Understanding the Ecology of Child Maltreatment: A Review of the Literature and Directions for Future Research

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Studies examining neighborhood characteristics in relation to social problems, including child maltreatment, have proliferated in the past 25 years. This article reviews the current state of knowledge of ecological studies of child maltreatment. Taken as a whole, these 18 studies document a stable ecological relationship among neighborhood impoverishment, housing stress, and rates of child maltreatment, as well as some evidence that unemployment, child care burden, and alcohol availability may contribute to child abuse and neglect. The authors include a discussion of methodological difficulties in conducting research at the neighborhood level and present a set of recommendations for future research that emphasizes movement from a simple examination of neighborhood-level characteristics toward a theoretically driven explication of processes and mechanisms supported by appropriate multilevel modeling techniques. The final goal of such efforts would be to enable practitioners to develop evidence-based neighborhood interventions that would prevent and reduce child abuse and neglect.

Keywords: *child maltreatment; neighborhoods; literature review; spatial analysis*

In its earliest conceptualization, child abuse was viewed within a paradigm of parental deviance (Gelles, 1973). Garbarino (1977) discussed a reconceptualization of child abuse that moved away from a focus on clinically defined pathology and toward a view that various forms of child maltreatment were best understood along a more general continuum of child-caregiver relations. This refocus was accompanied by policy and intervention efforts that concentrated on the identification of families at risk (see Nelson, 1994).

Throughout the past 30 years, there has been increasing consideration of neighborhoods as a risk factor for maltreatment and as a vehicle for intervention (e.g., Burton & Jarrett, 2000; Leventhal & Brooks-Gunn, 2000; Sampson, Morenoff, & Gannon-Rowley, 2002). For example, the ecological model developed by Bronfenbrenner (1979) proposes that levels of systems beginning with a single individual and expanding to include the family, neighborhoods, communities, and larger sociopolitical environments influence individuals' behaviors to varying degrees. Specifically related to child maltreatment, Garbarino (1977) describes a human ecology model that contains four components: (a) understanding how an individual adapts to his or her environment, (b) studying how

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different systems affect the individual, (c) examining the social "habitability" of an environment (i.e., how the quality of an environment affects individual behaviors and whether members of that particular environment are capable of creating a place that enhances the quality of life for children and families), and (d) considering the political, economic, and demographic conditions that affect maltreatment. These frameworks have been further developed to include how interactions between various systems (e.g., family and community) affect maltreatment (Belsky, 1993). The lack of formal or informal supports in neighborhoods may lead to feelings of social isolation among families but may only lead to maltreatment during times of family crisis (Belsky, 1980).

This article represents an effort to synthesize the findings of ecological studies of child maltreatment in which the primary unit of analysis is an area unit intended to roughly approximate the space of a neighborhood. Multilevel studies are included if they examine main effects of neighborhood characteristics. Following a review of the major findings, we attempt to analyze the ecological research from a person-centered versus place-centered perspective, taking into account the major theoretical perspectives in the field. We then examine some of the most pressing concerns associated with neighborhood-level research and conclude with a concrete agenda to guide future investigation into precisely how neighborhood social processes bear on the well-being of children and families.

WHY STUDY NEIGHBORHOODS?

The first reason why neighborhoods represent an important unit of analysis is that they may affect the social conditions of individuals living within them. It is a truism that there is considerable social and economic inequality among neighborhoods and that a number of social ills tend to come bundled together at the neighborhood level. Although this article focuses its attention on a review of studies of child maltreatment, it is important to bear in mind that numerous and varied problem outcomes are often clustered together in neighborhoods and are associated with similar social and structural characteristics; thus, there is a fair chance that common underlying processes are at play. The good news is that these results have not empirically varied with the operational unit of analysis, meaning that findings consistently emerge at multiple levels of geography, be they census tracts, zip code areas, or some other statistically defined area units.

Second, neighborhood-level interventions have unique potential to inform prevention activities. Most prevention efforts to reduce child maltreatment rely on the preliminary task of identifying at-risk children or families, with a focus on changing parental behavior or immediate circumstances that may lead to an increased risk of abuse. These types of interventions rely on practitioners' successful identification of at-risk families as well as successful, lasting change efforts directed toward individuals. Both are daunting tasks that suffer major limitations. On one hand, identification of at-risk families follows from screening policies that vary from place to place and that are ultimately dependent on scarce resources intended to fund a vast array of social services. On the other hand, efforts to change individuals meet with the same dilemma encountered by all person-centered behavior change strategies; even if the behavior change is successful, the individual remains living under the same set of conditions that helped to produce the problem in the first place, thus making reversion a serious concern. A neighborhood approach allows for primary prevention activities aimed at populations of families living in neighborhoods with characteristics deemed high risk for potential abuse and neglect. Interventions that change neighborhood conditions may have a greater probability of creating and sustaining safer environments for children.

Another advantage to neighborhood-level research is that neighborhood-level prevention activities are potentially more cost-effective than alternative approaches. It is estimated that child maltreatment expenditures cost $258 million each day or $94 billion a year (Fromm, 2001). A simple statistical example serves to illustrate the effect of a preventive intervention aimed at addressing child physical abuse through a reduction in the density of alcohol outlets in neighborhood areas. Given that the probability of a child being abused in any given year is p, then the probability that at least one child out of n children will be abused in any given year is $1 - (1 - p) \wedge n$, where n is the number of children in the population. In 2002, the probability of a child having a substantiated report of physical abuse was $p = .00237$, including those cases where substance abuse was a factor. However, the actual probability of being physically abused without the involvement of alcohol was $p = .00161$.[1] When this information is taken into account, the probability of one or more cases of physical abuse without alcohol when $n = 1{,}000$ is .800. When alcohol use and availability are considered ($p = .237$), the probability of one or more cases of physical abuse per 1,000 children is .907, demonstrating a 13% increase. The point is that relatively minor changes in a community (e.g., reductions in alcohol availability) may substantially affect the probability of child physical abuse.

Despite the potential effect on maltreatment, few population-based interventions, to date, have been well-conceptualized, implemented, and empirically evaluated. Below, we review what is currently known about neighborhood effects on child maltreatment by providing our methodology in detail and the major findings of the studies included in this review with respect to the association between child maltreatment and a number of neighborhood characteristics, including impoverishment, housing stress, child care burden, unemployment, alcohol and drug availability, family structure, neighborhood density, social support, and immigrant concentration.

