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No Safe Place

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No Safe Place: Assessing Spatial Patterns of Child Maltreatment Victimization

Derek J. Paulsen

SUMMARY. Little is known about spatial patterns of child maltreatment. The purpose of this exploratory research is to analyze the spatial patterns of child maltreatment victimization and their ecological causes. Specifically, this research seeks to determine the answer to three important questions regarding the spatial nature of child maltreatment victimization: First, are child maltreatment victimizations concentrated within certain parts of a city? Second, are there different spatial patterns for child abuse, child neglect, and juvenile assault victimization locations? Finally, how well does ecological theory explain the incidence of child abuse, child neglect, and juvenile assault victimization at the neighborhood level? *[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <http://www.HaworthPress.com> © 2003 by The Haworth Press, Inc. All rights reserved.]*

KEYWORDS. Child abuse, child neglect, spatial analysis, ecological theory

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Child maltreatment is an act that occurs on a daily basis in almost every community in this country. It occurs behind closed doors in the supposed safe haven of homes, in the public arena of schools and day care centers, and in state-controlled areas such as safe houses and juvenile facilities. Victimization crosses over the bounds of race, gender, class, and geography to affect every community in some manner. While many people would prefer to believe that child maltreatment is a private matter and one whose causes lie in personal family conflict, more and more research points to the causes of child maltreatment being related to neighborhood characteristics (Coulton, Korbin, & Su, 1999; Coulton, Korbin, Su, & Chow, 1995; Deccio, Horner, & Wilson, 1994; Drake & Padney, 1996; Garbarino & Crouter, 1978; Garbarino & Kostelny, 1992; Garbarino & Sherman, 1980; Vinson, Baldry, & Hargreaves, 1996; Zuravin, 1989). This research seeks to determine the extent to which child maltreatment is spatially concentrated within certain geographic areas and explore the role that neighborhood characteristics play in child maltreatment victimization.

BACKGROUND ON CHILD MALTREATMENT

Before delving into how neighborhood characteristics impact child maltreatment, it is beneficial to begin with a discussion of the definition and extent of child maltreatment. While each state is free to define child maltreatment in the manner that it decides, the federal government provides a minimum set of criteria that characterize the acts of maltreatment. In general, child maltreatment is defined as "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" (Henderson, 2000, p. 82). As this definition implies, there are four major varieties or types of child maltreatment: physical abuse, child neglect, sexual abuse, and emotional abuse. While each of these four types of child maltreatment is closely related, each is also separate and distinct from the others. Physical abuse is characterized by the infliction of physical injury through punching, beating, kicking, shaking or other means of harm. Importantly, the definition does consider intention; a caretaker need not intend to injure the child, as physical abuse can result from over-discipline or physical punishment. Child neglect, characterized by a failure to provide for a child's basic needs, can take the form of physical, emotional, or educational neglect. Examples of child neglect in-

clude failure to provide adequate health care, abandonment, allowance of chronic truancy, and inattention to a child's psychological needs. Sexual abuse is characterized by any number of improper sexual acts involving a child including fondling of genitals, intercourse, incest, rape, sodomy, and commercial exploitation through prostitution or production of pornographic materials. Finally, emotional abuse, characterized as psychological or mental injury to a child, includes any such acts or omissions that may cause serious behavioral, cognitive, or emotional problems (Henderson, 2000).

While laws and social actions aimed at reducing and preventing the incidence of child maltreatment have improved significantly over the last seventy years, the incidence of child maltreatment in the United States is still staggeringly high. The following findings reported by Henderson (2000) indicate the depth of the problem with child maltreatment within the United States. In 1997 alone, child protective services investigated over two million reports of child maltreatment involving over three million children. Importantly, substantiated maltreatment cases actually decreased slightly from 1,030,751 in 1996 to 984,000 in 1997, this after increasing a full 18% from 1990 to 1996. The most common type of child maltreatment is child neglect, which accounts for fully 54% of all victims, followed by child abuse with 24%, sexual abuse with 13%, and either emotional or medical neglect with 8%. While a significant percent of all child maltreatment results in some form of injury, 1,196 of the over 980,000 victims died as a result of their maltreatment. In terms of the age of victims, over 50% of all victims were seven years old or younger, with 25% of all victims under the age of four. The breakdown of victims by gender and racial type shows that females are slightly more likely than males to be victims, accounting for 52% of all victims, and that the vast majority of all reported cases of child maltreatment (67%) involve victims who are white. Finally, the vast majority of all child maltreatment offenders are either parents (75%) or other family members (10%). Overall, the picture of child maltreatment in this country is one in which victimization is still prevalent despite the best efforts of many.

EXPLANATIONS OF CHILD MALTREATMENT

Because of the high incidence of child maltreatment in the United States, there has been no shortage of research dealing with the causes of

child maltreatment victimization. In general, causation research can be grouped into three different categories: psychological, sociological, and social-psychological explanations. While psychological and sociological theories focus on differing micro and macro explanations of child maltreatment, social psychological theories constitute, in effect, a middle ground between psychological and sociological theories. As such, it attempts to understand the interaction between the abuser, the victim, and their immediate environment. The main theory within this social psychological perspective is ecological theory, which, importantly, is the explanation undergirding the present research. Ecological theory focuses on how various neighborhood characteristics such as poverty, population mobility, and housing status impact residents' propensity towards child maltreatment. Specifically, these neighborhood characteristics make child maltreatment more likely by preventing the development of formal and informal social networks that provide both emotional support and social control within a neighborhood. As Zuravin (1989) argues,

> High risk neighborhoods are characterized by demographic, social and physical characteristics that negatively impact on family and individual stress levels by decreasing the availability as well as the adequacy of support systems. Low risk neighborhoods are socially rich areas; they are neighborhoods in which families are embedded in informal helping networks and can easily access formal systems of assistance. (p. 102)

Thus neighborhoods that suffer from high levels of economic disadvantage and residential instability are more likely not to develop solid social networks; this condition increases the risks of child maltreatment within their boundaries.

