatment report outcome.

The Null Model

The first step was to estimate an unconditional model without any individual or neighborhood predictors in order to examine the amount of variance between neighborhoods and to determine if a multi-level model was appropriate (see Model 0 in Table 12). The intercept, or average logit hazard of experiencing a report of child maltreatment across the census tracts was -3.228 (s.e. = 0.037). Assuming the tract logit hazard of maltreatment reports to be approximately normally distributed, we would expect about 95% of tracts to have values between -2.774 and -3.683. By exponentiating
the logit hazard coefficients, 95% of neighborhoods are estimated to have a yearly maltreatment hazard between 0.062 and 0.025. This suggests considerable variation between neighborhoods in terms of child maltreatment. However, these probabilities do not take into account the age of the child. Furthermore, these differences not only reflect factors in the neighborhoods, but also may reflect differences in the children or families that reside in them. This suggests a hierarchical linear model is appropriate.

**Table 12: Reports of Maltreatment Model 0**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coef</th>
<th>SE</th>
<th>P Value</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRCPT2</td>
<td>-3.228</td>
<td>0.037</td>
<td>0.000</td>
<td>0.040</td>
</tr>
<tr>
<td>reliability</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighborhood (R0)</td>
<td>0.909</td>
<td>1.11836</td>
<td>0.000</td>
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</tr>
<tr>
<td>-2LL</td>
<td>-462012.00</td>
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<td></td>
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</tr>
</tbody>
</table>

**Unconditional (Individual Level) Models**

Table 13 presents estimates of the effects of the predictors on reports of child maltreatment. Raw logistic coefficients are also transformed by exponentiating them; showing the multiplicative effect on the odds of being the subject of a maltreatment report in any one-year interval. A hazard (or odds) of 1.00 represents no effect, greater than 1.00 represents a positive effect on the odds, and less than 1.00 represents a negative effect on the odds.

The first model (Model 1 in Table 13) is a simple discrete time hazard model. This model was fitted as a logistic regression with no intercept and only a set of age dummy variables. This model was used to estimate age 0-1 to age 5-6 and gave the shape of the baseline logit-hazard curve (Figure 1 above). This model was used as the baseline
model for the level one hazard models. It suggests that the baseline hazard curve for child maltreatment reports decreases with age, and in fact, the hazard is more than twice as high in the first year of life as it is between years 5 and 6. Specifically, parameter estimates for Model 1 show the estimation of the risk of a child experiencing a report of maltreatment for each year. In year one, the average log odds of being the subject of a maltreatment report was -2.905 (s.e. = 0.003, \( p < 0.0001 \)). This yields a hazard of 0.055. Thus for all children in their first year of life we estimated there was a 5.5% risk of being the subject of a maltreatment report. In the fifth year of life the average log odds of being the subject of a report was -3.806 (s.e. = 0.005, \( p < 0.001 \)). This yields a hazard of 0.022 or an estimated risk of 2.2% of being the subject of a child maltreatment report.

The impact of race on child maltreatment is of primary interest in this study. Therefore, the next step before taking other variables into account, I add just the race variables into the model (See Model 2a in Table 13). Here we see that, as the literature suggests, being Black or Hispanic greatly increases the hazard to being the subject of a child maltreatment report. For children born to Black mothers, the average log odds of being the subject of a report is 1.180 (s.e. = 0.063, \( p =0.000 \)). This yields a hazard of 3.255 or an estimated risk more than 325% higher than that of children born to White mothers. Hispanic children, compared to White children, are also at increased risk, with a hazard rate of 1.960.

The next step, before taking neighborhood into account, was to add in the individual level variables. Here I add child sex, race, mother’s age, mother’s marital status, maternal education, maternal alcohol and tobacco use during pregnancy, child birth weight and whether the child received Temporary Assistance for Needy Families and
Medicaid or just Medicaid in the first six months of life. This model estimates the effect of each variable (controlling for each of the other variables) on the log odds of having a report of maltreatment without taking into account neighborhood residence. Results are presented in Table 13, Model 2b. All variables are significant at least at the $p < 0.05$ level. In fact, except for the effect of child sex on maltreatment, which is significant at the $p = 0.038$ level, all other variables are significant at the $p < 0.001$ level. Here we see that being male, Black, having a mother who used alcohol or tobacco during pregnancy, being born weighing less than 2500 grams, and receiving TANF and/or Medicaid all increased the likelihood of experiencing a report of child maltreatment. While being born to a Hispanic mother, an older mother, a mother who is married at the time of the child birth, and a mother who is a high school graduate protects children from the likelihood of being the subject of a child maltreatment report. Looking at the hazard ratios, we see that compared to White children, Black children had a hazard 1.25 times greater of being the subject of a maltreatment report and the hazard for Hispanic children was 0.84 (or 16% lower). For each additional year older the mother was at the time of the birth of the child, the child’s hazard of being a victim of a maltreatment report dropped by 1.2%. Children born to married mothers and mothers who were high school graduates were more than 40% and 45% respectively less likely to experience a report. If the mother drank alcohol during pregnancy, the likelihood of her child being the subject of a report increased by almost 70%, while using tobacco almost doubled the chances of the child being the subject of a report. Being born low birth weight increased a child’s hazard of being the subject of a child maltreatment report by 24%. Being poor, as indicated by receipt of TANF and/or Medicaid, greatly increased the risk of child
maltreatment reports. Those children who received both TANF and Medicaid in the first six months of life were almost 4 times as likely (OR = 3.966) and those who received Medicaid only were 2.8 times as likely to be the subject of a maltreatment report.

Furthermore we see by comparing the age specific hazard rates in Model 1 and 2b that the hazard curve in Model 2b is less steep, meaning that some of the difference in the age specific hazard of experiencing a report of child abuse or neglect is explained by the individual and household predictors. Additionally, of specific interest, we see that when controlling for other individual and household variables, the effect of race changes compared to Model 2a and to the baseline hazard curves we saw above. In Model 2a, before taking into account the other individual level variables, we saw that Hispanic children (as compared to White children) had a higher hazard of a child maltreatment report at a given age (OR = 1.96). Here we see, when controlling for other individual and household factors, that that hazard of a child maltreatment report is lower for Hispanic children (OR = 0.843) meaning that they are almost 16% less likely to experience a report of abuse and neglect at any given age. Additionally, the magnitude of the relationship between having a Black mother and being the subject of a report of child maltreatment is greatly reduced. Before taking other individual and family level risk factors into account, children born to Black mothers are 3.25 times more likely than those born to White mothers to be the subject of a maltreatment report. After taking other individual and household factors into account, this increased risk shrinks to 1.25 times. This suggests that part of the reason African American children have a higher hazard of child maltreatment reports is that they are more likely to have other individual and household level risk factors.
Table 13: Maltreatment Reports - Models 1-3

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 (unconditional model with only age dummy variables)</th>
<th>Model 2a (unconditional model with only race variables)</th>
<th>Model 2b (unconditional model with level 1 predictors)</th>
<th>Model 3a (Conditional Baseline)</th>
<th>Model 3b (level 1 &amp; 2 predictors)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef</td>
<td>SE</td>
<td>p val</td>
<td>OR</td>
<td>Coef</td>
</tr>
<tr>
<td><strong>Individual Level Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 0-1</td>
<td>-2.905</td>
<td>0.052</td>
<td>0.000</td>
<td>0.055</td>
<td>-3.471</td>
</tr>
<tr>
<td>Age 1-2</td>
<td>-3.301</td>
<td>0.052</td>
<td>0.000</td>
<td>0.037</td>
<td>-3.853</td>
</tr>
<tr>
<td>Age 2-3</td>
<td>-3.380</td>
<td>0.051</td>
<td>0.000</td>
<td>0.034</td>
<td>-3.920</td>
</tr>
<tr>
<td>Age 3-4</td>
<td>-3.500</td>
<td>0.050</td>
<td>0.000</td>
<td>0.030</td>
<td>-4.029</td>
</tr>
<tr>
<td>Age 4-5</td>
<td>-3.652</td>
<td>0.049</td>
<td>0.000</td>
<td>0.026</td>
<td>-4.173</td>
</tr>
<tr>
<td>Age 5-6</td>
<td>-3.806</td>
<td>0.051</td>
<td>0.000</td>
<td>0.022</td>
<td>-4.320</td>
</tr>
<tr>
<td>Black</td>
<td>0.041</td>
<td>0.020</td>
<td>0.038</td>
<td>1.042</td>
<td>0.045</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1.180</td>
<td>0.063</td>
<td>0.000</td>
<td>3.255</td>
<td>0.224</td>
</tr>
<tr>
<td>Mother's Age</td>
<td>-0.012</td>
<td>0.003</td>
<td>0.000</td>
<td>0.988</td>
<td>-0.010</td>
</tr>
<tr>
<td>Mother Married</td>
<td>-0.554</td>
<td>0.039</td>
<td>0.000</td>
<td>0.586</td>
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</tr>
<tr>
<td>Mother HS Grad</td>
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<td>0.023</td>
<td>0.000</td>
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<tr>
<td>Alcohol</td>
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<td>0.066</td>
<td>0.000</td>
<td>1.887</td>
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</tr>
<tr>
<td>Tobacco</td>
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<td>0.027</td>
<td>0.000</td>
<td>1.993</td>
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<tr>
<td>LBW</td>
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<tr>
<td>TANF + Medicaid</td>
<td>1.378</td>
<td>0.045</td>
<td>0.000</td>
<td>3.967</td>
<td>1.223</td>
</tr>
<tr>
<td>Medicaid</td>
<td>1.045</td>
<td>0.024</td>
<td>0.000</td>
<td>2.843</td>
<td>0.932</td>
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</table>