REVIEW CRITERIA

This review included only those studies where a geographically defined area (to approximate neighborhoods) was the primary unit of analysis (including multilevel studies of individuals nested within these area units) and in which the main effects of neighborhood characteristics on child maltreatment were examined. We identified articles through a comprehensive literature search of major library databases, including PsycINFO, Social Service Abstracts, Sociological Abstracts, Current Contents, PubMed, and ISI Web of Science. In addition, we reviewed the reference section for each article to find other publications that had not been obtained through the primary literature search process.

This search method yielded 18 ecological studies of child maltreatment (see Table 1). The majority of these studies examined the relationship between neighborhood characteristics and child maltreatment solely at the aggregate level (e.g., neighborhoods, zip codes, census block groups); two studies incorporated the interplay between the individual and the surrounding environment using multilevel modeling techniques (see Table 2).

REVIEW METHODOLOGY

We first examined the findings of each study and recorded and summarized common measures and/or constructs. For example, measures of residential turnover (e.g., moved in past 5 years) and housing ownership (e.g., owner-occupied housing) were grouped into a category labeled "housing stress." We further delineated results by the type of analysis used such that results from studies using regression[2] procedures are distinguished from those studies using multilevel modeling[3] techniques. The results of this distillation process are presented in Tables 1 and 2, in which we present the abbreviated citation, geographic unit of analysis, independent and dependent variables, and findings from each of the studies reviewed. Geographic unit of analysis was included because of the range of ways in which researchers operationalized "neighborhood." For example, most social scientists who study neighborhoods rely on predefined administrative units, meaning geographic boundaries defined by the Census Bureau or other administrative body because of the ready availability of population characteristics and other data. However, a number of such administrative units exist and all are used to some degree in the literature.

Note that within each category, the results of all types of maltreatment are presented first, followed by the results pertaining to specific types of child maltreatment (e.g., sexual abuse, neglect). Similar to neighborhoods, most studies measure maltreatment with administrative data from Child Protective Services (CPS) but vary in their use of any CPS report versus only substantiated CPS reports or physical abuse versus child neglect. Relying on any report, whether or not substantiated, yields a higher base rate; furthermore, there is some evidence that cases with initially substantiated versus cases with initially unsubstantiated CPS reports are very similar in terms of future risk (Drake & Jonson-Reid, 2000). However, this measure is vulnerable to the inclusion of false positives (i.e., incidents that are reported to authorities but the maltreatment is unconfirmed). Although substantiated reports of maltreatment allow for more confidence that the maltreatment occurred, they may be subject to other biases, such as when greater surveillance efforts are directed toward minorities or residents of impoverished areas (Fluke, Yuan, Hedderson, & Curtis, 2003). Population estimates obtained through survey procedures may give a more accurate representation of rates of child abuse and neglect but are more time-consuming and costly to obtain and are rarely available at the neighborhood level of analysis. Other methodological considerations and implications due to operationalizing these key constructs are presented later in this article.

REVIEW OF MAJOR FINDINGS

Impoverishment

Studies that incorporate poverty-level assessments (e.g., percentages of families below the poverty level) find that poorer neighborhoods are at risk for higher levels of maltreatment (Deccio, Horner, & Wilson, 1994; Freisthler, 2004; Freisthler, Needell, & Gruenewald, 2005). For example, Coulton, Korbin, Su, and Chow (1995) used a factor score with loadings

(text continues on p. 270)

TABLE 1: Characteristics of Neighborhood Studies of Maltreatment

Study	*Geographic Unit*	N	*Child Maltreatment Outcomes*	*Independent Variables*	*Findings*[a]	R^2
Coulton, Korbin, Su, and Chow (1995)	Census tracts	177	Children with substantiated and indicated maltreatment reports/1,000 children	Factors for impoverishment, child care burden, and neighborhood instability; interaction between impoverishment and instability, adjacent to poverty indicator	Impoverishment (+), child care burden (+), instability (+), Impoverishment × Instability (–), adjacent to poverty (+)	.48
Deccio, Horner, and Wilson (1994)	Census tracts (comparison between high and low risk areas)	43	Substantiated and unsubstantiated child maltreatment reports/1,000 families	Population, families and children, income, race, age, occupation, unemployment, education, mother caregiver and work roles, vacant housing, instability, absence of phones, personal social support, poverty	Compared to low risk areas, high risk areas: Income (+), unemployment (+), vacant housing (+), instability (+), absence of phones (+)	—
Drake and Pandey (1996)	Zip codes	185	Reports (separated by physical abuse, sexual abuse, and neglect)/1,000 families	Occupied units, owner occupied, median residential property value, high school dropouts, two-parent families, race, poverty	Sexual abuse: Property value (–), poverty (+) Physical abuse: property value (–), two-parent families (–), poverty (+) Neglect: high school dropout (+), two-parent families (–), poverty (+)	.50 .62 .75
Ernst (2000)	Census tracts	159	Reports for families (separated by physical abuse, sexual abuse, and neglect)/ 1,000 families	Economic resources: below 200% of poverty line, above 400% of poverty line, renters paying more than 35% of income, median residential property value; Social resources: female-headed households, female labor force participation, single family homes, past year movement, past 5-year movement, arrived in United States past 5 years	Sexual abuse: property value (–), female labor force (–), single family homes (+), arrived United States past 5 yrs (–) Physical abuse: property value (–), past year movement (+), poverty (+), female labor force (–) Neglect: no significant variables	.18 .46 .38
Ernst (2001)	Census tracts	159	Reports for families/ 1,000 families	Factors for economic disadvantage, residential instability, family characteristics, interaction of disadvantage and instability	Disadvantage (+), Instability (+), Disadvantage × Instability (–)	.44
Freisthler (2004)	Census tracts	940	Substantiated child maltreatment reports/10,000	Population size, population/area, female-headed families, poverty, unemployment, vacant housing, population change, African American residents, persons older than 65 years, ratio of men to women, ratio of children to adults, past 5-year movement, foreign born, Hispanic residents, bars/population, restaurants/population, off-premise alcohol outlets/population	Population/area (–), female-headed families (+), poverty (+), unemployment (+), Hispanic residents (+), bars/population (+)	.72