Considerable research testing ecological theory has found a number of neighborhood characteristics strongly associated with a high incidence of child maltreatment. Specifically, child maltreatment rates have been associated with poverty (Coulton et al., 1995; Garabino & Sherman, 1980; Gelles, 1992; Zuravin, 1989), unemployment (Steinberg, Catalano, & Dooley, 1981), and overall community disorganization (Garabino & Kostelny, 1992; Zuravin, 1989). However, while considerable research supports the ecological theory of child maltreatment, several problems exist within the current literature. Most importantly, the models that have been used to test ecological theory have, in general, been incomplete. The majority of the research has focused largely on economic factors such as neighborhood poverty and income levels, while ignoring

characteristics associated with neighborhood instability (Zuravin, 1989). However, the degree of instability within a neighborhood is vitally important to the rationale of ecological theory because instability (as measured by such characteristics as residential mobility, housing tenure, and the number of vacant homes and owner-occupied homes in a given neighborhood) in concert with neighborhood economic factors significantly impacts the development of informal support networks in neighborhoods (Bursik & Grasmik, 1993). Neighborhoods high in economic disadvantage but low in instability factors have been shown to have lower criminal victimization rates than those neighborhoods that have high amounts of both poverty and instability (Bursik & Grasmik, 1993). In effect, neighborhood instability factors can act as limits of victimization through their impact on the development of informal support networks.

One problem confronting our understanding of child maltreatment in terms of ecological theory is that past research has tended to give most of its attention to associations between maltreatment and neighborhood economics and has, by and large, neglected connections between maltreatment and neighborhood instability. The research has thus understood and applied ecological theory unevenly or only in part. A more complete ecological model would be one based on criminological research that combines measures of both neighborhood disadvantage and neighborhood instability factors (Sampson & Groves, 1989). In order to remedy this problem, this research will employ an ecological model based on prior criminological research that employs both neighborhood disadvantage and neighborhood instability measures (Rosenfeld, Bray, & Eglen, 1999).

A second problem confronting our understanding of child maltreatment in terms of ecological theory is the paucity of research supporting the way in which the theory explains different types of child maltreatment (Drake & Padney, 1996). Virtually all research into child maltreatment has grouped different types of child maltreatment (child neglect and child abuse) together into one aggregate measure rather than separate them out into individual measures. However, this methodology ignores the potential that these distinctly different types of child maltreatment are associated with different aspects of ecological theory (Drake & Padney, 1996). In grouping different forms of child maltreatment together as one measure, researchers are masking potential differences in causation that might be determined by separating them. This problem is made all the more glaring by research indicating that the neighborhood characteristics associated with child abuse and child ne-

glect are fundamentally different (Drake & Padney, 1996; Zuravin, 1989). Specifically, prior research has indicated that child neglect is more strongly associated with neighborhood disadvantage than is child abuse (Drake & Padney, 1996; Zuravin, 1989). Moreover, little research has attempted to determine the degree that ecological variables are associated with child maltreatment and other forms of juvenile victimization such as juvenile assault victimization (Coulton et al., 1995). The present research will attempt to remedy such problems by determining the degree to which different forms of child victimization are associated with ecological factors, and what if any potential differences in ecological characteristics are associated with these different victimization types.

A final problem with the current literature on child maltreatment is the lack of any analysis of potential spatial patterns of child maltreatment. While research on child maltreatment has been conducted at various levels of measurement amenable to spatial analysis, with the exception of one national level study, research has thus far ignored spatial aspects of child maltreatment (Turnbull, 2000). The long productive history of spatial pattern research with criminology has yielded sound insights and understanding of victimization patterns (Messner, Anselin, Baller, Hawkins, Deane, & Tolnay, 1999); the same methodology can be applied profitably to research on child maltreatment. Specifically, the analysis of spatial patterns can provide valuable information concerning areas of high and low concentration of child victimization as well as any spatial differences that exist between different types of victimization. These spatial patterns can, in turn, be overlaid with measures of ecological characteristics to determine what, if any, associations may exist between spatial patterns of ecological factors and spatial patterns of victimization. Furthermore, assessing spatial patterns of individual victimization locations provides a better understanding of spatial processes than analyzing aggregate measures of victimization. The present research will accordingly attempt to remedy this gap in the literature by analyzing child victimization locations to determine whether any spatial patterns exist, to what degree these patterns vary by victimization type, and what association, if any, there is between spatial patterns of neighborhood ecological characteristics and victimization locations.

Overall, this research is exploratory in nature and seeks to answer three main research questions concerning child maltreatment: First, are child victimizations concentrated within certain parts of a city? Second, are there different spatial patterns for child abuse, child neglect, and juvenile assault victimization locations? Finally, how well does ecologi-

cal theory explain the incidence of child abuse, child neglect, and juvenile assault victimization at the neighborhood level?

METHODS

Child abuse and child neglect victimizations were singled out as the main variables of analysis in this study because they are the most prevalent type of maltreatment and are most likely to be reported to official departments. In addition, juvenile assault victimization was included in this study to determine the degree to which characteristics of juvenile assault victimization are similar to child maltreatment victimization. Juvenile assault was chosen because of its relative frequency and the various common elements it shares with child abuse and child neglect in terms of victim and offender relationship. For purposes of this analysis, juvenile assault is defined as all criminal assaults in which a minor was the victim. The data used in this study come from Charlotte, North Carolina, a large city in the southeastern United States with a population of approximately 550,000. Data concerning child abuse, child neglect, and juvenile assault victimization come from official police records and represent all incidents occurring in the year 2000 that were serious enough to warrant an official response. While official data on child abuse and child neglect are often derided as underestimating the incidence of victimization (Newberger, Reed, Daniel, Hyde, & Kotelchuck, 1977; O'Toole, Turbett, & Nalpeka, 1983), recent research indicates that findings based on official records are almost identical to those based on survey research (Drake & Pandey, 1996). Furthermore, official records are a commonly used measure for child maltreatment research and are considered highly valid (Garbarino & Sherman, 1981; Pelton, 1981; Zuravin, 1989).