**Neighborhood Level Variables**

<table>
<thead>
<tr>
<th></th>
<th>Model 3a (Conditional Baseline)</th>
<th>Model 3b (level 1 &amp; 2 predictors)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>p-value</td>
<td>vC</td>
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<tr>
<td>Impoverishment</td>
<td>0.231</td>
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<tr>
<td>Instability</td>
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<td>Childcare Burden</td>
<td>0.000</td>
<td>0.023</td>
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<table>
<thead>
<tr>
<th>Random Effects</th>
<th>Model 3a (Conditional Baseline)</th>
<th>Model 3b (level 1 &amp; 2 predictors)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neighborhood (R0)</td>
<td>0.599</td>
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<tr>
<td>-2LL</td>
<td>-480959.40</td>
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</table>
Two-Level Discrete Time Hazard Models

The next step in model building is to understand the extent to which the parameter estimates change when we take into account the child’s neighborhood of residence and add in the neighborhood level predictors. Model 3a (shown in Table 13) includes no neighborhood level predictors and only a single random effect on the intercept. The random effect on the intercept is the only thing that distinguishes it from Model 2. It provides a baseline comparison against which all other two-level models can be compared. I then add the neighborhood predictors Impoverishment, Instability and Childcare Burden to the model (Model 3b in Table 13). Both Impoverishment and Instability are significant and positively associated with child maltreatment reports. Each one standard deviation unit increase in Impoverishment results in a 26% increase in the hazard of being the subject of a child maltreatment report, while each one standard deviation unit increase in Instability increases the hazard of a report by 16.5% across ages. Childcare Burden was not significant (and was therefore removed from all subsequent models). Additionally, by comparing Models 3a and Model 3b with the addition of the neighborhood predictors, we see that including neighborhood Impoverishment and Instability in the model further diminish the effect of race on the risk of a child maltreatment report. Specifically, the log odds of a report for Black children drop from 0.234 to 0.084 (decreasing the risk, as compared to White children, from more than 26% to less than 9% at any given age) when we take into account Impoverishment and Instability. This suggests that part of the risk for Black children is due to the fact that they are more likely to be concentrated in impoverished and instable neighborhoods. Additionally, there appears to be protective factors in the Hispanic
community that buffer the negative effects of neighborhood disadvantage. Before taking neighborhood into account, Hispanic children were 16% less likely to be the subject of a maltreatment report, after controlling for neighborhood impoverishment and instability, they are 31% less likely to be the subject of a report compared to White children. This relationship between family race and neighborhood conditions will be further explored in the final model.

Testing the Proportional Odds Assumptions

Models 4 and 5 (see Table 14) show the result of the test of the level one and two proportional odds assumptions. In each case, in order to achieve a more parsimonious model, the age dummy variables remained in the model to define the shape of the baseline hazard curve and two continuous age variables (age and age squared) were added to test the proportionality assumptions. To do this, I explore the level one and level two predictors’ interaction with time. When a predictor interacts with time, this indicates that its impact on the outcome is different in different time periods. To this point, Models 1, 2 and 3 do not allow the predictors’ effects to vary with time. These are proportional-odds models where the effect of the predictors on the logit hazard is the same in every time period considered. Willett, et al. (1998) argue that many predictors do not have the same effect in each time period, and therefore should be tested by creating cross products with each predictor and time. If the effect of any predictor varies over time this indicates that the proportional odds assumption has not been met and a non-proportional model that allows the shapes of the logit hazard to differ over time periods must be specified (Willett, et al., 1998). This is accomplished by keeping any significant predictors/time interactions in the model.
<table>
<thead>
<tr>
<th>Individual Level Variables</th>
<th>Model 4a (Level One)</th>
<th>Model 4b (Model 4a - Trimmed)</th>
<th>Model 5 (Level Two)</th>
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<tr>
<td></td>
<td>Coef</td>
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<td>Age 1-2</td>
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<td>Age 3-4</td>
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<td>Age 4-5</td>
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<td>Age 5-6</td>
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<td>0.046</td>
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<td>Tobacco</td>
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<tr>
<td>Medicaid</td>
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<th>Individual Interactions with Age</th>
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<td>ageXblack</td>
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<tr>
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<td>ageXHispanic</td>
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<td>age2Xmarried</td>
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<tr>
<td>ageXhs grad</td>
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<tr>
<td>age2Xhs grad</td>
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<td>ageXalcohol</td>
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<tr>
<td>ageXtobacco</td>
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<td>ageXbw</td>
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<td>ageXTANF+Med</td>
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<table>
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<tr>
<th>Neighborhood Level Variables</th>
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<tr>
<td>Impoverishment</td>
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<tr>
<td>Instability</td>
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<table>
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<th>Neighborhood Interaction with Age</th>
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<td>age2XImpov</td>
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<td>ageXInstab</td>
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<tr>
<td>Neighborhood (R0)</td>
</tr>
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<td>-2LL</td>
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</tbody>
</table>

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Model 4a tests the level one proportional odds assumption by including interaction terms for each of the individual and household predictors’ and time. The effects of six individual and household level predictors on reports of child maltreatment were found to vary by the age of the child. The interaction between mother’s age, mother’s marital status, mother’s use of alcohol during pregnancy, child’s birth weight, and receipt of TANF and age squared are all significant at at least the $p = 0.05$ level. The interaction between mother’s use of tobacco during pregnancy and child age is significant at almost the $p = 0.10$ level. The interactions between mother’s age, marital status and receipt of TANF with continuous age are also significant. These results indicate we must reject the level one proportional odds assumption. For each of these predictors their effect on the likelihood of being a subject of a maltreatment report is stronger for younger children. In order to interpret these interactions, Figures 5, 6, 7, 8, 9 and 10 display the estimated hazard curves showing the effects of each of these variables while holding all the other predictors at their mean.

As you can see in Figure 5, being born to a younger mother (one standard deviation below the mean age, or about 21 years old) increases the risk of being the subject of a child maltreatment report. This risk appears to be somewhat more pronounced at the youngest ages, but is consistently significantly higher through early childhood. Figure 6 shows that with all other predictors at their mean, children of unmarried mothers are about twice as likely to be the subject of a child maltreatment report.

---

6 To avoid problems with small cell sizes and multicollinearity, each interaction with child age was also entered separately into the model. The results of separate models were very similar to the models shown here, and are therefore not shown.

7 The interaction between mother’s use of tobacco during pregnancy and age squared was significant at the $p = 0.008$ level when it was entered into the model alone and was therefore included in the final model.
report in the first year of life compared to children of married mothers. Children of unmarried mothers remain at higher risk for being the subject of a child maltreatment report throughout the first six years of their life, however the curves are closer to being parallel from age three to age six. Figures 7 and 9 show the risk of being the subject of a maltreatment report for children born to mothers who consumed alcohol during pregnancy and those who are born weighing less than 2500 grams. The hazard curves in these two cases look very similar. In both cases, the risk is considerably higher in the first year of life, but then is almost equal to that of children born to mothers who did not consume alcohol and were born weighing 2500 grams or more from age 3 onward. Figure 8 shows the risk of being the subject of a maltreatment report for children born to mothers who consumed tobacco during pregnancy. You see here that the difference in risk level is highest among the youngest children, but the risk remains elevated throughout the early childhood for those children born to a mother who smoked during pregnancy compared to those who did not. In Figure 10, we see that the risk of being the subject of a child maltreatment report to those children who were on TANF is significantly higher throughout childhood, but is most pronounced in the first year of life when their risk is about four times higher than for children not on TANF.
Model 5 in Table 14 shows the interaction of the neighborhood level predictors and time. None of the interactions between the neighborhood level predictors and time are significant. Model 5 indicates that we should not reject the level two proportional odds assumption.

*Testing the Proportional Errors Assumption*

Model 6 (not shown) tests the proportional errors assumption. To do this, I allow the coefficients of each of the age dummy variables to vary by neighborhood. This model, as noted above, because of large number of random effects in the model, presents substantial estimation problems. As a result, the model did not converge, most likely because of the low variance of the random effects and the correlation between them (Rearden, Brennan & Buka, 2002). Instead, I estimated a more parsimonious quadratic model using the two continuous age variables and omitting the six age dummy variables. This model still took 582 macro iterations before converging, but did produce estimates (not shown). The chi-square tests of the null hypotheses that the variances of the random effects on AGEC and AGESQ are zero (AGEC var = 0.008, se = 0.091, chi-square = 152.857, \( p > 0.500 \); AGESQ var = 0.001, se = 0.023, chi-square = 158.916, \( p > 0.500 \)) indicate no evidence of non-proportional errors. Thus, Model 6 indicates that we should not reject the level two proportional errors assumption. Therefore the age variables were fixed in all models.
The Quadratic Baseline Hazard Model