Freisthler, Midanik,and Gruenewald (2004)	Census tracts	940	Substantiated child maltreatment reports (separated by physical abuse and neglect)/10,000	Population size, population/area, female-headed families, poverty, unemployment, vacant housing, population change, African American residents, persons older than 65 years, ratio of men to women, ratio of children to adults, past 5-year movement, foreign born, Hispanic residents, bars/population, restaurants/population, off-premise alcohol outlets/population	Physical abuse: female-headed families (+), poverty (+), Hispanic residents (+), off-premise/population (+) Neglect: female-headed families (+), poverty (+), unemployment (+), bars/population (+)	.45 .70
Freisthler et al. (2005)	Census block groups	304	Substantiated child maltreatment reports/1,000	Female-headed families, poverty, unemployment, vacant housing, African American residents, Hispanic residents, ratio of men to women, ratio of children to adults, past 5-year movement, owner-occupied housing, bars/ population, restaurants/population, off-premise alcohol outlets/population, drug possessions/ population, drug sales/population	Poverty (+), Hispanic (+), ratio of men to women (+), bars/ population (+), drug possessions/ population (+)	.55
Garbarino and Crouter (1978)	Census tracts	93	Substantiated reports/ 1,000 families	Income < $8,000, income > $15,000, female-headed households, married women with children younger than 6, past year movement, single family homes, vacant housing, views on neighborhood	Coefficients and significance levels not reported for multivariate analyses	—
Garbarino and Kostelny (1992)	Neighborhoods (20 to 39 census tracts apiece)	4	Substantiated child maltreatment reports	Unemployment, poverty, female-headed households, median educational attainment, ethnic/racial concentration, past 5-year movement, overcrowded housing	Coefficients and significance levels not reported for multivariate analyses	—
Gillham et al. (1998)	Areas	48	Registered case of physical abuse, sexual abuse, and neglect/child	Male unemployment, female unemployment, single parent density, free meals, free clothing, no. of social workers/children	Male unemployment (+)	—
Korbin, Coulton, Chard, Platt-Houston, and Su (1998)	Census tracts	189 White, 94 Black	Children with substantiated and indicated maltreatment reports/1,000 children	Factors for impoverishment, child care burden, and neighborhood instability; interaction between impoverishment and instability, adjacent to poverty indicator	European American: impoverishment (+), child care burden (+), instability (+), Impoverishment × Instability (–) African American: impoverishment (+), Impoverishment × Instability (–), adjacent to poverty (+)	.67 .51

(continued)

TABLE 1 (continued)

Study	*Geographic Unit*	N	*Child Maltreatment Outcomes*	*Independent Variables*	*Findings*[a]	R^2
Krishnan and, Morrison (1995)	District offices	48	Official reports/1,000 children	Population change, no. of children < 19, unemployment, females in labor force, native population, single parent density, northwest region	Population change (–), unemployment (+), native population (+), Northwest region (+)	.49
Young and Gately (1988)	Census block groups	155	Substantiated maltreatment reports/ 1,000 families with children	Unemployment, female-headed households, females in labor force with children < 6, past 5-year movement	Past 5-year movement (+)	.11
Zuravin (1986)	Census tracts	202	Families reported for child abuse and neglect/ 1,000 families with children	Race/ethnicity, poverty, less than 8 years of education, employment in blue-collar occupations, 1.01 persons/room, 1.51 persons per room	Coefficients and significance levels not reported for multivariate analyses	—
Zuravin (1989)	Census tracts	202	Families reported (separated by abuse and neglect)/1,000 families with children	Economic stress: income < $8,000, income > $15,000; Inadequate social support: female-headed households, past year movement, females in labor force with children < 6, single family homes, vacant housing	Abuse: income < $8,000 (+), female labor force (–), single-family homes (+), vacant housing (+)	.56
					Neglect: income < $8,000 (+), female labor force (–), single-family homes (+), vacant housing (+), past-year movement (+)	.65

a. (+) and (–) refer to the direction of the statistically significant relationship between that variable and the child maltreatment outcome.

TABLE 2: Characteristics of Multilevel Models of Child Maltreatment

Study	*Geographic Unit*	N	*Child Maltreatment Outcomes*	*Independent Variables*	*Findings*[a]
Molnar, Buka, Brennan, Holton, and Earls (2003)	Neighborhood clusters	80 (neighborhood clusters); 3,465 (caregivers); 4,252 (children)	Latent construct for parent-child physical aggression using the Conflict Tactics Scale	Neighborhood: factors for concentrated disadvantage, immigrant concentration, residential instability; Family: age, sex, and race/ethnicity of caregiver, family socioeconomic status (SES), Child: sex, age	Neighborhood: immigrant concentration (–), Family: age (–), family SES (–), male caregiver (–), other race (–), unemployment (+), single mother (+); Individual: male (+), 12, 15 years (–)
Coulton et al. (1999)	Census block groups	20 (neighborhoods), 400 (caregivers)	Child Abuse Potential Inventory score	Neighborhood: factors for impoverishment, child care burden, and neighborhood instability; Individual: social support, family income, violence in family of origin, married, education, neighborhood tenure; Interactions: Impoverishment × Violence, Child Care Burden × Education	Neighborhood: impoverishment (+), child care burden (+); Individual: social support (–), family income (–), violence in family (+), married (–), education (–); Interactions: Impoverishment × Violence (–), Child Care Burden × Education (–)

a. (+) and (–) refer to the direction of the statistically significant relationship between that variable and the child maltreatment outcome.

of percentage of families with incomes below the federal poverty line, the percentage of unemployed persons, the percentage of vacant housing, population loss, the proportion of African American residents, and percentage of female-headed households; they found that neighborhoods with higher impoverishment scores had higher rates of child maltreatment (Coulton et al., 1995). A later study by this same group suggested that this was true in predominantly European American as well as in African American neighborhoods (Korbin, Coulton, Chard, Platt-Houston, & Su, 1998). Sharing a geographic boundary with at least one other impoverished neighborhood (as measured by having at least 40% of residents below the poverty line) also was positively related to the rate of child maltreatment (Coulton et al., 1995), particularly for predominantly African American neighborhoods (Korbin et al., 1998). Neighborhood poverty (as measured by the percentage of families with income less than 200% of the poverty line) was one of the strongest predictors for both neglect and child abuse among 202 census tracts in Baltimore, Maryland (Zuravin, 1989).

Several studies examined the effect of poverty on type-specific rates of maltreatment. Drake and Pandey (1996) reported a positive relationship between neighborhood poverty and sexual abuse, whereas Ernst (2000) found no relationship. Poverty is consistently related to higher rates of physical abuse (Drake & Pandey, 1996; Ernst, 2000; Freisthler, Midanik, & Gruenewald, 2004; Zuravin, 1989) and child neglect (Drake & Pandey, 1996; Freisthler et al., 2004; Zuravin, 1989). One multilevel study found a main effect of neighborhood impoverishment on an individual caregiver's child abuse potential (Coulton, Korbin, & Su, 1999). Thus, after controlling for individual family poverty, neighborhood impoverishment remained positively related to child abuse, indicating a neighborhood effect of socioeconomic disadvantage for maltreatment.