The data informing this research were received from the Charlotte police in a standard Geographic Information Systems (GIS) format, from which the information on child abuse, child neglect, and juvenile assault victimization was selected out from all crimes occurring in the year 2000. A total of 156 child abuse, 134 child neglect, and 410 juvenile assault incidents were included in the analysis. Importantly, all of these incidents were independent incidents in which no other crime was reported. While co-occurrences of child abuse, child neglect and juvenile assault may have actually occurred, officially only one of the crimes was reported to the police. The information on individual victimization was then separated into two discrete data sets to be used in

the analysis. The first of these sets, to be used in the spatial analysis of incident locations, comprised all individual incidents in a GIS format. A GIS is a relational database that allows any incident with an address to be displayed geographically on a map. As the data supplied by the Charlotte Police was already in a GIS format, no further preparation for the individual incident location spatial analysis was necessary.

The analysis of this spatial dataset was conducted using two different spatial analysis techniques, hot spot analysis and kernel density interpolation. Hot spot analysis determines statistically significant concentrations of point patterns, much like a multivariate cluster analysis. Specifically, nearest neighbor hierarchical clustering (Nnh) determines groups of points that are spatially closer than would be expected to occur by chance alone (Levine, 1999). In conducting an Nnh hot spot analysis using Crimestat software, the user is required to specify two important criteria prior to beginning the analysis. First, the minimum number of points for the hot spot is selected. This determination sets the least amount of points required for a hot spot to be created. In these analyses the minimum number of points was set at five incidents, a figure that is commonly used in exploratory hot spot analysis (Levine, 1999). Second, the user must select the probability level for defining the threshold distance between the points in the hot spot (Levine, 1999). This selection determines the probability that the hot spot could be due to chance. In this analysis the probability level was set at the .05 level. In contrast to hot spot analysis, kernel density interpolation is used to create a point pattern density map showing where there are statistically significant high densities of points (Levine, 1999). The kernel density interpolation for the present study was conducted using ESRI's Spatial Analyst extension for Arcview 8.1 (Environmental Systems Research Institute, 2001). The method of kernel density interpolation chosen for the analysis was a single kernel interpolation, an analysis type which is commonly used in these types of analyses because it allows for a smoother density creation (Levine, 1999).

The second data set that was created involved aggregating all of the incident location data to the census tract level for use in traditional statistical analysis. Creation of this data set was accomplished through a multi-step process. First, in order to determine the number of child abuse, child neglect, and juvenile assault victimization incidents per census tract, all incident level data were joined with census tracts using a GIS. This process allows for individual incidents to be joined with census tract numbers based on the census tract that the incidents are located within on a map. The data were then exported to a statistical pack-

age, where variables representing ecological characteristics were then added to the data set. In selecting variables to be used in the analysis, this study paid careful attention to select variables that represented both the economic disadvantage and residential instability components crucial to a complete and comprehensive ecological explanation. Variables included in the analysis were based on variables used in research by Rosenfeld and colleagues (1999) involving violent victimization. The variables considered in the analysis included family poverty rates, the number of female-headed households with children under 18, the number of unemployed males, vacancy rates, owner occupancy rates, lengths of household tenure, the number of households receiving public assistance, the prevalence of populations between the ages of fifteen and twenty-four, and the incidence of black population (see Table 1 for full explanation of variables).

In accordance with the methodology used in the research by Rosenfeld et al. (1999), the present study calculated variables and conducted a factor analysis using principal component analysis for later use in multiple regression analysis. The research produced two factors with eigenvalues above one, accounting for approximately 63% of the variance. Six different variables loaded significantly on these two factors. The variables that loaded on the first factor, which was renamed "neighborhood disadvantage," were family poverty rates, the number of female-headed households with children under eighteen, the number of households receiving public assistance, and the prevalence of populations between the ages of 15-24. Only two variables, rates of owner occupied housing and vacant home rates, loaded on the second factor, which was renamed "neighborhood instability." These two factor scores, as well as the percent of pop-

TABLE 1. Variables Used in Analysis

Variable Name	Variable Description
Family Poverty Rate	Family households with incomes above the poverty line.
Female-Headed Households	% of total households headed by females with children under the age of 18.
Male Unemployment	% of males over 16 that are unemployed.
Vacancy Rate	% of total housing units that are vacant.
Owner Occupancy Rate	Rate per 1,000 of owner occupied households.
Household Tenure	% of population in the same house 5 years ago.
Households Receiving Public Assistance	% of total households receiving public assistance.
Population between 15-24	% of family households between 15-24.
Black Population	% of total population that is black.