To achieve a more parsimonious model and to deal with very small cell sizes, I continue with the parametric specification of the baseline hazard as a quadratic function of time. While this is a much more parsimonious model, I must check to determine whether this simplifying assumption (that the baseline hazard is quadratic) is valid. I do this two ways, first by examining the hazard and cumulative failure curves. Figures 11 and 12 below show that the quadratic curves estimated with the continuous age variables (age and age squared) fit the shape of the curves estimated by the age dummy variables closely throughout the range of the data. The differences are rather minimal when we compare the cumulative failure curve. Until age five, the differences between the two models is less than 2%. Only at age six is the difference closer to 3%. In comparing the hazard curve, we see some more substantial differences. The continuous model gives a smoother shape to the curve and therefore produces slightly higher hazard estimates at older ages (thus minimizing the striking difference in the hazard of being the subject of the report between birth and age one compared to older ages).
Secondly, I examine the validity of the assumption that the curves are quadratic by comparing parameter estimates from model 4b and 7 to determine whether the quadratic model affects the estimates of individual and neighborhood level predictors. As you can see in Table 15, the agreement between the models is very strong.
### Table 15: Maltreatment Reports - Models 4b, 7 & 8

**Model 4b (Level One Proportional Odds - Trimmed)**

| Variable        | Coef  | SE   | P Val | OR   | Coef  | SE   | P Val | OR   | Coef  | SE   | P Val | OR   |
|-----------------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|------|
| INTRCPT2        | -3.812| 0.064| 0.000 | 0.022| -3.750| 0.065| 0.000 | 0.024|       |      |       |      |      |

**Individual Level Variables**

- **AGEC**
  - 0.082, 0.022, 0.006, 0.940
- **AGESQ**
  - 0.007, 0.005, 0.166, 1.007
- **Age 0-1**
  - -3.356, 0.069, 0.000, 0.035
- **Age 1-2**
  - -3.611, 0.068, 0.000, 0.027
- **Age 2-3**
  - -3.602, 0.071, 0.000, 0.027
- **Age 3-4**
  - -3.657, 0.070, 0.000, 0.026
- **Age 4-5**
  - -3.760, 0.069, 0.000, 0.023
- **Age 5-6**
  - -3.879, 0.067, 0.000, 0.021
- **Male**
  - 0.045, 0.020, 0.025, 1.046
- **Black**
  - 0.082, 0.037, 0.027, 1.096
- **Hispanic**
  - -0.376, 0.057, 0.000, 0.087
- **Mother's Age**
  - -0.016, 0.005, 0.001, 0.984
- **Mother Married**
  - -0.481, 0.086, 0.000, 0.618
- **Mother HS Grad**
  - -0.509, 0.024, 0.000, 0.590
- **Alcohol**
  - 0.204, 0.224, 0.364, 1.226
- **Tobacco**
  - 0.592, 0.064, 0.000, 1.808
- **LBW**
  - -0.037, 0.075, 0.627, 0.964
- **TANF + Medicaid**
  - 0.988, 0.061, 0.000, 2.685
- **Medicaid**
  - 0.902, 0.043, 0.000, 2.464

**Individual Interactions with Age**

- ageXmother age
  - 0.009, 0.003, 0.010, 1.009
- ageXmarried
  - -0.164, 0.052, 0.002, 0.848
- ageXalcohol
  - 0.179, 0.174, 0.302, 1.196
- ageXtalcohol
  - 0.086, 0.037, 0.021, 1.090
- ageXtobacco
  - 0.034, 0.048, 0.488, 1.034
- ageXtobacco
  - 0.086, 0.056, 0.241, 1.088
- ageXtobacco
  - 0.051, 0.012, 0.000, 1.052
- ageXtobacco
  - -0.133, 0.043, 0.002, 0.875
- ageXtobacco
  - -0.021, 0.010, 0.031, 0.980

**Neighborhood Level Variables**

- Impoverishment
  - 0.230, 0.021, 0.000, 1.259
- Instability
  - 0.153, 0.019, 0.000, 1.165

**Cross Level Interactions**

- BlackXimpov
  - -0.267, 0.039, 0.000, 0.768
- BlackXinstab
  - -0.111, 0.029, 0.000, 0.895
- HisXimpov
  - -0.239, 0.084, 0.005, 0.787
- HisXinstab
  - -0.201, 0.074, 0.007, 0.818

**Random Effects**

- **Reliabil vc p-value**
  - **Reliabil vc p-value**
  - **Reliabil vc p-value**
  - **Reliabil vc p-value**
  - **Reliabil vc p-value**
  - **Reliabil vc p-value**

- **Neighborhood (R0)**
  - 0.487, 0.065, 0.000
  - 0.486, 0.065, 0.000
  - 0.430, 0.050, 0.000

- **-2LL**
  - -481906.00
  - -482022.40
  - -482605.70
Finally, being confident the more parsimonious quadratic model fits the data well, I include cross-level interactions in the final model (Model 8) to explore research objective 4: To understand if the influence of neighborhood disadvantage on the probability of having a reported or substantiated incident of maltreatment is moderated by the race of the child. To do this individual race was interacted with neighborhood Impoverishment and Instability. All four of the interaction terms are negative and significant, indicating that for Black children, the negative effect of living in impoverished and instable neighborhoods is less than it is for white children. Neighborhood Impoverishment and Instability both have a stronger influence on whether White children are the subject of a child maltreatment report than for other racial/ethnic groups. In fact, White children living in very impoverished or instable neighborhood have higher hazard of being the subject of a report compared to Black and Hispanic children. However, in neighborhoods with low and moderate levels of impoverishment and instability, their hazard of being the subject of maltreatment report is lower than that of Black and Hispanic children. These finding are similar to a number of recent studies (Drake, et al., 2008) which have found that in very poor neighborhoods, White children may be more likely to be reported than Blacks. Yet, in less poor areas, the opposite may be true. These findings may also support those of Korbin, et al. (1998) that neighborhood disadvantage has a weaker effect on African American children, and suggest that African American communities may have protective factors for families living in impoverished neighborhoods. The findings in the present study also indicate that moderating factors may be present in Hispanic communities as well. Figures 13 and 14 graphically depict these relationships.
Reports of Child Neglect

The next step in the analysis was to examine the other two outcomes of interest to determine if the impact of the individual/household and neighborhood factors of interest varied in effect direction or magnitude. I begin with reports of child neglect. Before turning to the models, I examine the observed patterns of reports of child neglect in the data. Figures 15 and 16 show the hazard and cumulative failure curves observed in the data. Here we see that, again the proportion of children who are the subject of a child neglect report drops with age. Approximately 3.9% of children were the subject of a child neglect report in their first year of life. 2.5% of children who were not the subject of a child neglect report their first year of life were the subject of a report between ages one and two. 2.1% of children who were not the subject of a report in earlier years were the subject of child neglect report between ages two and three. 1.7% of those at risk were the subject of a child neglect report between ages three and four and 1.4% were the subject of a report between ages four and five. The hazard rate between ages five and six
was 1.2%. The cumulative failure curve (Figure 16), shows the cumulative proportion of children who were the subject of a child neglect report by age six was almost 13%.

![Figure 15: Observed Hazard Curve for Reports of Child Neglect](image1)

![Figure 16: Observed Cumulative Failure Curve for Reports of Child Neglect](image2)

Examination of the hazard and cumulative failure curves by race yields similar results as we saw with all child maltreatment reports. Figure 17 and 18 below show that both Black and Hispanic children have a higher hazard of child neglect reports at all ages, especially during the first year of life, and it appears that the impact of race on child neglect reports varies by the age of the child. In the first year of life, almost 8% of Black children are the victim of a child neglect report, compared to 2.1% of White children and 2.8% of Hispanic children. Additionally, the curves are much less steep for White and Hispanic children, while for Black children the difference in hazard in the first year of life (7.8%) to the fifth year of life (2.2%) is more than threefold. The cumulative failure curve shows that the cumulative hazard of being a victim of a child neglect report before age six is almost 25% for Black children. This is more than three times as high as it is for White children, whose cumulative hazard by age six is under 7.2%. The hazard over the first six years of life for Hispanic children is just under 12%. However, again, without
controlling for other variables, it is unclear whether these differences may be accounted for by other individual and/or neighborhood level factors that co-vary with race.

**Child Neglect Models**

Each model is estimated using the neglect person-period data which includes 365,903 record or person-years. The first model (Model 1 in Table 16) is a simple discrete time hazard model with only the set of age dummy variables. It provides shape of the baseline logit-hazard curve (Figure 15 above) for child neglect reports. Specifically, parameter estimates for Model 1 show the estimation of the risk of a child experiencing a child neglect report for each year. In year one, the average log-odds of being the subject of a maltreatment report was \(-3.233\) (s.e. = 0.054, \(p = 0.000\)). This yields a hazard of 0.039. Thus for all children in their first year of life we estimated there was a 3.9% risk of being the subject of a neglect report. The risk diminished in each year. In the fifth year of life the average log odds of being the subject of a neglect report was \(-4.445\) (s.e. = 0.058, \(p = 0.000\)). This yields a hazard of 0.012 or an estimated risk of 1.2% of being the subject of a child neglect report.
In Model 2a, I add in just the race variables in order to estimate the multiplicative effect on the odds of having a report of child neglect by race. Here we see that, like with the child maltreatment report outcome, being Black or Hispanic greatly increases the hazard of being the subject of a child neglect report. For children born to Black mothers, compared to those born to White mothers, the average log odds of being the subject of a neglect report is 1.235 (se = 0.070, \( p = 0.000 \)). This yields a hazard of 3.44 (slightly higher than the increased hazard for all reports which was 3.25). Hispanic children, compared to White children, are also at increased risk, with a hazard rate of 1.63 (which is slightly lower than for all types of reports).