Housing Stress

Housing stress incorporates multiple components of neighborhood housing structure, including residential instability, owner-occupied housing, and vacant housing units. Areas with a greater density of vacant housing and fewer owner-occupied housing units may be places where property investment (e.g., time and money spent on lawn care, home repairs, etc.) is less valued. Residential instability is the degree to which people move in and out of the neighborhood; more stable neighborhoods are those where residents have lived there for long periods of time. Residential instability has been measured previously as a single variable of the percentage of residents living in their current residence for less than a year (Zuravin, 1989). Utilized as a factor score, the measurement has included the percentage of people who resided in the neighborhood for less than 10 years, the percentage of residents who moved in the last 5 years, and the percentage who moved in the last year (Coulton et al., 1995; Ernst, 2001).

Examining 155 geographic areas in El Paso, Texas, Young and Gately (1988) found that the percentage of families who had moved in the last 5 years was a significant predictor of substantiated reports of child maltreatment. Several other studies examining neighborhood predictors of child abuse and neglect also have suggested that residential instability is associated with higher rates of child maltreatment (Coulton et al., 1995; Deccio et al., 1994; Ernst, 2001). Korbin et al. (1998) found that instability was positively related to maltreatment in predominantly European American neighborhoods but not in African American neighborhoods. Amount of vacant housing also has been associated with higher rates of maltreatment (Freisthler, 2004; Freisthler, Needell, et al., 2005), but no such associations have been found for percentage of owner-occupied housing (Freisthler, Needell, et al., 2005).

Ernst (2000) documented a positive relationship between the density of single-family homes and sexual abuse but found no relationship between past year movement and sexual abuse. Neighborhood areas with more single family homes (Ernst, 2000; Zuravin, 1989), more vacant housing (Zuravin, 1989), and lower median residential property values (Drake & Pandey, 1996; Ernst, 2000) had higher rates of physical abuse. Ernst (2000) found a positive relationship between past year movement and physical abuse, although two additional studies found no relationship (Freisthler et al., 2004; Zuravin, 1989). Percentage of single-family homes and percentage of past year movement by neighborhood residents have shown a positive relationship with child neglect (Zuravin, 1989); however, Freisthler et al. (2004) found no relationship between moving within the past 5 years and neglect. Thus, housing stress appears to be positively related to overall rates of maltreatment, but the evidence is more ambiguous when considering maltreatment-specific rates.

Child Care Burden

Child care burden refers to the amount of adult supervision and resources available in neighborhoods to care for children (Coulton et al., 1995). Child care burden has been conceptualized as a factor score of the ratio of children to adults, percentage of residents

older than 65, and ratio of men to women in an area (Coulton et al., 1995; Korbin et al., 1998). When used as a factor score, child care burden was related to higher rates of child maltreatment in all neighborhoods (Coulton et al., 1995), and in predominantly European American neighborhoods (Korbin et al., 1998). Freisthler, Needell, et al. (2005) found that rates of child maltreatment were higher in areas with higher ratios of adult men to adult women. As women continue to engage in more hours of primary caregiver activities per day (U.S. Bureau of Labor Statistics, 2005), a higher ratio of adult men to adult women may indicate that in these neighborhoods women have even greater levels of child care responsibilities, increasing aggregate levels of child care burden.

Other investigators have measured child care burden as the percentage of women in the workforce (Ernst, 2000; Young & Gately, 1988; Zuravin, 1989). In these studies, the percentage of women in the labor force is an indicator of child care burden because it reflects the stress placed on a woman's role as caregiver (Young & Gately, 1988). It was expected to have a positive relationship to rates of child maltreatment, that is, more women in the labor force would be associated with higher rates of child abuse and neglect, presumably due to an increase in child care burden. Counterintuitively, when child care burden was operationalized in this manner, studies found a negative relationship between a higher percentage of working women and child maltreatment (Young & Gately, 1988; Zuravin, 1989). Post hoc hypotheses for this finding suggest that working women may be connected to greater resources in the community, such as social support and stable child care centers (Young & Gately, 1988). The availability of these resources may serve to decrease neighborhood child care burden and hence decrease rates of child abuse and neglect. A competing explanation for this finding is that women who work are more competent (e.g., demonstrated by their ability to secure and maintain employment) and personal characteristics associated with competence lessen the likelihood of maltreatment.

Similarly, areas with higher percentages of women participating in the labor force had lower rates of child sexual abuse (Ernst, 2000), child physical abuse (Ernst, 2000; Zuravin, 1989), and child neglect (Zuravin, 1989). In a multilevel study, Coulton and colleagues (1999) found a main effect of child care burden on child abuse potential controlling for individual caregiver characteristics. Examination of a cross-level interaction between child care burden and caregiver education found that caregivers with more education, who lived in areas with greater child care burden, were less likely to be abusive.

Unemployment

Zuravin's (1989) review of child maltreatment studies found that the percentage of people unemployed in a neighborhood was positively associated with both substantiated and unsubstantiated maltreatment reports. It has been hypothesized that the rate of joblessness may change the socioeconomic structure of a neighborhood (Steinberg, Catalano, & Dooley, 1981), thus affecting aggregate levels of neighborhood child maltreatment reports. Young and Gately (1988) found that the percentage of unemployed within a neighborhood was a significant predictor of children maltreatment for male, but not female, perpetrators. A study of 48 district offices in Alberta, Canada, reported a significant positive relationship between the percentage unemployed in an area and reports of child maltreatment (Krishnan & Morrison, 1995), but Freisthler (2004) found a significant positive relationship between unemployment in 940 census tracts in three California counties and substantiated reports of child maltreatment. These investigators found no relationship in a study of 304 census block groups in a Northern California city (Freisthler, Needell, et al., 2005).

A study examining a child's "career" in the child welfare system found that male unemployment was highly correlated with physical abuse (Gillham et al., 1998). This study examined both male and female unemployment rates within 22 neighborhood areas in Scotland for registered child abuse and neglect cases throughout a 3-year period (Gillham et al., 1998). They concluded that living in neighborhoods with high rates of male unemployment places children at a greater risk of being physically abused. Unemployment rates are positively associated with child neglect (Freisthler et al., 2004).

Alcohol and Drug Availability

More recent neighborhood studies examining environmental characteristics of neighborhoods have found that alcohol and drug availability are related to rates of maltreatment. Specifically, neighborhood areas with more bars and more drug possession incidents per population are related to higher rates of child abuse and neglect (Freisthler, 2004; Freisthler, Needell, et al., 2005). Freisthler et al. (2004) found a differential relationship between alcohol availability and type of child maltreatment. These researchers show that neighborhoods with higher densities of off-premise alcohol outlets have higher rates of physical abuse. In the case of child neglect, there was a positive relationship with greater concentrations of bars and pubs.