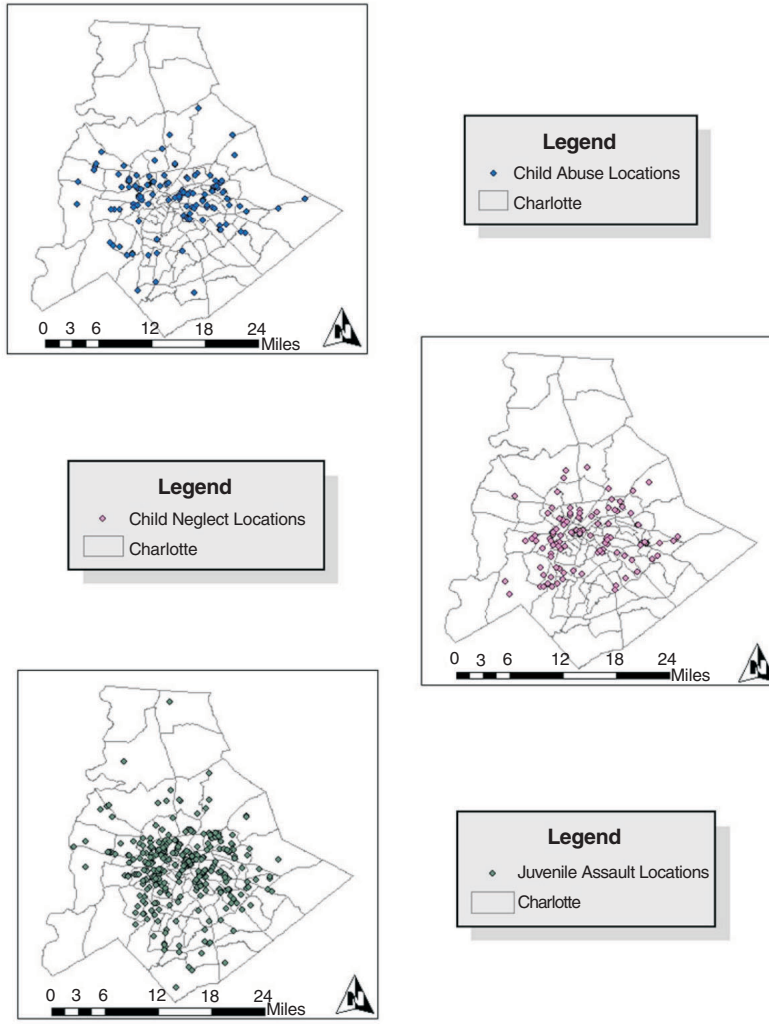
ulations that are black, were used as independent variables in a multiple regression analysis. Finally, the dependent variables for the multiple regression analysis were created. In following standard convention in creating child maltreatment rates, child neglect and child abuse rates are per 1,000 housing units within each census tract (Drake & Padney, 1996). In contrast, the juvenile assault rate is per 1,000 juveniles (under 18) per census tract. All of the data in this aggregate set were then joined with a map of census tracts in order to make the data available for spatial analysis.

RESULTS

In considering the results of the analysis, the discussion will first start with the spatial analysis and then move on the statistical analysis. Figure 1 provides a geographical version of a frequency distribution, showing the spatial distribution of child abuse, child neglect, and juvenile assault incident locations in Charlotte. In comparing these distributions, it is apparent that child neglect incidents have the most spatially compact distribution, with child abuse incidents being more spatially dispersed and juvenile assault incidents having the greatest spatial distribution. Despite the differences in their spatial distribution, all three incident types have their greatest concentration of incidents near the center areas of Charlotte. This phenomenon appears to show that there is some degree of spatial consistency, at least in terms of areas of highest concentrations of incidents, between the three distinct victimization types.

Figure 2 provides a view of the spatial distribution of victimization rates by census tract for child abuse, child neglect, and juvenile assault incidents. It is apparent from this map that there are definite spatial differences in terms of rates of victimization for these three incident types. Child abuse appears to have the greatest spatial distribution of census tracts with high victimization rates, with census tracts with high victimization rates distributed throughout the Charlotte area. Similarly spatially distributed, but not to the same degree as child abuse, high juvenile assault victimization rates appear most concentrated in the downtown Charlotte area and directly to the north of downtown. In contrast to child abuse and juvenile assault, child neglect victimization appears to be centered in a narrow area around the downtown area of Charlotte. It is important to note that while there appear to be marked differences in the spatial distribution of victimization rates, there are some important similarities in

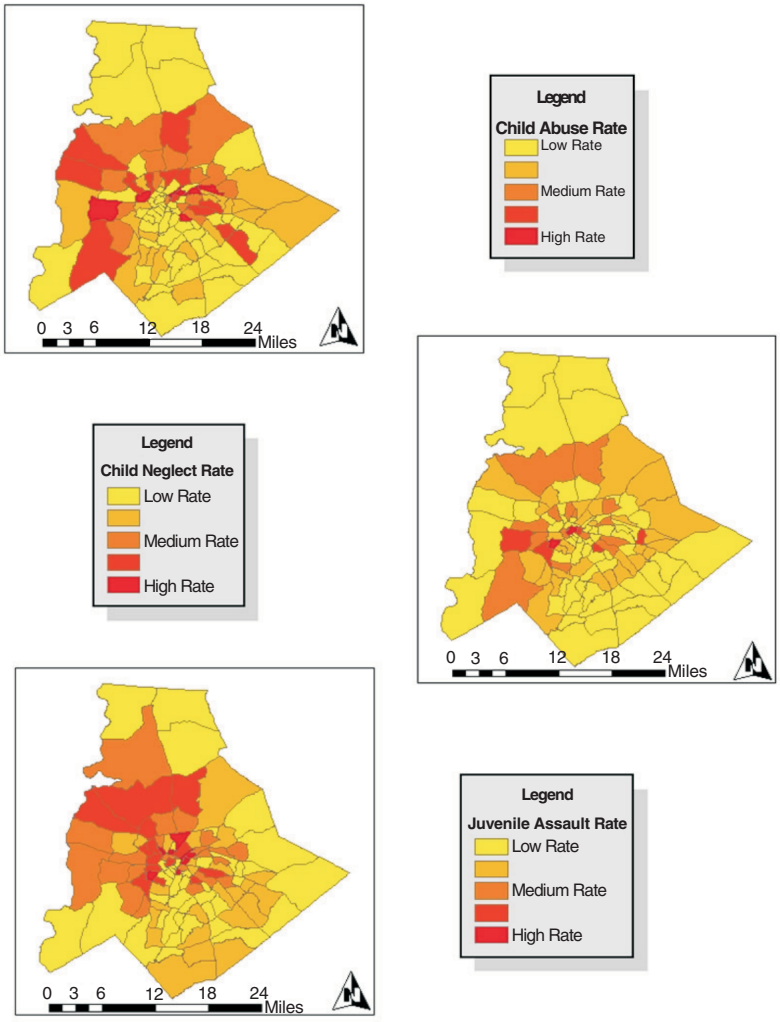
FIGURE 1. Comparison of Incident Locations by Victimization Type



the victimization rates as well. Specifically, victimization rates are low for all three incident types on the outer areas of Charlotte, such as the northern boundary of the county.