In Model 2b, I add child sex, race, mother’s age, mother’s marital status, material education, maternal alcohol and tobacco use during pregnancy, child birth weight and whether the child received Temporary Assistance for Needy Families and Medicaid or just Medicaid in the first six months of life. Results are presented in Table 16, Model 2b. All variables are significant at least at the \( p < 0.05 \) level. As we saw with all reports of child maltreatment, we see again that controlling for other individual and household variables, that being male, Black, having a mother who used alcohol or tobacco during pregnancy, being born weighing less than 2500 grams, and receiving TANF and/or Medicaid all increased the likelihood of experiencing a report of child neglect. While being born to a Hispanic mother, an older mother, a mother who was a high school graduate and who was married at the time of the birth decreased the likelihood of a child neglect report. Looking at the hazard ratios, we see that compared to White children, Black children had a hazard 1.31 times greater of being the subject of a child neglect report and the hazard for Hispanic children was 0.70 (or 30% lower). The impact of race
on child neglect is more pronounced than we saw with all child maltreatment reports where being born to a Black mother increased the hazard rate by 25% and being born to a Hispanic mother decreased the hazard rate by 16%. However mother’s age had a slightly less strong effect. For each additional year older the mother was at the time of the birth of the child, the child’s hazard of being a victim of a child neglect report dropped by less than 1% (0.7%) compared to a 1.2% drop when looking at all child maltreatment reports. Very similar to those with any child maltreatment report, children born to married mothers and mothers who were high school graduates were more than 45% and 47% respectively less likely to experience a child neglect report. If the mother drank alcohol during pregnancy, the likelihood of her child being the subject of a report of child neglect increased by almost 60%, while using tobacco almost doubled the chances of the child being the subject of a report of neglect. Being poor, as indicated by receipt of TANF and/or Medicaid, greatly increased the risk of child neglect reports. Those children who received both TANF and Medicaid in the first six months of life were almost 4.1 times as likely (OR =4.128) and those who received Medicaid, and not TANF, were 2.9 times as likely to be the subject of a child neglect report. Consistent with the literature (Drake & Pandey, 1996; Sedlack & Broadhurst, 1996), these data indicate that compared to its effect on any type of child maltreatment report, poverty status had a somewhat stronger effect on reports of child neglect.

Like we saw with all child maltreatment reports, we see here that when controlling for other individual and household variables, the effect of race changes compared to Model 2a and the baseline hazard curves we saw above. In Model 2a, we saw that Hispanic children (as compared to White children) had a higher hazard of a child
neglect report at a given age. Here we see, when controlling for other individual and household factors, that that hazard of a child neglect report is lower for Hispanic children. Additionally the hazard of a child neglect report for those children born to a Black mother is 31% greater than that of children born to White mothers when taking into account other individual and household level factors compared to 3.5 times greater if we do not account for these factors.

Models 3a and 3b take neighborhood into account. Model 3a includes no neighborhood level predictors and only a single random effect on the intercept and provides a baseline comparison. Model 3b includes the three neighborhood predictors Impoverishment, Instability and Childcare Burden in the Model. Again, both Impoverishment and Instability are significant and positively associated with child neglect reports. The coefficients are very similar to what we previously saw with all child maltreatment reports. Each standard deviation unit increase in Impoverishment results in a 32% increase in the hazard of being the subject of a child neglect report, while each standard deviation unit increase in Instability increases the hazard of a neglect report by 17% across ages. Childcare Burden was not significant. The effect of Impoverishment on child neglect was stronger than with any type of child maltreatment report (where it increased the hazard by 25%). These finding support past studies that have found structural characteristics of neighborhoods to be more strongly associated with child neglect than with other types of maltreatment (Freisthler, et al., 2004; Kim, 2004; Zuravin, 1996; Zuarvin, 1999). Additionally, by comparing Model 3a and Model 3b with the addition of the neighborhood predictors, we see that including neighborhood Impoverishment and Instability in the model change the effect of race on the risk of a
child neglect report. Specifically, the log odds of a report for Black children drops from 0.265 to 0.068 (decreasing the risk, as compared to White children, from more than 30% to 7% at any given age) when we take into account Impoverishment and Instability. Additionally, the effect of being born to a Black mother is no longer significant. This suggests that part of the risk of child neglect reports for Black children is due to the fact that they are more likely to be concentrated in impoverished and instable neighborhoods.
### Table 16: Reports of Child Neglect - Models 1-3

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 - (unconditional model with only age dummy variables)</th>
<th>Model 2a - (unconditional model with race predictors)</th>
<th>Model 2b - (unconditional model with level 1 predictors)</th>
<th>Model 3 (Conditional Baseline)</th>
<th>Model 3 (level 1 &amp; 2 predictors)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef</td>
<td>SE</td>
<td>P Val</td>
<td>OR</td>
<td>Coef</td>
</tr>
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<td>Individual Level Variables</td>
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<td></td>
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<td>Age 0-1</td>
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<td>Age 2-3</td>
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<td>-4.624</td>
</tr>
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<tr>
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<td>Childcare Burden</td>
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<td>0.039</td>
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<td>0.986</td>
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Random Effects:  
-2LL: -492026.20  
-2LL: -492795.40
Substantiated & Indicated Child Maltreatment Events

The final outcome to be examined is substantiated and indicated child maltreatment events. Before beginning to build models, I examine the observed pattern of substantiated and indicated child maltreatment events in the data. Figures 19 and 20 show the hazard and cumulative failure curves observed in the data. Here we see that, like with all types of reports of maltreatment and with reports of child neglect, the proportion of children who are the subject of a substantiated/indicated report drops with age. Approximately 3.8% of children are the subject of a substantiated/indicated maltreatment report in their first year of life. 2.1% of those who were not the subject of a substantiated/indicated report in their first year of life were the subject of a report between ages 1 and 2. The hazard rate between ages 5 and 6 was .005 (less than half a percent). The cumulative failure curve (Figure 20), shows the cumulative proportion of children who were the subject of a substantiated or indicated report by age six was 10%.

Here again, I looked at the hazard and cumulative failure curves by race. Figure 21 and 22 below show that Black children have a higher hazard of substantiated/indicated child maltreatment reports at all ages, especially during the first year of life.
Like with all reports, it appears that the impact of race on substantiated/ indicated child maltreatment reports varies by the age of the child. The cumulative failure curve shows that the cumulative hazard of being a victim of substantiated or indicated child maltreatment report before age six is almost 20% for Black children. This is more than four times as high as it is for White children, whose cumulative hazard by age six is under 5.4%. The hazard over the first six years of life for Hispanic children is 9%. However, again, without controlling for other variables, it is unclear whether these differences may be accounted for by other individual and/or neighborhood level factors that co-vary with race.

**Substantiated and Indicated Maltreatment Report Models**

Each model is estimated using the substantiated and indicated person-period data which includes 369,210 record or person-years. The first model (Model 1 in Table 17) is a simple discrete-time hazard model with only the set of age dummy variables. In year one, the average log odds of being the subject of a substantiated or indicated maltreatment report was −3.265 (s.e. = 0.003, \( p = 0.000 \)). This yields a hazard of 0.038
(almost equal to that age 0 to 1 hazard for a report of child neglect). We see again that
the risk diminished in each year. In the fifth year of life the average log odds of being the
subject of a substantiated or indicated maltreatment report was \(-5.250\) (s.e. = 0.07, \(p =
0.000\)). This yields a hazard of 0.005 or an estimated risk of 0.5 % of being the subject of
a substantiated or indicated child maltreatment report.

In Model 2a, with just the race variables shows that, like with the other two
outcomes, being Black or Hispanic greatly increases the hazard of being the subject of a
substantiated or indicated child maltreatment report. For children born to Black mothers,
compared to those born to White mothers, the average log odds of being the subject of a
substantiated/ indicated report is \(1.270\) (se = 0.072, \(p =0.000\)). This yields a hazard of
3.56 (higher than the increased hazard for all reports which was 3.25, and for reports of
child neglect which was 3.44 ). Hispanic children, compared to White children, are also
at increased risk, with a hazard rate of 1.65 (which is slightly lower than for all types of
reports and approximately equal to that for the child neglect).

In Model 2b, the individual level predictors were added. Results are very similar
to the last two outcomes, except here neither the sex of the child or age of the mother are
significant. All other variables are significant at least at the \(p < 0.05\) level. As we saw
with all reports of child maltreatment, we see again that being male, Black, having a
mother who used alcohol or tobacco during pregnancy, being born weighing less than
2500 grams, and receiving TANF and/or Medicaid all increased the likelihood of
experiencing a substantiated/ indicated report of child maltreatment. The pattern of
effects looks very similar to the last two outcomes. However again, compared to White
children, Black children had a hazard 1.35 times greater of being the subject of a
substantiated or indicated report of maltreatment. This is about 5% higher than the effect of being born to a Black mother had on the likelihood of being the subject of a report of child neglect and about 10% higher than its effect on being the subject of any child maltreatment report. Here we see, when controlling for other individual and household factors, that that hazard of a substantiated or indicated child maltreatment report is lower for Hispanic children. Additionally, while the impact of tobacco use during pregnancy appears to be consistent across outcomes, the impact of being born to a mother who drank alcohol during pregnancy varied. Maternal alcohol use during pregnancy increases the hazard of being the subject of any report of child maltreatment by 69%, of being the subject of a child neglect report by 59% and of being the subject of a substantiated or indicated report of child maltreatment by over 100% (it more than doubled the chance of being the subject of a indicated or substantiated maltreatment report). This finding is consistent with Sun and colleagues (2001) who found that maternal alcohol abuse increased the rate of substantiation.