Although these investigators found a relationship between alcohol and drug availability and rates of maltreatment, there are only a handful of such studies that assessed this relationship, and those focused primarily on urban and suburban areas. Future studies should attempt to replicate these results in other ecological studies of child maltreatment and in both rural and urban areas.

Family Structure

Research examining differences between neighborhood characteristics and rates of child maltreatment studied other variables to further sort out this relationship. For example, family structure was operationalized as the percentage of female-headed households (Ernst, 2000; Freisthler, 2004; Zuravin, 1989), percentage of two-parent homes (Drake & Pandey, 1996), and single parent density (Gillham et al., 1998; Krishnan & Morrison, 1995). Only Freisthler (2004) found a positive relationship between the percentage of female-headed families and maltreatment, whereas Drake and Pandey (1996) found a positive relationship between two-parent families and both physical abuse and neglect. The remaining studies found no relationship between family structure and maltreatment. The discrepancies in these findings may be due to statistical methodology and insufficient sample size. Freisthler (2004) used spatial regression models that assess and control for spatial autocorrelation and provide more accurate estimates of the statistical tests of the coefficients. Regarding sample size, the studies that detected no relationship between family structure and neighborhood rates of child maltreatment ranged from 48 to 940 neighborhood areas, with the latter finding statistical significance. Thus, increased statistical power in that study may account for the statistically significant relationship. These measures of family structure may inadequately represent family typologies that may affect neighborhood rates of maltreatment (e.g., multiple generation homes).

Neighborhood Density

Zuravin (1986) examined the impact of neighborhood residential density and child maltreatment. She hypothesized that neighborhoods with more overcrowding may be less supportive than neighborhoods with fewer overcrowded households. Zuravin examined 202 census tracts and, after controlling for ethnicity and socioeconomic class, the percentage of homes with 1.51 people per room was positively associated with higher rates of reported child maltreatment. Neighborhood areas can be residentially dense (more people per room) yet not be located in areas with high populations of children (e.g., population density). Freisthler (2004) examined the relationship of overall child population rates and neighborhood rates of maltreatment and reported that population per square mile was negatively related to rates of maltreatment. Based on density dependence analyses, it appears that as more children are found in smaller neighborhood areas, a leveling off of substantiated reports occur (Freisthler, 2004). Put in other words, at a certain level of population density, the rate of maltreatment in that area stabilizes.

Social Support

Various studies measuring social support have found a negative relationship between the amount of social support and rates of child abuse and neglect (Garbarino & Sherman, 1980; Vinson, Baldry, & Hargreaves, 1996). These studies differ from the previous studies in that instead of using many neighborhoods and census variables to proxy neighborhood characteristics, they have chosen pairs of neighborhoods that are at high or low risk for child maltreatment. When neighborhood socioeconomic status is taken into account, these studies report that the high-risk neighborhoods had fewer neighborhood resources and support than the low-risk neighborhoods (Garbarino & Kostelny, 1992; Garbarino & Sherman, 1980; Vinson et al., 1996).

Immigrant Concentration

Immigrant concentration, often used as a proxy for underdeveloped support networks,[4] was negatively related to sexual abuse when measured as residents who arrived in the United States in the past 5 years (Ernst, 2000) and negatively related to physical abuse when measured as a factor score with high loadings of percentage foreign born and percentage Hispanic (Molnar, Buka, Brennan, Holton, & Earls, 2003). Studies have found that neighborhoods with higher rates of physical abuse have higher percentages of Hispanic residents (Freisthler et al., 2004). With regard to child neglect, studies have found that higher rates of neglect are positively associated with neighborhood areas characterized by higher percentages of residents without a high school education (Drake & Pandey, 1996).

SUMMARY OF MAJOR CONCLUSIONS

This review has documented a stable ecological relationship between rates of child maltreatment and neighborhood poverty, housing stress (e.g., residential instability, vacant housing), and drug and alcohol availability. [5] Areas with increased levels of poverty,

housing stress, and drug and alcohol availability have higher rates of child maltreatment, and these relationships appear to be maintained across various ways of measuring maltreatment and defining neighborhood. Although evidence suggests that neighborhood child care burden (depending on how it is measured) and the unemployment rate also may contribute to rates of maltreatment, the findings are not conclusive. Future research needs to be conducted to further delineate how and why these factors may be related to rates of child abuse and neglect. Little empirical evidence exists supporting a relationship between family structure and maltreatment at the neighborhood level. Thus, aggregate measures of family structure (e.g., percentages of female headed families) may not be indicators of underlying neighborhood processes related to child maltreatment. Finally, more research needs to be conducted on how neighborhood levels of residential density (as measured by number average number of individuals per room in a home), population density (i.e., number of individuals within a neighborhood area), social support, immigrant concentration, and availability of resources are related to rates of child maltreatment before definitive conclusions can be drawn.

These gaps in the research support the necessity of developing a more thorough understanding of how neighborhood characteristics exert their influence on varying types of child maltreatment. An important limitation of all the studies included in this review is their cross-sectional nature that only allows for discussion of correlational associations between maltreatment and neighborhood features. The next generation of ecological studies of child maltreatment needs to explicate the processes and mechanisms through which specific neighborhood characteristics are believed to exert their effect and establish a temporal relationship between these neighborhood processes and child abuse and neglect to determine causality. Finally, excluding Coulton and colleagues (1995, 1999), these studies have been primarily concerned with direct effects of neighborhood characteristics on rates of maltreatment. We need a better understanding of how neighborhood characteristics interact with each other and with individual characteristics to provide a clearer picture of the social processes and mechanisms involved in the maltreatment of children.