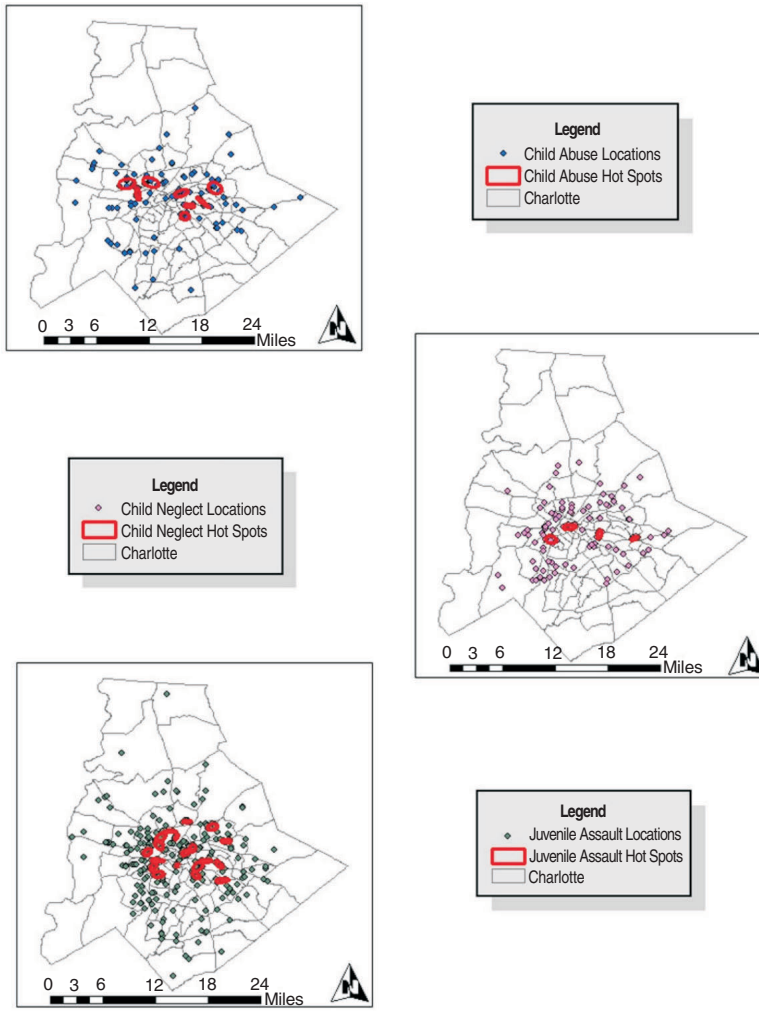
Figures 3 and 4 provide a more statistically significant analysis of the spatial patterns of the three incident types by showing the areas of great-

FIGURE 2. Comparison of Victimization Rates per Census Tract



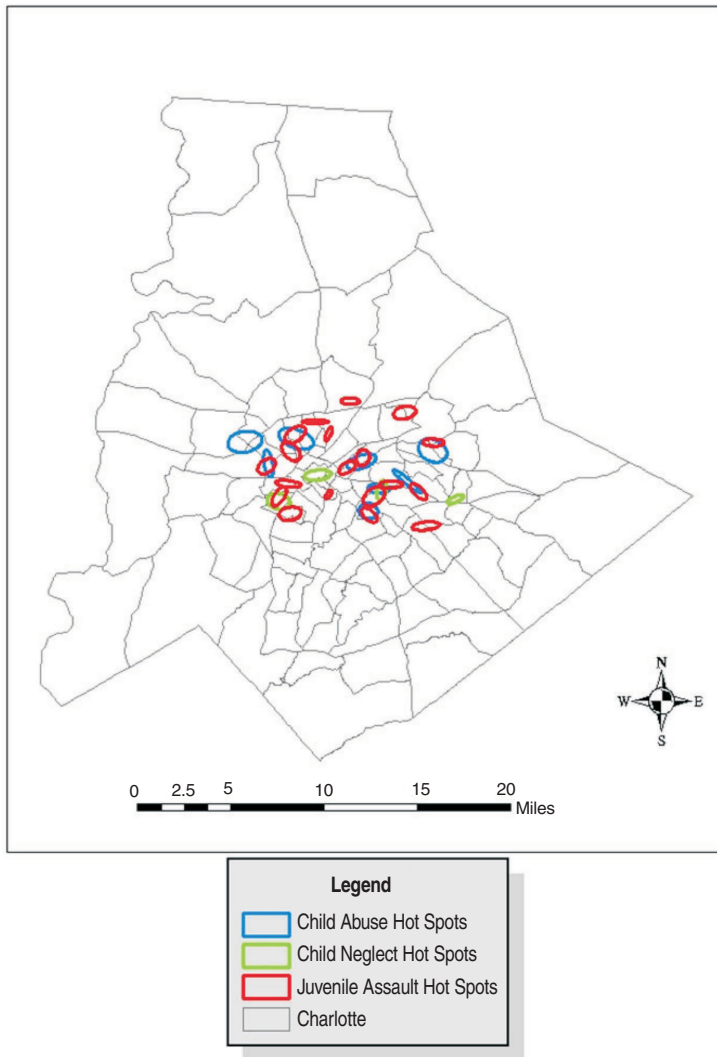
est concentration, or "hot spots" of incident locations. Figure 3 shows the hot spot locations for each incident type overlaid with the distribution of the actual incident locations. Child abuse has eight hot spots, indicating a moderate degree of spatial concentration. In contrast, child neglect has only four hot spots, indicating that it is not very spatially concentrated.