Being poor, as indicated by receipt of TANF and/or Medicaid, also greatly increased the risk of a substantiated/ indicated child maltreatment report, more so than with the two previous outcomes. Those children who received both TANF and Medicaid in the first six months of life were almost 4.5 times as likely (OR =4.507) and those who received Medicaid, and not TANF, were 3.1 times as likely to be the subject of a substantiated/ indicated maltreatment report.
### Table 17: Indicated and Substantiated Child Maltreatment Reports - Models 1-3

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 - (unconditional model with only age dummy variables)</th>
<th>Model 2a - (unconditional model with race predictors)</th>
<th>Model 2b - (unconditional model with level 1 predictors)</th>
<th>Model 3a (Conditional Baseline)</th>
<th>Model 3b (level 1 &amp; 2 predictors)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Coef</td>
<td>SE</td>
<td>P Val</td>
<td>OR</td>
<td>Coef</td>
</tr>
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<td><strong>Individual Level Variables</strong></td>
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<td>Age 0-1</td>
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<td>0.003</td>
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<td>0.003</td>
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<td>1.003</td>
</tr>
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<td>Mother HS Grad</td>
<td>1.000</td>
<td>0.003</td>
<td>0.003</td>
<td>0.407</td>
<td>1.003</td>
</tr>
<tr>
<td>Alcohol</td>
<td>1.000</td>
<td>0.003</td>
<td>0.003</td>
<td>0.407</td>
<td>1.003</td>
</tr>
<tr>
<td>Tobacco</td>
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<td>0.003</td>
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<td>0.407</td>
<td>1.003</td>
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<td>LBW</td>
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<td>0.407</td>
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<td>TANF + Medicaid</td>
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</tr>
</tbody>
</table>

**Note:** Coef = Coefficient, SE = Standard Error, OR = Odds Ratio, P Val = P Value.
Model 3b adds the three neighborhood predictors Impoverishment, Instability and Childcare Burden to the model. Again, both Impoverishment and Instability are significant and positively associated with substantiated and indicated child maltreatment reports. The coefficients are very similar to what we previously saw with all child maltreatment reports and with reports of neglect. Each standard deviation unit increase in Impoverishment results in a 27% increase in the hazard of being the subject of a substantiated or indicated child maltreatment report, while each standard deviation unit increase in Instability increases the hazard of a report by 14% across ages. Childcare Burden was not significant. Additionally, by comparing Model 3a and Model 3b with the addition of the neighborhood predictors, we see that including neighborhood Impoverishment and Instability in the model changes the effect of race on the risk of a substantiated or indicated child maltreatment report, and the effect of being born to a Black mother is no longer significant.

In summary, both the individual/household and neighborhood predictors exert a similar pattern of effects on the three outcomes. However, some differences in the magnitude of effects are seen when comparing the three outcomes. Of interest, the effect of mother’s race is an important predictor of all three outcomes, but it is most strong on substantiated and indicated child maltreatment events and least strong on any type of report. The same is true for the impact of poverty. However the impact of neighborhood impoverishment exerts the greatest impact on child neglect (OR=1.32), while its impact on the other two outcomes is about equal (OR=1.26 for all reports, and OR=1.27 for indicated and substantiated events). Instability exerts a similar effect on all three outcomes. Finally, in comparing the hazard curves of the three outcomes (see Figure 23),
you can see that reports of any type of maltreatment and of child neglect are roughly parallel. However the curve is steeper for indicated and substantiated child maltreatment incidents, indicating that the over representation of very young children is most pronounced among indicated and substantiated incidents of child abuse and neglect.

![Figure 23: Observed Baseline Hazard Curves by Outcome](image)

**Examination of Families Who Changed Neighborhood**

Because of the limits of the data, this study examined neighborhood residence at a single point in time. Results presented in this chapter reflect the relationship between neighborhood factors at the time of birth and child maltreatment for children through age five. However, there may be considerable mobility among families which could bias the result of contextual effects, especially for more distal outcomes. While some scholars posit that it is likely that the impact of neighborhood residence varies across child development (Leventhal & Brooks-Gunn, 2003), most are unable to assess this because they do not have neighborhood measures at multiple points in time. Therefore, most either do not consider this, or argue that neighborhood factors change only minimally or that subjects move among similar neighborhoods (Leventhal & Brooks-Gunn, 2003;
Reardon, et al, 2002). The dataset used in this study allows me to examine that assumption for this sample of children. For those with a child maltreatment event in the sample, neighborhood data are available at the time of the incident making it possible to determine 1) among those with a maltreatment event, what percentage live in a different neighborhood than the neighborhood at birth, and, 2) for those who do live in a different neighborhood, to what extent neighborhood characteristics differ.

A large percentage of children who had a child maltreatment report by the age of six moved at some point between their birth and the time of the event. Of the 11,832 children with an event, 11,547 (97.6%) had address information at the time of the report. 285 (2.4%) had missing address information and are therefore not considered. Of the 11,537 for whom address information is available, 6571 (56.9%) moved at some point between their birth and the time of the report. Of these, 171 children were in tracts that were missing on all neighborhood measures and were therefore excluded from analysis. A total of 6404 had address information available to compare. In order to assess the extent to which the neighborhood these children lived in at birth and the neighborhood where they lived at the time of the child maltreatment report differ, I compare the neighborhoods on the key neighborhood variables of interest (Impoverishment, Instability and Childcare Burden as well as on the predictors that the factors are comprised of). These results are presented in Table 18. Here we see that on average, birth neighborhood and neighborhoods at the time of the event look similar. Some slight differences are of note. For example, the mean Impoverishment score was 0.54 in birth neighborhoods, compared to a slightly lower score of 0.47 in neighborhoods children lived in at the time of the event. This lower score appears to be driven by differences in neighborhood
composition of African American residents and families headed by females. The average percentage of African American residents in birth neighborhoods is 52.8%, while it is 48.4% in neighborhoods children lived in at the time of the event. We see a similar reduction in the percentage of female headed households from 49.1% in birth neighborhood compared to 47.7% in neighborhoods children lived in at the time of the event. The mean Instability score increased very slightly driven by a very slight increase in population loss between 1995 and 2000, and a very slight decrease in the average percentage of persons over age 65.

Additionally, in order to assess the changes between the neighborhood at birth and the neighborhood at the time of the maltreatment event, I examined average amount of change between the Impoverishment, Instability and Childcare Burden scores at birth and at the time of event. The average change in neighborhood Impoverishment was 0.08,
but the scores changed by as much as a 4.45 decrease to a 4.19 point increase in Impoverishment. A similar pattern was seen in the instability scores, with an average change of -0.06, but a range of -4.97 to 4.97. For Childcare Burden, the average change was -0.02, and the range was -18.73 to 18.73. We can get a sense for what proportion of children experienced a large change in neighborhood conditions between the time of their birth and the time of the report by examining what percentage experienced at least a one standard deviation change on factor scores. 10.3% of children moved to neighborhoods that were more than one standard deviation more impoverished than their neighborhood at birth and 13.8% moved to a neighborhood that was more than one standard deviation less impoverished. Thus, while the mean difference in neighborhood Impoverishment is not large, more than 24% of children were living in a neighborhood at the time the maltreatment report occurred that was at least one standard deviation more or less impoverished than the neighborhood they were born in. A similar result was found when looking at Instability. 13.7% of children moved to neighborhoods that were more than one standard deviation more instable than their neighborhood at birth, and 15.4% moved to a neighborhood that was more than one standard deviation less instable. Indicating that at the time the maltreatment report occurred, more than 29% of families were living in a neighborhood quite different from the neighborhood the child was born in. For Childcare Burden, while the range was the largest, fewer children were on the extremes. In fact, over 95% of children remained in neighborhoods with Childcare Burden scores within one standard deviation of those in their birth neighborhood.

These results indicate the association between neighborhood factors and reports of child maltreatment may be underestimated, especially for children who experience their
first child maltreatment event at older ages. Furthermore, the assumption that many researchers make, that despite considerable mobility, poor families move between similar neighborhoods, may be called into question. These data show, that while the mean levels of neighborhood disadvantage are similar between birth neighborhoods and neighborhoods children are living in at the time they are subject to a maltreatment report, the proportion of children who experience a change in neighborhood conditions in either direction, is quite significant.

Review of Research Questions and Hypotheses

Objective One – Child Age

The first research objective was to examine the hazard of child maltreatment by age for children up to age six in Cuyahoga County, Ohio, and answer the questions as to whether the risk of child maltreatment varies by the age of the child. I hypothesized that the hazard of child maltreatment would be greater among younger children. Results indicated that this hypothesis is supported for each of the three outcomes. Before controlling for any individual or neighborhood level factors the observed proportion of children who are the subject of a report (or substantiated/indicated incident) of child maltreatment (or neglect alone) declines as children get older. Furthermore, the curve is steepest for indicated and substantiated child maltreatment incidents, indicating that the over representation of very young children is most pronounced among indicated and substantiated incidents of child abuse and neglect.
Objective Two – Racial Disproportionality

The second research objective was to examine the impact of race on the hazard of child maltreatment. The first research question asked whether African American children are disproportionally represented in these data. I hypothesized that they would be. Before controlling for any individual or neighborhood level factors, Black children accounted for 33.2% of the sample, yet made up 56.8% of the child maltreatment reports, 59.7% of the reports of neglect and 61.0% of the substantiated or indicated report of maltreatment. The data showed that being born to an African American mother increases the hazard of being the subject of a child maltreatment report by 3.25 times, of a report of neglect by 3.44 times and of a substantiated or indicated maltreatment allegation by 3.56 times. However, once poverty and other factors are taken into consideration, the increased risk of being the subject of a child maltreatment report for Black children drops by more than half (to 1.3 times greater) than that of White children. It drops even further, (to 1.09 times more likely) after neighborhood disadvantage factors are taken into account. Similar reductions in the risk of a report of child neglect and of a substantiated or indicated maltreatment event were seen when controlling for individual and neighborhood factors.