PERSON AND PLACE CHARACTERISTICS

If features such as impoverishment, population instability, and family structure figure importantly in the production of problems, then presumably they exert their effect via certain processes or mechanisms. Although many neighborhood researchers tend to frame their work within a theoretical perspective, they do not explicitly articulate and examine the processes and mechanisms by which neighborhood characteristics exert their effects. The critical question is how certain features of neighborhoods bring about change in a given phenomenon of interest. When so many variables are used to try to better understand a given phenomenon of interest, it can be helpful to use a person-centered versus place-centered approach to help clarify thinking from both theoretical and analytical perspectives. Person-centered refers to characteristics of individuals that have been aggregated to some geographic unit. Poverty, residential instability, child care burden, unemployment, female head of household, social networks, and immigrant status are some examples of person-centered characteristics that were included in the studies reviewed. Place-centered characteristics refer to specific features of the physical environment. Specific place-centered variables reviewed here include vacant housing, alcohol and drug availability, property value, residential density, and population density. Place characteristics also would include availability of and access to neighborhood-based resources and services that may prevent or reduce maltreatment. As an example, a person with low income (person characteristic) may live in an area with a good transportation system (place characteristic) and a number of child care centers (another place characteristic). From a theoretical perspective, the person-place classification can be extended to characterize theoretical frameworks used to describe neighborhood processes thought to affect maltreatment. It can help to clarify where in the model a particular variable or construct fits, how to best measure it and how to articulate its role in relationship to the outcome of interest, and in this case, its role in increasing or decreasing the likelihood that a child will be abused or neglected.

In addition, neighborhood processes that refer to interactions between and among neighborhood residents (e.g., social support) are separated from purely physical features of neighborhoods that may contribute to maltreatment. Of importance, social reality is at the interaction points between person-centered and place-centered constructs; these are the social processes that ecological researchers aim to understand and model (e.g., residents' participation in neighborhood activities and organizations that are prosocial in nature, such as neighborhood watch groups or local school activities). These types of measures are generally absent from the literature.

This classification can be extended to include current theoretical frameworks that attempt to understand neighborhood characteristics and their relationship to problem outcomes. In particular, theories such as social disorganization, social capital, and routine activities have been used to unravel these relationships. In a broad sense, social disorganization refers to deviant behaviors and the societal context that produces them (Shaw & McKay, 1942). Neighborhoods that are socially disorganized are those that lack a structure to help maintain social controls that allow communities to realize commonly held values. Thus, social disorganization directs conceptual thinking primarily toward person-centered characteristics.

Disorganization is most often measured by poverty, residential instability, and immigrant concentration (Sampson, Raudenbush, & Earls, 1997). Relying on those measures, the studies reviewed here show positive associations between impoverishment and residential instability and neighborhood rates of child maltreatment, thus providing some support for this theory. Immigrant concentration was found to be negatively related to child maltreatment (Ernst, 2000; Molnar et al., 2004) and not related to maltreatment (Freisthler, Needell, et al., 2005). In general, the child maltreatment literature has been somewhat contradictory about differential rates of abuse/neglect among cultural or ethnic populations (Korbin, 1997). One difficulty is that ethnicity must be consistently disentangled from socioeconomic status. Another is that immigrant populations have cultural differences that affect family relationships in general, and child rearing practices in particular. Finally, it may be argued that immigrant concentration is a place characteristic rather than a person characteristic. If one argues from this perspective, it may be that immigrant concentration must be disentangled from other physical features of the environment, such as the differential availability of social services for these populations. The interaction of these other variables with ethnicity may be at points such as whether family difficulties are managed informally within kin networks or by recourse to public agencies. Thus, additional research needs to be conducted to better elucidate these complex relationships.

Routine activities theory is essentially a place-centered framework that focuses on how a neighborhood's physical structure relates to where and when people conduct their daily life and how that may place them at greater or lesser risk for harm such as crime. Routine activities theory states that for harm to occur there must be a motivated offender, a suitable target, and the absence of guardians who are capable of preventing the harm from occurring (Cohen & Felson, 1979).

Freisthler et al. (2004) relied on this theoretical framework in their study of the differential relationship between type of alcohol outlet (i.e., bars, off-premise outlets) and type of maltreatment (i.e., neglect, physical abuse). These investigators hypothesized that the processes affecting the relationship between alcohol outlet density and child neglect and child physical abuse at the neighborhood level may differ. Furthermore, they interpreted previous studies delineating neighborhood characteristics by type of maltreatment within this paradigm. As such, an increase in the number of single parent homes was characterized as a decrease in guardians available to prevent maltreatment from occurring, whereas in two-parent homes, the presence of a second adult was thought to act as a deterrent to abuse or neglect. Lack of resources, social support, and increased feelings of isolation in a neighborhood may provide a catalyst that triggers abuse or neglect behaviors in an individual who otherwise might not be so inclined. In Freisthler's model, children are viewed as suitable targets because they are often weaker and more vulnerable due to their age. They also may be socialized to believe that what occurs in the home is private. This helps ensure that the child will not discuss the abuse with other adults who might intervene. These factors can converge at various points to create maltreatment.

Further examination of this theory shows that the positive relationship between past year movement and child neglect may decrease the availability of guardians as more social networks and support systems are disrupted (Ernst, 2000; Freisthler et al., 2004). The fact that the percentage of two-parent families is negatively related to both abuse and neglect may be interpreted as an increase in guardians in the home (Drake & Pandey, 1996). Freisthler et al. (2004) reported a positive relationship between the density of bars and rates of child neglect, whereas off-premise alcohol outlets were positively related to rates of child physical abuse. Thus, parents' routine activities related to drinking locations may affect rates of maltreatment. The use of routine activities theory suggests specific pathways by which this relationship occurs. Parents may go to bars or pubs to socialize and leave children at home alone. Caregivers may obtain alcohol from off-premise outlets and go home to drink. Drinking may reduce their inhibitions toward aggression and result in a greater propensity for abuse. This line of thinking and type of research can provide useful information on ways to prevent maltreatment (e.g., reduce density of bars and pubs in areas at high risk for neglect).

Social capital theory provides some framework for studying the interactions between person-centered and place-centered paradigms. Coleman (1988) first termed the phrase "social capital" to refer to norms, networks, and interpersonal relationships through which informal interactions occur. It is a resource that relies on reciprocity, trustworthiness, and obligations between people (Coleman, 1988). As such, social capital theory represents interaction points between people and places. Social capital theory holds several implications for preventing and intervening in neighborhoods around child maltreatment. Neighborhoods where members participate in associations that have at their core trust and reciprocity may be better equipped to prevent child abuse and neglect. However, these networks can be destroyed when inequality or divisions among groups occur (Jack & Jordan, 1999). Examination of the degree to which neighbors participate in organizations and trust individuals or institutions may help illuminate why rates of maltreatment are high in some neighborhoods and not in others. To date, this theory has been the least researched, with only social support being systematically examined (Garbarino & Sherman, 1980; Vinson et al., 1996).

In summary, both social disorganization and routine activities theory provide a useful theoretical framework for understanding processes related to the ecology of child maltreatment, whereas social capital theory remains a promising framework for understanding neighborhood interaction effects on child maltreatment; yet, direct measures of neighborly ties and interactions, mutual trust, shared expectations, land use, and social activity patterns are largely absent from the current literature. More research is necessary to explicate the specific pathways that may affect child abuse and neglect.