FIGURE 3. Comparison of Hot Spot Locations by Victimization Type



Finally, juvenile assault has nineteen hot spots, indicating a strong degree of spatial concentration. In comparing the location of the hot spots, Figure 4 indicates a considerable degree of spatial overlap between the different incident types. Specifically, seven of eight child abuse hot spots, two of four child neglect hot spots, and twelve of nineteen juvenile as-

FIGURE 4. Overlay of Different Hot Spot Locations



sault hot spots overlap with other incident hot spots. In terms of spatial patterns, child abuse and juvenile assault appear to be the most similar, with seven child abuse hot spots overlapping ten juvenile assault hot spots. In contrast, of the four child neglect hot spots, only two overlap with either child abuse or juvenile assault, indicating a definite spatial dif-

ference in its incident pattern. Importantly, there is only one location in which all three hot spots overlap, indicating that there are definite spatial differences in the distributions of these incident types.

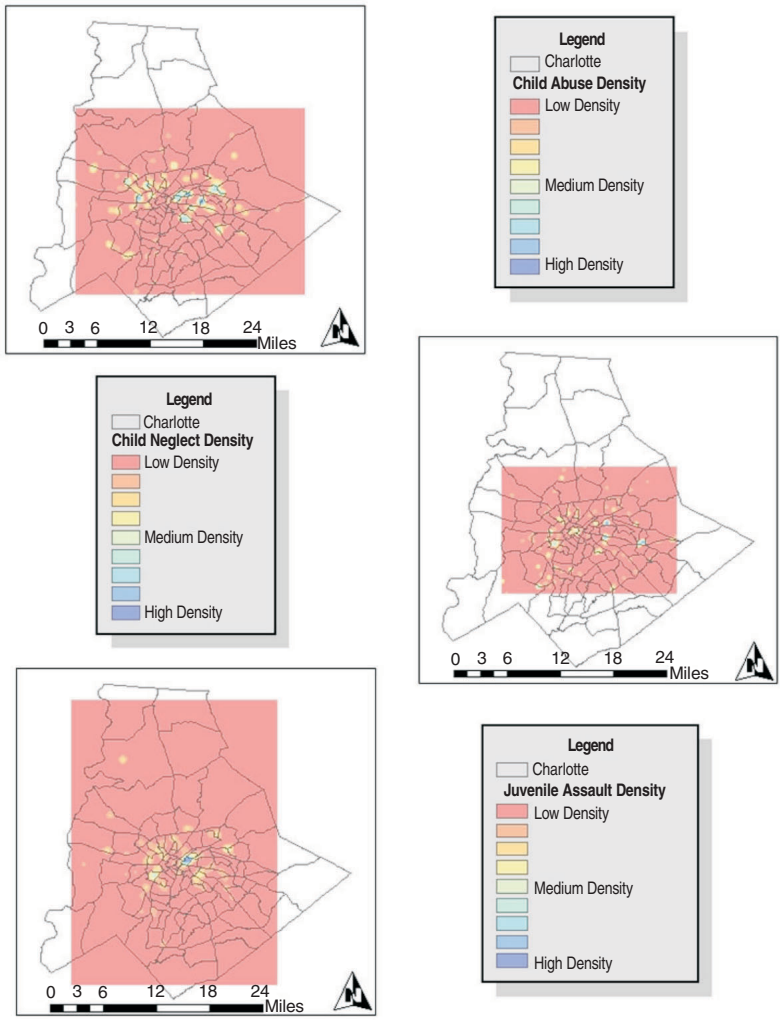
Figure 5, the final representation of the spatial distribution of incident patterns, shows the kernel density of each incident type. The purpose of this map is to indicate the areas where the highest density of incident locations occurs. In looking at these maps, it is apparent that there are definite spatial differences in the amount and location of incident density areas. Child abuse has several fairly spatially close, high-density incident locations, indicating a moderate degree of spatial concentration. In contrast, child neglect has only a few high-density locations that are more spatially dispersed than child abuse, indicating only a mild degree of spatial concentration. Finally, juvenile assault is the most spatially concentrated of the three incident types, with one major area of high-density incident locations. Importantly, in comparing the density maps of the three incident types, the research suggests, as it does with the hot spot locations, that child abuse and juvenile assault are spatially similar in distribution.

Overall, the spatial analysis provides important information concerning two of the main questions this research sought to determine. First, child maltreatment victimizations do appear to be concentrated within certain parts of Charlotte. Specifically, all three incident types are more heavily concentrated near the city center or downtown area, with little concentration on the outer areas of the city. Secondly, there do appear to be different spatial patterns for the different incident types, although not to a large degree. Importantly, child abuse and juvenile assault incidents appear to occur in similar spatial patterns, which appear to be spatially dissimilar to the patterns of child neglect. Both the hot spot analysis and kernel density interpolation analysis appear to indicate that child neglect incidents have a slightly different spatial pattern than either child abuse or juvenile assault victimizations.

ECOLOGICAL THEORY ANALYSIS

Table 2 provides basic descriptive statistics for census tracts in which incidents of each incident type occurred as well as those where no victimizations occurred. This table indicates that census tracts where these incidents occurred are fairly similar in their composition, with the exception of a few areas. Specifically, the poverty rates, number of female-headed households, and prevalence of black population

FIGURE 5. Comparison of Victimization Density Levels by Victimization Type



are all substantially lower in census tracts where juvenile assaults occurred than in those tracts where child abuse or child neglect victimizations occurred. It is important to note that in comparison to census tracts where no victimizations occurred, victim tracts have much higher poverty rates, total populations, and black populations.