The second research question asked if the effect of race on the risk of child maltreatment varies by child age. This study supported hypothesis H2b, that race will have a stronger effect on the odds of child maltreatment among younger children. Before taking factors into account the impact of race varied by the age of the child. The biggest difference between the curves is among children between birth and age one. For example, the effect of being born to an African American mother on the likelihood of being the
subject of a child maltreatment report is more than twice that of children born to Hispanic mothers and 3.5 times that of being born to a White mother. Furthermore, the cumulative hazard of being a victim of child maltreatment before age six is almost 40% for Black children. This is more than three times as high as it is for White children, whose cumulative hazard by age six is under 12%. The hazard over the first six years of life for Hispanic children is 23%. However, once other individual and neighborhood factors are taken into account, we saw no interaction between race and child age. This suggests that African American children are more likely to have other factors (being born low birth weight to young, unmarried mothers who used alcohol during pregnancy, and received Temporary Assistance to Needy Families) that account for the age specific differences in child maltreatment reporting and indication/substantiation.

**Objective Three – Neighborhood Disadvantage**

The third research objective sought to examine the impact of neighborhood disadvantage on the hazard of child maltreatment. The first questions asked if neighborhood disadvantage increase the risk of child maltreatment. The first hypothesis (H3a) was supported. This study found the hazard of child maltreatment to be greater among children living in impoverished neighborhoods. Each one standard deviation increase in Impoverishment results in a 26% increase in the hazard of being the subject of a child maltreatment report, a 32% increase in the hazard of being the subject of a child neglect report, and a 27% increase in the hazard of being the subject of a substantiated or indicated child maltreatment report. The second hypothesis (H3b) that the hazard of child maltreatment would be greater among children living in instable neighborhoods was
also supported. Each one standard deviation increase in Instability increases the hazard of a report by 16.5% across ages, increases the hazard of a neglect report by 17%, and increases hazard of a substantiated or indicated report by 14%. However, the third hypothesis (H3c) that the hazard of child maltreatment will be greater among children living in neighborhoods with higher Childcare Burden was not supported with any of the three outcomes.

The second set of questions under this research objective sought to understand if the effect of neighborhood disadvantage varied by the age of the child. None of these hypotheses were supported. No interaction was found between neighborhood Impoverishment, neighborhood Instability or neighborhood Childcare Burden and child age.

**Objective Four – Race and Neighborhood Disadvantage**

The final research objective sought to understand if the influence of neighborhood disadvantage on the hazard of child maltreatment is moderated by the race of the child. The two research hypotheses were: (H4b) neighborhood Impoverishment will have a weaker effect on the hazard of child maltreatment among African American children than among White children, and (H4c) neighborhood Instability will have a weaker effect on the hazard of child maltreatment among African American children than among White children. (The third hypothesis regarding Childcare Burden was omitted because Childcare Burden did not reach statistical significance on its own). Both were supported. To test these hypotheses, individual race was interacted with neighborhood Impoverishment and Instability. All four of the interaction terms are negative and
significant; indicating that for Black children, the negative effect of living in impoverished and instable neighborhoods is less than it is for White children. Neighborhood Impoverishment and Instability both have a stronger influence on whether White children are the subject of a child maltreatment report than for other racial/ethnic groups. In fact, White children living in very impoverished or instable neighborhood have higher hazard of being the subject of a report compared to Black and Hispanic children. However, in neighborhoods with low and moderate levels of impoverishment and instability, their hazard of being the subject of maltreatment report is lower than that of Black and Hispanic children.

It is important to note, however when looking at these finding the there is a strong correlation between Black and White race and neighborhood impoverishment. For example in these data, less than 2% of children born to an African American mother live in a neighborhood more than one more than standard deviation below the mean impoverishment level, while 54% live in neighborhoods more than one standard deviation above the mean impoverishment level. While approximately 30% of children born to white mothers live in a neighborhood more than one more than standard deviation below the mean impoverishment level, yet only less than 2% live in neighborhoods more than one standard deviation above the mean impoverishment level.
CHAPTER 6 – Discussion

Scholars have long documented the disproportionately higher number of African American children in the child welfare system. Yet, many questions remain about the causes of disproportionality and how to reform policy and practice to address it. Disproportionality is most often described using cross-sectional data, and most studies have not disaggregated by age, place, or time (Chapin Hall Center for Children, 2008). This approach may fail to capture the dynamics and full magnitude of the issue. The multi-level discrete time hazard modeling approach used in this study provides both an ecological and life course perspective not seen in the majority of the literature on this topic. It provides a clear description of where racial disproportionality exists in the child welfare system and the factors associated with it. This is an important first step in understanding why racial disproportionality exists and provides some guidance as to the timing and type of policies and practices that might be used to address it. Specifically, this research points to the need to focus on the risk of child welfare involvement for infants and children living in impoverished neighborhoods in order to address racial disproportionality.

Summary of the Main Findings

This study focused on individual and neighborhood characteristics associated with reported and substantiated cases of child maltreatment in Cuyahoga County, Ohio. It sought to better understand risk and protective factors associated with child maltreatment, specifically the role race and neighborhood disadvantage play. It used an ecological
framework that takes into account multiple levels and incorporated a developmental perspective that suggests that risk and protective factors may vary by the age and development stage of the child.

The study had four main research objectives:

1. To examine the hazard of child maltreatment by age for children up to age six in Cuyahoga County, Ohio.
2. To examine the impact of race on the hazard of child maltreatment.
3. To examine the impact of neighborhood disadvantage on the hazard of child maltreatment.
4. To understand if the influence of neighborhood disadvantage on the hazard of child maltreatment is moderated by the race of the child.

Each will be discussed in turn.

Objective One – Child Age

Consistent with prior research (Crampton & Coulton, 2008; Sabol, et al., 2003; Wulczyn, et al., 2005), this study showed that younger children are subject to more child maltreatment reports and substantiations than older children. Furthermore, the hazard curve is steepest for indicated and substantiated child maltreatment incidents, suggesting that the over representation of very young children is more pronounced among indicated and substantiated incidents of child abuse and neglect than among child maltreatment reports or reports of child neglect.

While previous research (Crampton & Coulton, 2008; Sabol, et al., 2003; Wulczyn, et al., 2005) has been able to disaggregate by some aspect of place (e.g.: county
poverty level and urbanicity) and found the disparity between infants and older children is greatest in poor and urban environments, previous research has not been able to control for other individual factors that might help account for these differences. The data and methodology used in this study allowed for a closer examination of why young children are disproportionately represented in child maltreatment reports, and revealed that much of the over representation of infants in the child welfare system is explained by mother’s age, mother’s marital status, mother’s use of alcohol and tobacco during pregnancy, child’s birth weight, and receipt of TANF. Some argue (Roberts, 2002) that the large racial disproportionality among infants results from the placement into foster care of drug exposed newborns because substance abuse by indigent black women who often give birth in public hospitals that serve poor minority communities is more likely to be detected and reported compared to white mothers who often give birth in private hospitals. While this study did not measure mother’s prenatal drug use or hospital of birth, it found no interaction between race and child’s age or between neighborhood Impoverishment or neighborhood Instability and child’s age. This study did find an interaction between receipt of TANF and Medicaid and child’s age. Receiving Medicaid may be related to use of public hospitals. However, in order to more definitively test for this, future studies should control for hospital of birth.

**Objective Two – Racial Disproportionality**

These data show that in Cuyahoga County children born to African American mothers are disproportionately represented in the child maltreatment statistics by a rate of almost 2:1 (compared to their percentage in the population, they are 1.7 times more likely
to be the subject of a maltreatment report, and more than 1.8 times more likely to be the subject of a report of child neglect or of a substantiated or indicated report of maltreatment). Thus without controlling for other factors, being born to an African American mother greatly increases the likelihood of being the subject of a child maltreatment or neglect report and of a substantiated or indicated maltreatment allegation. However, once measures of poverty and other individual level factors and neighborhood disadvantage are taken into consideration, the increased risk of being the subject of a child maltreatment report for Black children drops considerably, and is no longer a significant predictor of reports of child neglect or substantiated or indicated reports of maltreatment. There is broad empirical and theoretical consensus in the literature that poverty is associated with higher rates of both actual and reported maltreatment (Berger, 2004; Chibnall, et al., 2003; Courtney, Barth, Berrick, Brooks, Needell, et al., 1996; Drake, et al., 2008; Drake, Jonson-Reid, Way, & Chung, 2003; Drake & Zuravin, 1998; Pelton, 1978). The large over representation of Black children among the poor provides one possible explanation for the disproportionality of Black children in child maltreatment reports. Theory argues that while Blacks are reported at higher rates than Whites, this is a function of the aggregation of Blacks in poverty, and their subsequent increased visibility (Ards, et al., 2003b). While this study was not able to assess the impact of family income directly, the large reduction in the strength of the association between race and maltreatment when including measures of individual and neighborhood poverty in the models provides support for the theoretical association of poverty and child maltreatment.