METHODOLOGICAL DILEMMAS

There are several methodological challenges to conducting neighborhood-level research, including the thorny problem of how to define and measure a neighborhood as a unit of analysis and how to select and measure neighborhood processes, appropriate spatial analysis techniques, and self-selection into particular neighborhoods.

Unit of Analysis

Most studies employ administrative units to represent neighborhood boundaries. One limitation in the use of these predetermined units is that higher levels of aggregation may lose some of the variation across units as data from more individuals within these units are used to create measures. This may result in neighborhoods appearing to have greater similarity at higher levels of aggregation (e.g., counties vs. census tracts). Findings related to social problems that consistently emerge at multiple levels of geography increase confidence that some underlying neighborhood process or mechanism is producing these results. A second limitation is that these administratively constructed areas may not accurately capture neighborhood boundaries as viewed by the residents, thus making it difficult to shed light on the salient neighborhood processes. In an attempt to address this problem, Coulton, Korbin, Chan, and Su (2001) mapped neighborhoods using residents' perceptions as a guide. Although these perceptions are likely to share common areas, they also are likely to differ on the edges of neighborhoods as each resident's experience is slightly different than another's. By using common areas based on perceptions, researchers can obtain a better grasp on real neighborhoods, which in turn makes it possible for researchers to better select and measure the processes most relevant to an outcome of interest.

Variable Selection and Measurement

This review of the literature confirms that the vast majority of studies that examine the role of neighborhood characteristics on child maltreatment do so utilizing estimates of population characteristics; that is, these studies incorporate measures of population characteristics within defined areas (e.g., poverty percentages within neighborhoods, percentages of people who have moved in the past 5 years). These measures are primarily obtained from Census or other archival databases and generally reflect aggregated characteristics of individuals. Thus, these measures can only provide a static picture of neighborhoods, which inadequately reflects how neighborhood structures and social processes exert their influence on a particular outcome. As an example, archival measures of family structure cannot adequately assess extended kin networks in and around a neighborhood that may provide support and resources to family members. General population surveys of residents would allow for a more detailed inquiry about neighborhood norms and processes. Self-report survey data also would give more accurate estimates of child abuse and neglect levels because they would not rely on reports from official investigation agencies, thus helping to eliminate underreporting biases (Theodore et al., 2005).

Measures that are able to capture neighborhood dynamics and processes need to be further developed, tested, and utilized in ecological studies. The

development of measures that portray neighborhood processes such as social ties and daily land use patterns would enable researchers to build conceptual models, specify relationships, and conduct analyses to gain a more comprehensive understanding of how neighborhood effects operate. "Ecometrics," as it has been called (see Raudenbush & Sampson, 1999), would establish the ability to measure and assess both current neighborhood processes as well as factors that influence how those processes develop and change over time.

Raudenbush and Sampson (1999) present a detailed plan about how to systematically observe disorder in neighborhoods (e.g., presence of graffiti, loitering) to study the production of crime. In a sample of 80 neighborhood clusters in Chicago, observers drove down streets coding information on face-blocks about land use, traffic, physical condition of buildings, and evidence of physical disorder. In addition, a pair of video recorders taped the social activities and physical features of the face-blocks. These methods allowed the researchers to develop scales related to both physical and social disorder based on observational data. These scales were used to test theories about the neighborhood production of crime. These techniques could be used to study child maltreatment by direct observation of social phenomena (e.g., children walking to school with an adult guardian) and serve as a qualitative supplement to survey data.

Spatial Analysis

Currently, all of the studies that examine the ecology of maltreatment have done so cross-sectionally. The next generation of ecological studies of neighborhood effects requires the use of specialized statistical techniques that can address the problems of spatial autocorrelation and clustering. Spatial regression procedures manage statistical problems related to spatial autocorrelation, whereas hierarchical linear models handle problems associated with clustering of individuals within the same neighborhood areas (for further information on these problems and techniques that address them, see Notes 2 and 3). Freisthler, Lery, Gruenewald, and Chow (in press) demonstrate that when traditional statistical methods are applied to ecological studies without appropriate controls for spatial autocorrelation, Type I or Type II errors may result. The three studies that use spatial regression procedures find statistically significant positive spatial autocorrelation ranging from .144 to .545 (Freisthler, 2004; Freisthler et al., 2004; Freisthler et al., 2005). In the absence of appropriate controls, the presence of such positive spatial autocorrelation could result in reporting statistically significant findings where none really exist. Thus, discrepancies in some of the findings reviewed here may be an artifact of the use of less-sophisticated statistical techniques that do not account for these problems.

One common disconnect between theory and design is that ecological research looks solely at characteristics of the individuals' place of residence when in fact many activities of interest unfold in multiple locations, often outside the residential neighborhoods in which the persons engaged in these behaviors actually live. Parents and guardians of young children may bring their child to school, take a bus to work, and return at the end of the day to pick up their child in some after-care arrangement. Spatial lags describe a situation where characteristics in surrounding neighborhoods affect rates of problems in local areas (see Freisthler et al., in press). In someinstances, persons who reside in one neighborhood are more heavily influenced by experiences that they have in an adjacent area (e.g., low-income family districted for a more affluent school district). Thus, theory should address what surrounding neighborhood characteristics may play a role in rates of maltreatment and analytic models should include variables that take into account this spatial dynamic.

As ecological studies become more sophisticated, spatial analyses can begin to encompass individual characteristics in a spatiohierarchal format (see Banerjee, Carlin, & Gelfand, 2004). This method is similar to hierarchical linear modeling (HLM) used by two studies reviewed here (Coulton et al., 1999; Molnar et al., 2003) but contains proper controls for spatial structure at the neighborhood level. In essence, these models combine multilevel procedures that adjust estimates due to intraclass correlations with techniques designed to adjust estimates due to spatial autocorrelation. Moreover, the techniques designed to do this enable researchers to model spatial structure of neighborhoods as spatial random effects. When researchers properly model these spatial dynamics (i.e., include all relevant variables measuring neighborhood processes), these random effects are less likely to be statistically significant. Inclusion of spatial lag variables that model the effect of characteristics from adjacent areas on local rates of maltreatment may adequately represent underlying spatial processes, resulting in no further need to model spatial structure as random effects.