TABLE 2. Basic Descriptives for Census Tracts Containing Victims of Different Types

Neighborhood Characteristic	Child Abuse Tracts	Child Neglect Tracts	Juvenile Assault Tracts	No Victim Tracts
Total Population	4576	4576	4307	4027
Total Households	1753	1753	1679	1583
Family Poverty Rate per 1,000 Households	39.95	39.95	33.54	21.54
% of Total Households that Are FHH w/Children	10.5	10.5	8.5	8.3
% of Males Unemployed	2.6	2.6	2.48	2.85
% of Total Households Getting Public Assistance	8.2	8.2	6.86	6.8
% of Population Between 15-24	3.5	3.5	2.71	2.5
% of Population that Is Black	42.8	42.8	34.62	31.3
Total Census Tracts	59	59	90	111

Table 3 provides the results of the multiple regression analysis. Standardized betas are provided, as well as significance levels and adjusted r-squares. These results indicate striking differences in the level of explanation that is provided for each victimization type. None of the factors had any significant effect on child neglect rate, although neighborhood disadvantage ($p = .062$) was close to being significant at the .05 level. This finding means that child neglect rates are not significantly related to neighborhood disadvantage, neighborhood instability, or the percent of population that is black. In contrast, the variance of child abuse rates at the census tract level is significantly impacted by neighborhood disadvantage ($\beta = .383$) characteristics. These findings are consistent with previous studies (Coulton et al., 1995; Drake & Padney, 1996; Zuravin, 1989). However, as with child neglect rates, neighborhood instability and black population have little impact on the variance in child abuse rates at the census tract level. Finally, the results indicate that juvenile assault rates are significantly impacted by both neighborhood disadvantage ($\beta = .288$) and black population ($\beta = .385$), with black population having the larger impact. Importantly, neighborhood instability has little to no impact at all on any of the three victimization types. Moreover, neighborhood instability does not even appear to approach significance in any of the three regression analyses; this indicates its true lack of impact in the analysis.

TABLE 3. Multiple Regression Results

Variables	Child Abuse β (p-value)	Child Neglect β (p-value)	Juvenile Assault β (p-value)
Neighborhood Disadvantage	.383**	.288(.062)	.288*
Neighborhood Instability	−.029(.740)	−.006(.947)	−.009(.911)
Black Population	.167(.167)	.211(.170)	.385**
Adjusted R-square	.258***	.203***	.395***

* Chi square $p < .05$
** Chi square $p < .01$
*** Chi-square $p < .001$

It is important to note that the adjusted R^2 for these three models are all fairly low, ranging from only .203 for child neglect to .395 for juvenile assault. This result indicates that the model explained a relatively small percent of the total variance in these victimization types, ranging from only 20% for child neglect to 25% for child abuse and 39% for juvenile assault. Overall, this finding indicates that the model was a much better fit for explaining the variance in juvenile assault rates at the census tract level than either child abuse or child neglect rates.

The final aspect of the ecological theory analysis involved determining the spatial relationship between victimization hot spot locations and neighborhood disadvantage and neighborhood instability scores at the census tract level. Figure 6 shows the spatial relationship between hot spot locations for all three victimization types and neighborhood disadvantage scores. Importantly, all of the hot spot locations for both child abuse and juvenile assault are located within census tracts that scored between medium and high disadvantage. In contrast, two of the four child neglect hot spots are located in census tracts that scored at the lower end of the disadvantage range. It is also important to note that two census tracts to the west of downtown Charlotte that had the highest disadvantage scores had no victimization hot spots at all. This finding appears to indicate that some other factors present in those census tracts, but untested in this analysis, help to minimize victimization.

Figure 7 shows the spatial relationship between neighborhood instability scores and victimization hot spot locations. Importantly, all three victimization types appear to be in census tracts that score low on neighborhood instability. These spatial analysis results appear to confirm the multiple regression analysis results. Specifically, child abuse and juvenile assault hot spots are strongly associated with neighborhood disad-