The present study was also consistent with literature that has found the greatest
disproportionality between Black and White children at the youngest ages (Crampton & Coulton, 2008; Sabol, et al., 2003; Wulczyn, 2005). However, once other individual and neighborhood factors are taken into account, we saw no interaction between race and child age. This suggests that African American children are more likely to have other factors (being born low birth weight to young, unmarried mothers who used alcohol during pregnancy) that account for the age specific differences in child maltreatment reporting and indication/substantiation.

**Objective Three – Neighborhood Disadvantage**

Like previous research (Coulton, et al., 1999; Coulton, et al., 1995; Deccio, et al., 1994; Ernst, 2000; Ernst, 2001; Fromm, 2004; Garbarino & Crouter, 1978; Korbin, et al., 1998; Hyde, 1999; Lery, 2009; Paulsen, 2003; Young & Gately, 1988; Zuravin, 1986; Zuravin, 1989), this study found the hazard of child maltreatment to be greater among children living in impoverished and instable neighborhoods. However, unlike previous research (Coulton, et al., 1999; Coulton, et al., 1995; Korbin, et al., 1998; Lery, 2009), this study found no associated between Childcare Burden and child maltreatment. Furthermore, like previously research (Drake & Pandey, 1996; Kim, 2004; Zuravin,1986; Zuravin, 1989), I found the impact of neighborhood characteristics, specifically Impoverishment, to exert its strongest effect on child neglect compared to the other outcomes. However, contrary to my hypotheses, the impact of neighborhood Impoverishment and neighborhood Instability did not vary by the age of the child.

Hill’s (2006) review of the literature on both the scope and nature of disproportionality in child welfare concluded that community factors such as poverty are
important in understanding disproportionality. This study confirmed that neighborhood factors are important in understanding racial disproportionality in the CPS. In this study, even after controlling for individual level factors, the inclusion of neighborhood Impoverishment and Instability further reduced the strength of the association between race and maltreatment. Additionally, the reduction in the strength of the association between race and maltreatment when including neighborhood Impoverishment in the models further supports the theoretical association of poverty and child maltreatment.

**Objective Four – Race and Neighborhood Disadvantage**

Findings from this study suggest that for Black children, the negative effect of living in impoverished and instable neighborhoods is less than it is for White children. Neighborhood Impoverishment and Instability both have a stronger influence on whether White children are the subject of a child maltreatment report than for other racial/ethnic groups. In fact, White children living in very impoverished or instable neighborhoods have a higher hazard of being the subject of a report of maltreatment compared to Black and Hispanic children. However, in neighborhoods with low and moderate levels of impoverishment and instability, their hazard of being the subject of a maltreatment report is lower than that of Black and Hispanic children.

These findings are in agreement with empirical findings that suggest a differential sensitivity to poverty (Drake, et al., 2008) or here more generally a differential sensitivity to neighborhood disadvantage, where among the very disadvantaged Whites may be more likely to be reported than Blacks. This study found, like other studies (Ards, et al, 2003b; Drake, et al., 2008; McDaniel & Slack, 2005) that suggest that White children may be
more likely to be reported in high poverty areas and Black children may be more likely to be reported in low poverty samples, an interaction between individual race and neighborhood disadvantage. Moreover this is in agreement with findings by Korbin, et al. (1998) that report rates for White children appear more powerfully linked to poverty than are report rates for Black children.

Drake and colleagues (2008) offer a theoretical explanation for this in the idea of differential assortment. They posit that because structural barriers and restricted residential mobility make it harder for Blacks to succeed economically compared to Whites, that it is plausible that on the average, those Whites who do experience extreme economic hardship and live in areas of concentrated poverty have “fallen through more safety nets.” Furthermore, those relatively few White families who live in very poor areas may have a higher number of risk factors that also increase the risk for child maltreatment such as substance abuse or mental health issues, low education, or inadequate socialization. In contrast, they suggest that Black families that have the strengths necessary to raise children without maltreatment may be less able to move away from high poverty neighborhoods.

*Cumulative Risk of Child Maltreatment*

The discrete time hazard modeling approach used in this study allowed for the estimation of the cumulative hazard of becoming involved in the child welfare system. Unlike cross-sectional analysis, this methodology provides an understanding of the scope of the problem across young childhood. This study found that for children born in Cuyahoga County between 1998 and 2001 the cumulative baseline hazard of being the
subject of a child maltreatment report by age six is 20.4%. When thought of in these terms, child maltreatment is not a rare event, but something one out of every five children will experience before their sixth birthday. Furthermore unlike cross-sectional analysis, this methodology provides a description of the scope of disproportionality. This study found the cumulative hazard of being the subject of a child maltreatment report to be 38.5% for African American children. Thus almost four in ten young African American children in Cuyahoga County come into contact with the child welfare system.

**Differences by Outcome**

This study confirmed some slight differences found in past studies between outcomes. For example, the effect of mother’s race and poverty were important predictors of all three outcomes, but were most strongly predictive of substantiated and indicated child maltreatment events and least strongly predictive of any type of report. The impact of neighborhood impoverishment exerted the greatest impact on child neglect. This provides further support for prior research findings suggesting that neglect, compared to other types of child maltreatment, is more strongly associated with structural characteristics of neighborhoods (Drake & Pandey, 1996; Kim, 2004; Zuravin, 1989). However, because this study looked at all types of maltreatment reports (of which almost 66% are reports of neglect) and compared those to only reports of neglect, these findings may underestimate the magnitude of the difference between the two.

**Study Strengths and Limitations**

There are a number of limitations to this study that warrant discussion.
Study Sample

This study is limited to one county in the state of Ohio. For this reason, caution should be taken in generalizing the findings to other areas. Another limitation of the current data is that I am only able to use birth certificates to fix individuals in particular neighborhoods. It has been shown that many families moved between the date of the child’s birth and the date of the report. Furthermore it is quite possible that families moved between the birth of the child and the 2000 Census from which I took the neighborhood level measures. I attempted to minimize this second problem by restricting birth data to the 1998–2001 timeframe, thus limiting the degree of mobility and neighborhood change which might occur.

Measurement of Child Maltreatment and the Use of CPS Data

This study relied on administrative data. The analyses were done using reported and substantiated cases of child maltreatment. By only using reports of maltreatment that come to the attention of CPS agencies, the actual prevalence of maltreatment may be underestimated. Furthermore, the use of administrative data reflects decisions on the part of reporters and of child protective services staff regarding if and when to events should be reported and whether or not reports are deemed appropriated for investigation and rise to the level of truth and seriousness to be indicated or substantiated. It is the common belief among child welfare researchers and practitioners that a large proportion of child maltreatment cases do not come to the attention of CPS agencies. In fact, studies have shown that 25% to more than 50% of child maltreatment events go unreported (Ards, et al., 1998; Ards & Harrell, 1993; Hampton & Newberger, 1985). Furthermore, because
official CPS data do not necessarily measure child maltreatment behavior, this study was not able to disentangle the roles that behavioral influences, recognition and reporting and selection play in children coming to the attention of CPS agencies.

**Measurement of Poverty**

A limitation of these data is that I do not have individual level direct measures of poverty. Thus, for the purposes of this paper, the concept of individual poverty is measured using proxies (receipt of Medicaid and/or TANF).

**Use of Birth Certificates**

One advantage of this study was the use of birth cohorts to understanding the age specific and cumulative hazard of child maltreatment. However, this type of analysis relies on birth certificates matched to child welfare records. The use of birth certificates poses some limitations. A number of child welfare records were not able to be matched to a birth certificate, and were therefore not included in the dataset. These are incidents where the birth data is suppressed. It is assumed that this is most likely to happen when the baby is taken away immediately after birth and put in foster care. This is of concern because these numbers are quite large. For example in 1998 there were 1132 births that were suppressed of which 227 children had a substantiated/indicated incident by age one. Therefore the hazard rate (especially for the youngest children) may be underestimated.
**Potential Effects of Looking at all Types of Maltreatment Together**

Because of the small numbers of events at the neighborhood level, in most analyses all types of child maltreatment have been considered together as a group. Many argue that the etiology of differing types of child maltreatment varies, and it is therefore important to distinguish between subtypes of abuse (Drake & Pandey, 1996). For example, Drake and Pandey conclude that community norms regarding sexual abuse would not be expected to vary because sexual abuse in our culture is not tolerated or seen as an everyday experience. Additionally, the majority of child maltreatment victimizations are neglect (over 60% according to the U.S. Department of Health and Human Services, 2005 report, and over 66% in this study) and neglect may be particularly influenced by poverty and neighborhood factors. Thus, by including all type of maltreatment, the effect of macro structural factors on a specific type of maltreatment (such as neglect) may be underestimated. However, the majority of studies examining child maltreatment, specifically those looking at ecological factors, have measured child maltreatment this way. Therefore, the findings from this study can be compared to the majority of the existing literature on the subject.

**siblings**

This study did not adjust for correlation that arises from the inclusion of siblings. Children from the same family who are the subject of a report of child maltreatment during the study period are not independent with respect to exogenous factors influencing their outcomes and this correlation biases the standard errors in the statistical models.
Selection Bias

Because of the cross-sectional nature of this study, it was not possible to rule out the possibility of selection. That is, families that may be more likely to maltreat their children may be drawn to impoverished neighborhoods. This is also sometimes called omitted variable bias because unmeasured characteristics (individual or family) associated with neighborhood residence may account for at least a portion of observed neighborhood effects. For example, families who move to, or remain in, poor neighborhoods may differ in important ways from families who leave or chose to live elsewhere. Differences in their levels of motivation, self-efficacy, mental or emotional health, etc. may account for some of the observed neighborhood effects, and thus lead to an overestimation of the importance of neighborhood. This bias could be omitted through the use of randomization or following families longitudinally to model who moves and who does not. However, randomizing families to a particular neighborhood is quite impractical in most cases, and in this particular case, the data do not allow either of these approaches to be used (the data only allow for measurement of neighborhood residence at the time of the child’s birth).