The next step for ecological researchers is to begin to examine these processes temporally to assess how changes in the neighborhood environment can affect

changes in rates of child abuse and neglect. Techniques are available that permit the analysis of space and time interactions controlling for both spatial and temporal autocorrelations. In cases where both space and time are examined, these methods allow us to understand how maltreatment rates in local areas are influenced by neighboring areas. In general, this model would allow us to examine (a) whether a temporal trend exists, (b) if this temporal trend varies by county, and (c) if there is a separate spatial structure/process. These advanced spatial models also enable researchers to study the diffusion process of child maltreatment. For example, when the abusive behavior of a few is not sanctioned, does the behavior spread to other families? More generally, does a lack of a specific social mechanism, such as social controls around negative behaviors, generate greater production of these behaviors in a degenerative ecological cycle?

Selection Bias

Selection bias is a major challenge facing neighborhood research. How does one know an outcome is the result of neighborhood factors rather than the differential selection of families into certain neighborhoods? The challenge is to separate the role of neighborhood context from the selection bias that may accompany individual choice about residence. Just as one factor will never explain all of the variation in an outcome of interest, it is unlikely that selection bias, to the degree it operates, will be the single most important explanatory variable of interest. Science must move forward while taking into account these types of limitations and designing research that addresses challenges such as selection bias.

Ecological Fallacy

Finally, neighborhood research is often criticized for committing the "ecological fallacy." Ecological fallacy refers to the process of incorrectly making assumptions about individuals' behaviors from neighborhood-level data (Selvin, 1958). Clearly, findings that relate neighborhood poverty to rates of maltreatment should not be interpreted as a greater propensity of individuals living in poverty to abuse or neglect their children. Instead, neighborhood poverty may be a proxy for lack of resources, such as social services, neighborly ties, or adequate child care, which strains individuals and can lead to higher rates of child maltreatment. In addition, a strictly physical environmental measure of neighborhoods, such as alcohol outlet density, refers to a collective number of places at the neighborhood level that can affect individuals who reside in the area. For example, an excess of bars in a neighborhood may draw gatherings of unruly, often intoxicated patrons. These conditions might serve to constrain parental choices about where and when children can safely go outdoors; children who cannot safely play outdoors or walk to the local library wind up staying indoors. This can serve as an irritant to parents trying to make dinner or tend to younger siblings, thus adding to the potential for abuse. In sum, social and physical structures that manifest their influence at the neighborhood level can have important implications for the safety and well-being of children.

CONCLUSION

Throughout the past 20 years, there has been a move away from a traditional fixation on static features of individuals (race, socioeconomic status) and toward a focus on multilevel influences, including how certain features of neighborhood life bring about change in a given phenomenon of interest. This has led to unique attempts to empirically measure social interactional and institutional dimensions that might explain how neighborhood effects work out in the day-to-day life of communities.

Certainly, there is substantial cross-sectional evidence that child maltreatment is related to features of the larger neighborhood environment. The mechanisms that underlie these relationships have not been fully explored and lead one to ask, "What is it about the environment that may affect the prevalence of child maltreatment?" This question must be addressed and the findings translated into effective intervention efforts. Toward that end, studies that examine the causal mechanisms of neighborhood dynamics, together with appropriate spatial analytic techniques, will contribute much to advance the understanding of the etiology of child maltreatment.

Interventions designed to prevent or reduce child abuse and neglect are a natural extension of such research. Ecological studies may suggest environmental approaches that are not often used in the prevention of child maltreatment. For example, prevention efforts may take the form of changing access to alcohol through zoning and planning ordinances or by local policy decisions that reduce the days and times for the sale of alcohol. Opportunities to develop multisystemic interventions may arise by continuing to develop and refine these multilevel models. The results from these studies may suggest multitier prevention efforts that may prove more effective than a single intervention designed to only affect caretakers, families, or communities as separate entities. An example of this multitier approach might be an intervention that aims to reduce alcohol

availability while enhancing parental monitoring. Another example is social science research showing that certain types of roadways, such as residential streets that have only one lane in each direction and do not have a divider, may increase neighborly relations among residents (Grannis, 1998). This is likely a result of lessened automobile and foot traffic typically associated with streets that run through an entire area or to and from highways. This roadway modification may make it easier to determine who lives in the area, thereby supporting the development of friendships. Thus, an intervention that reroutes traffic away from neighborhoods where large numbers of children live may serve to increase neighborly contacts, which in turn increases neighborhood-level capacities for social support and decreases maltreatment.

Evidence-based interventions should be implemented on a scale large enough to have an effect but focused enough to ensure a rigorous evaluation for efficacy and effectiveness. At their core, such interventions need to focus on explicitly stated social processes that result in harm to children across ecologically defined units of analysis. This means studying the interactions between person and place characteristics that create situations where abuse is more or less likely to occur. Are parents whose social support system is located within their neighborhood of residence better connected to local services? Are neighbors more likely to intervene in problematic behaviors for the good of the neighborhood when social ties have been developed because children in the neighborhood play in the same park or on the same sports teams? Or does the lack of such programs or places constrain the opportunities for developing supporting parenting networks that might lessen feelings of isolation and prevent maltreatment? Answers to these kinds of questions encourage researchers to create maps of social networks and social ties to examine how resources are utilized both within and across neighborhoods.

NOTES

1. Assuming 50% of those substantiated cases were precipitated by parental substance use (Child Welfare League of America, 1990), with 64% of those due to parental alcohol use (U.S. Department of Health and Human Services, 1993).

2. The majority of studies use ordinary least squares (OLS) regression, whereas a few use more advanced spatial regression procedures that assess and control for spatial autocorrelation. Spatial autocorrelation refers to the condition of adjacent spatial units (i.e., neighborhoods that share a boundary) being correlated and that errors in measurement from statistical models also may be correlated between adjacent units (Cliff & Ord, 1973, 1981). Lack of controls for positive spatial autocorrelation results in smaller standard errors and a higher propensity for committing Type I errors, thus inflating nominally significant relationships.

3. Hierarchical linear modeling (HLM) was used in two studies reviewed here. HLM was designed to adjust for the intraclass correlations found when individuals are nested within some unit, such as neighborhoods. In this case, individuals living in the same neighborhood area may experience the neighborhood environment in similar ways and share characteristics related to that. Furthermore, studies that use HLM can assess the contribution of individual and neighborhood characteristics separately for their effects on child maltreatment. HLM also can be used to examine cross-level interactions or the interactions between individual and neighborhood-level characteristics.

4. Immigrant concentration is related to decreases in density of friendship networks (Sampson, 1991) and increases in various types of victimization rates (Sampson & Groves, 1989).

5. As mentioned, alcohol and drug availability has only been studied at the neighborhood level by one group of researchers.

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