FIGURE 6. Comparison of Hot Spot Locations by Neighborhood Disadvantage Score

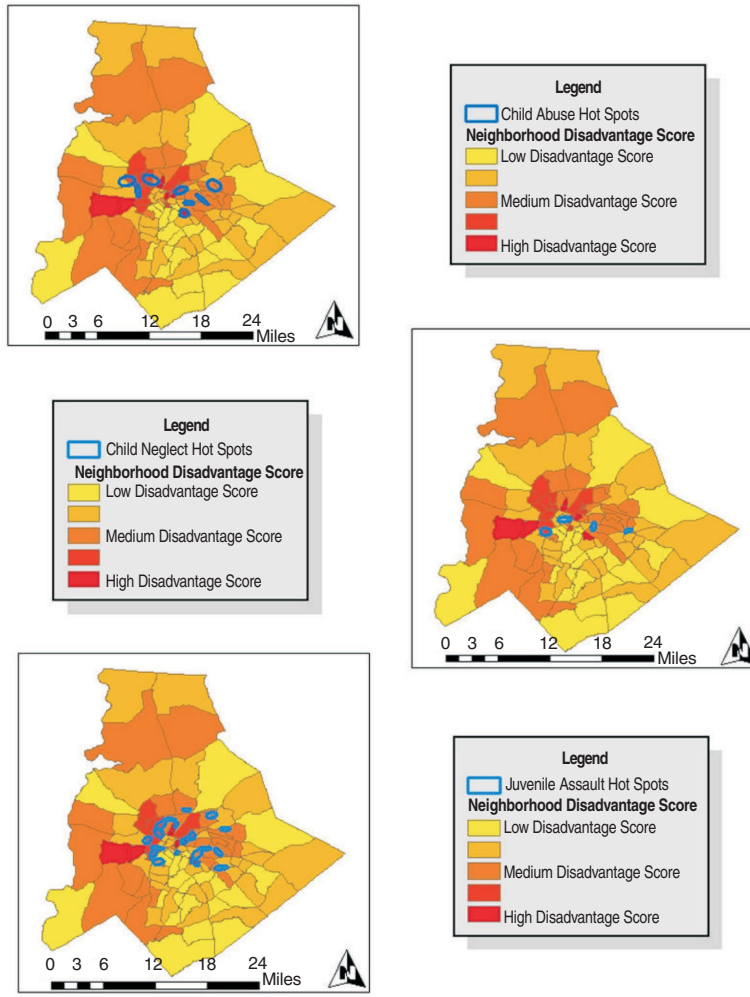
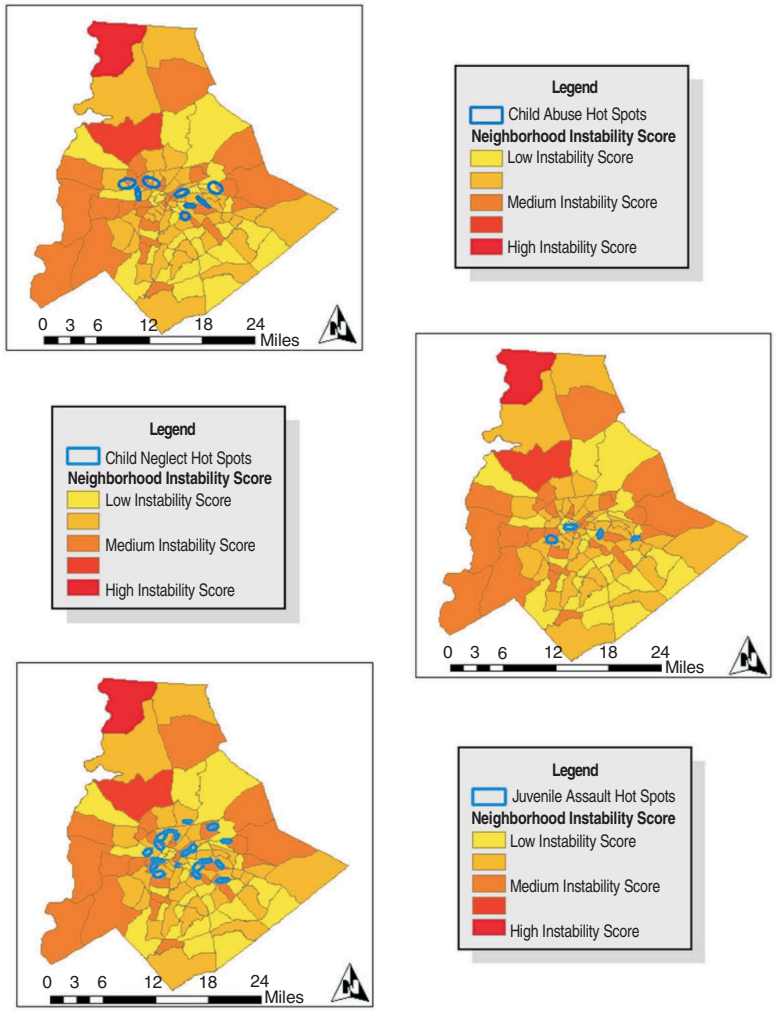


FIGURE 7. Comparison of Hot Spot Locations by Neighborhood Instability Score



vantage scores, with child neglect hot spots being less so; in addition, all three victimization types are unrelated to neighborhood instability scores.

DISCUSSION

The results of the present study provide several important findings and insights concerning the understanding of child maltreatment. First, the results are consistent with the literature, in that economic factors appear to be highly related to child abuse rates (Coulton et al., 1995; Drake & Padney, 1996; Zuravin, 1989). However, in contrast with prior research, child neglect rates are not significantly associated with economic factors (Drake & Padney, 1996). This finding seems to indicate that there are different social processes associated with child abuse and child neglect victimization. These results are particularly important, considering that the ecological theory model fully tested both economic and instability factors, whereas prior research has largely failed to consider instability factors.

A second important finding is the spatial difference in child abuse and child neglect locations. These spatial analysis results appear to further confirm that there are different social processes associated with child abuse and child neglect victimization. These spatial and ecological differences point to the need for different policies for addressing the problems of child abuse and child neglect. Furthermore, the spatial analysis points to the potential requirement that victims' services for child abuse and child neglect be centered in different locations to serve their victim population more fully. This last point confirms the utility of spatial analysis of these types of incidents and begs for replication of these analyses in other locations.

A third major finding centers around the spatial and ecological similarities between child abuse and juvenile assault victimization. The results seem to indicate that spatially and socially, these two different victimization types may be more closely related than first assumed. These two victimization types, while not considered similar in the research literature, appear to be associated with similar social processes resulting in spatially similar patterns. More research needs to be conducted in this area to determine the nature and extent of the similarities of these two incident types.

A fourth major finding surrounds the failure of neighborhood instability to be a significant predictor for either child abuse or child neglect. These findings bring into question the validity of ecological theory in the study of child maltreatment. Given the current findings and the large amount of research relating economic factors to child maltreatment, it appears that there may be some other social processes at work in child

maltreatment. More research needs to be conducted using a full ecological model to determine further the extent that ecological variables are at work in child maltreatment.

A final important finding concerns the incidence of census tracts having high scores of neighborhood disadvantage, yet low amounts of victimization. While neighborhood disadvantage was found to be highly associated with child abuse and juvenile assault victimization, some areas with high neighborhood disadvantage had low densities of victimization. These findings, only apparent through spatial analysis, appear to support the idea that some other factors are present in some neighborhoods that protect them from high victimization, despite high levels of disadvantage. More research needs to be conducted to try to determine what other social, cultural, or other factors may be present in these areas that insulate them from high concentrations of victimization.

While this study is admittedly limited by its use of official data and its relatively small geographical focus, its implications are potentially far reaching. Specifically, the results of this study point to the utility of using full ecological models in the study of child maltreatment as well as the benefits to be gained from disaggregating victimization types. Furthermore, this research heralds the insights that can be gained into social processes by conducting small area spatial analysis. It is hoped that through replication in other cities, further understanding can be gained into the research questions this research generates.

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