Definition of Neighborhood

While there is controversy in the literature surrounding the best way to define and conceptualize neighborhoods, most studies, like this one, have employed a geographical definition, dividing communities according to municipal boundaries, often census tracts. It should be noted however that concern has been raised that a neighborhood defined in this manner may differ from the conceptualization of the neighborhood that is held by the
community's residents (Coulton, et al., 2001). However, the advantage of using census tracts to define neighborhoods is the ability to easily obtain information about macro structural characteristics using decennial census data. This allows researchers to characterize neighborhoods along a number of dimensions such as neighborhood poverty, stability, etc. Additionally, some research has indicated that residents’ reports of neighborhood boundaries are similar to the size of census tracts (Sampson, et al., 1997). Finally, Lery (2009) investigated the relationship between neighborhood social structure and foster care entry risk in neighborhoods defined three different ways (as zip codes, census tract and block groups) and found that foster care entry rates are significantly higher in neighborhoods with relatively high levels of disadvantage, instability and childcare burden, and that the strength of the associations were very consistent across spatial scales. This suggests that social processes operating in neighborhoods are robust with respect to how neighborhood is conceptualized.

*Mobility and Measurement of Neighborhood*

The data used in this study provided an opportunity to examine the extent of mobility among families that become involved in the child welfare system. This is an important contribution to the neighborhood literature. Many scholars who study neighborhood effects are concerned about mobility, yet they often do not have measures of the neighborhood at multiple points in time. This study confirmed that mobility is a factor that scholars should be concerned about. Data showed that a large percentage of children (56.9%) who had a child maltreatment report by the age of six moved at some point between their birth and the time of the event. Furthermore, while the mean
differences in neighborhood Impoverishment and Instability were not large, more than
24% of children were living in a neighborhood at the time of the maltreatment report that
was one standard deviation more or less impoverished than their neighborhood at birth,
and 29% were living in a neighborhood that was more than one standard deviation more
or less instable. Thus, it may not be safe to assume that despite considerable mobility,
poor families move between similar neighborhoods. These data show that while the mean
amount of change is minimal, the proportion of children who experience a change in
neighborhood conditions in either direction is quite significant. These results also
indicate that the association found in this study between neighborhood factors and reports
of child maltreatment may be underestimated, especially for children who experience
their first child maltreatment event at older ages.

Generalizability

Finally, caution should be taken with generalizing these results to communities
beyond the scope of this study, which are families and children living in Cuyahoga
County, Ohio.

Implication for Policy and Practice

This study adds to the child maltreatment literature by providing a deeper
understanding of the individual and neighborhood level factors associated with child
maltreatment reporting and substantiations. It is the first of its kind to look at the risks of
maltreatment by child age, and thus it provides an understanding of how these risks vary
over early childhood. This information can be beneficial to both individually targeted policies and programs as well as to policies and practices aimed at the community level. Overall study findings suggest that policy and prevention efforts should be targeted to poor families with very young children living in poor neighborhoods.

This study confirmed the disproportionate representation of African American children in the child welfare system. While findings show that African American children in Cuyahoga County are over represented in the child welfare system, when poverty and other individual level factors are taken into account the increased hazard for African American children of becoming the subject of a maltreatment report or substantiation is greatly diminished. This may suggest that African American children are more likely have individual and family characteristics that increase the risk of maltreatment behaviors and/or increase the likelihood that they will be recognized and reported. Factors such as poverty, single parenthood, low maternal education, maternal use of alcohol and tobacco during pregnancy, and low birth weight are all factors at the individual/family level that increase the hazard of a child maltreatment reports and substantiations and help account for the increased hazard for children of color. Thus, one strategy for decreasing racial disproportionality in the child welfare system is to address the factors that help account for it. Program and policies designed for poor, single mothers with low level of education during the perinatal period might help accomplish this goal.

This study provided further support for using a bio-ecological/life course perspective (Wulczyn, et al., 2005). A deeper understanding of maltreatment variations by age can be used to develop targeted efforts for those most at risk. This study confirms
previous research findings that the risk of maltreatment is greatest among the youngest children. It adds to the literature by examining the factors associated with the increased risk and suggests a number of places prevention efforts could be aimed. During the prenatal period, prevention efforts aimed at young, unmarried mothers, especially those who use alcohol and tobacco during pregnancy and who are receiving TANF, are needed. Additionally, resources and supports should be given to mothers not only with those risk factors, but also to mothers who give birth to a child weighing less than 2500 grams immediately following the birth of their child. Specific strategies such as prenatal home visiting and home visits to families with very young children may hold promise.

This study also found that the impact of race on child maltreatment reports and substantiations varies by child age. However, once other individual level factors are taken into account, there was no interaction between race and child age. This suggests that African American children are more likely to have other factors that account for the age specific differences in child maltreatment reporting and substantiation, and that strategies aimed at addressing the high proportion of infants who come to the attention of child welfare agencies might also help to reduce racial disproportionality in the child welfare system.

Individually targeted prevention efforts are only one avenue to take in meeting the goal of decreasing child maltreatment. Community-level efforts that focus on reducing neighborhood level disadvantage and improving neighborhood resources may also hold promise. This study found that living in neighborhoods with higher levels of Impoverishment and Instability increases the likelihood of a child being the subject of a maltreatment report or substantiation. Moreover, it found that once Impoverishment and
Instability are taken into account the increased hazard of coming to the attention of child welfare services for Black children (as compared to White children) was diminished. This study also found that White families living in very disadvantaged neighborhoods may be especially at risk. These findings suggest that strategies aimed at reducing neighborhood disadvantage will also help to reduce racial disproportionality in the child welfare system. Impoverished neighborhoods are likely to lack resources and services to support families such as quality childcare and drug treatment programs, which may lead to more children coming to the attention of the child welfare system than being diverted to preventive services. Similarly, high rates of residents moving frequently may mean that families do not live in one neighborhood long enough to develop social capital or knowledge of the resources that are available. Strategies to build resources for families and strategies to help families become aware of the services and resources available to them are needed in impoverished and unstable neighborhoods. The consistently strong relationship between residential instability and impoverishment and child maltreatment suggests that a focus on improving the quantity and quality of resources and supports for families may help protect children in impoverished and unstable neighborhoods. However, in addition to policies and practices aimed at resource building and marketing in disadvantaged neighborhoods, broader strategies aimed at lowering the levels of impoverishment are needed. Macro level programs, such as economic development programs, are needed to reduce disadvantage and improve the overall quality of the neighborhoods where children live.

This study showed that the cumulative hazard of being a victim of child maltreatment before age six is almost 40% for Black children, 23% for Hispanic children
and 12% for White children in Cuyahoga County. These proportions indicate that when measured as an outcome over the early childhood years, being the subject of an investigated child maltreatment report is not a rare event. A substantial proportion of the children in our community are the victims of an investigated report of child maltreatment and suffer from the consequences of child maltreatment and/or the intrusion of a child maltreatment investigation. It is incumbent on the research, policy and practice community to better understand who these children are, why they are the victim of a maltreatment report, and based on those answers, to develop programs and policies to address the factors, such as poverty, that put them at risk.

**Future Research**

While research examining the relationship between neighborhoods and child maltreatment has received increased attention in recent years, scholars have yet to clearly demonstrate how and why neighborhoods influence child maltreatment. Scholars are gaining more insight into the neighborhood structural factors associated with child maltreatment, yet few researchers have attempted to uncover the specific mechanisms that contribute to or weaken social integration in neighborhoods. The limited number of neighborhood process studies provides some clues regarding the relationships between neighborhoods and child maltreatment, yet much work remains to be done in identifying the specific mechanisms that account for neighborhood differences in maltreatment rates. The lack of understanding about how neighborhoods influence child maltreatment means neighborhood-based prevention programs are set up without a clear sense of how neighborhood factors can help prevent child maltreatment and therefore may not be
effective. Additional research is necessary to uncover how neighborhood processes are related to family stress and support, as well as how neighborhood experiences might mitigate or aggravate the risk of maltreatment.

This study is the first study that I could find to use a multi-level discrete time hazard model to study child maltreatment. There are several strengths of this methodology in terms expanding our understanding of the risks of child maltreatment. This method provides an actual, not inferred or synthetic, description of child maltreatment while taking into consideration both individual and neighborhood level factors. Additional age differentiated analysis of child maltreatment is needed. Research methods, such as multi-level discrete time hazard analysis, should be used to study the factors associated with child involvement with the child welfare system. This type of research that takes into account individual/household and neighborhood risk factors and the age/developmental period of the child can provide a deeper understanding of which children are most at risk. This information is vital to practitioners and policy makers in order to plan and implement effective programs and policies to address child maltreatment. Infants and children living in disadvantaged neighborhoods are populations that policy and practice should be directed toward. New conceptual models and research methods are being developed to evaluate geographically targeted neighborhood efforts to reduce child welfare involvement (Coulton, et al., 2007) and should be employed in future research.
References


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