Child Maltreatment
16(4) 300-311

DOI: 10.1177/1077559511428801
http://cm.sagepub.com
SAGE

The Availability of Neighborhood Early Care and Education Resources and the Maltreatment of Young Children

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Abstract

Using Census and administrative data for 2052 Census tracts in a large urban county, this study explores the relationship between several indicators of social organization and neighborhood rates of child maltreatment for 0- to 5-year-olds. Spatial regression models demonstrate that neighborhoods with a higher percentage of 3- and 4-year-olds attending preschool or nursery school, both locally and in adjacent neighborhoods, had lower rates of early maltreatment referrals and substantiations. Neighborhoods with more licensed child care spaces relative to child care need, as defined by the number of 0- to 5-year-old in the neighborhood with working parents, had lower rates of early child maltreatment referrals. However, neighborhoods with a greater spatial density of child care center spaces, defined as the number of licensed child care center spaces or "slots" per square mile, had higher rates of early child maltreatment referrals. Neighborhoods characterized by concentrated socioeconomic disadvantage, inadequate resources for informal child supervision, and ethnic heterogeneity experienced higher rates of early child maltreatment referrals and substantiations, while neighborhoods with larger concentrations of affluent residents and immigrants experienced lower rates. These results point to the importance of community context in understanding child maltreatment risk. They also suggest that early care and education resources may deserve special attention when developing community-based prevention programs to reduce the maltreatment of young children.

Keywords

child maltreatment, child care, communities, community services, ecological models

Young children in the United States are at heightened risk for child maltreatment. In 2009, a third (33.4%) of the 702,000 maltreated children identified by U.S. child protection authorities were infants and toddlers less than 4 years old, and this age group had the highest rate of abuse and neglect at 13.6 for every 1,000 children of the same age in the population. In comparison, older children 4 through 17 years were maltreated at a rate of 8.0 for every 1,000 children of the same age (United States Department of Health and Human Services, Administration for Children and Families [ACF], 2009). Infants and toddlers also constitute the largest and fastest growing segment of the nation's foster care population (Vig, Chinitz, & Shulman, 2005). In 1993, 23% of America's foster children were less than 6 years old (Maza, 1996 in Berrick, Needell, Barth, & Jonson-Reid, 1998). Sixteen years later, this figure had almost doubled to 45% (ACF, 2010). This "infantalization" (Berrick et al., 1998, p. vii) of the child welfare system is particularly concerning because young children are severely injured and die as a consequence of abuse or neglect more often than older children (ACF, 2009). In the United States, an estimated 1,770 children died from maltreatment in 2009, and more than four-fifths (80.8%) of them were younger than 4 years old (ACF, 2009). Even when outcomes are less serious, the developmental sequelae of early maltreatment can still be pernicious, sometimes resulting in debilitating and long-lasting physical, behavioral, socioemotional, and cognitive problems (Lansford et al., 2002; Stahmer et al., 2005; Zimmer & Panko, 2006).

The growing number of infants and toddlers in the U.S. child welfare system highlights a need for child abuse prevention and intervention programs for families with young children. However, many of the existing programs designed to reduce maltreatment for this age group, such as targeted home visiting and parent education programs, use a secondary or tertiary prevention approach requiring that "at risk" or maltreating families first be identified and potentially stigmatized as a precondition of service (Faver, Crawford, & Combs-Orme, 1999; Howard & Brooks-Gunn, 2009; Lundahl, Nimer, & Parsons, 2006). "Ecological" interventions that focus on changing neighborhood and community environments to make them more supportive for families of young children may

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provide a promising *primary* prevention approach to reducing early child maltreatment.

Why Focus on Early Care and Education and Child Maltreatment? There are several reasons to anticipate that increasing the availability of early care and education (ECE) services within neighborhoods may make them more habitable for families with young children and help reduce child maltreatment. These reasons vary somewhat depending on the type of ECE service in question, however. ECE services in the United States take several forms, including unregulated or ''informal'' care provided by a relative, nanny, or babysitter; family day care provided to a small number of children in a professional caregiver's home; and center-based care often provided to larger numbers of children in an institutional setting (Magnuson & Waldfogel, 2005). While center-based programs share the same regulatory requirements related to minimum health and safety standards, school-based programs (i.e., preschools and nursery schools) are popularly perceived as being more educationally focused than other forms of center-based care (BabyCenter, 2011).

ECE services of all kinds have the potential to provide a safe alternative to less reliable forms of child supervision and reduce parental stress by offering respite from the difficult task of caring for an infant or toddler. High-quality ECE programs that promote children's socioemotional and cognitive development may also help prevent abuse by reducing challenging behavior at home and in the school that can lead to parent–child conflict (Mersky, Topitzes, & Reynolds, 2011; Reynolds & Robertson, 2003).

In addition, social disorganization theory suggests that the local availability of child care centers can help reduce child maltreatment at the community level. According to this theory, neighborhoods characterized by residents' active participation in local institutions tend to be more effective at organizing against neighborhood problems. Participation in local institutions is thought to promote interaction between residents, formation of support networks, the development of shared norms and expectations for resident behavior, and ultimately a greater sense of ''collective efficacy'' that equips residents to effectively exert social control to discourage undesirable behavior in the community (Sampson, 2001; Shaw & McKay, 1969). An extrapolation of this theory suggests that the presence of ECE organizations within neighborhoods may promote parents' development of social connections to other parents as well as shared values and norms regarding acceptable parenting. In this way, the presence of local ECE programs can increase a community's capacity to organize against unacceptable and abusive parenting practices.

Several empirical studies support the idea that school-based and other types of ECE services can help prevent child abuse and neglect. Of particular note, a quasi-experimental, longitudinal study of the Chicago Parent–Child Centers' ECE program found that children who participated during their preschool years were half as likely as matched controls to subsequently become the subject of a substantiated child maltreatment report (Reynolds & Robertson, 2003). A propensity score analysis of children receiving Head Start preschool services generated similar findings; the families of children who received Head Start services had significantly less contact with child protection authorities than children who received exclusively parental care prior to Kindergarten, and they also had lower rates of neglect than children in alternative center-based or nonparental child care arrangements (Zhai, Waldfogel, & Brooks-Gunn, 2011). Other studies have examined a range of ECE approaches collectively as opposed to focusing on a specific program model. Li, Godinet, and Arnsberger (2011) found that irregular preschool attendance significantly increased the probability of a child being reported to child protective services (CPS) for possible child maltreatment, while Kotch and Thomas (1986) found that at-risk families who were reported to CPS were significantly less likely to have the report substantiated if their child was regularly receiving child care services. Difficulties finding child care has also been linked to increased rates of self-reported child neglect among substance abusing mothers (Cash & Wilke, 2003).

That most of these findings link ECE service utilization to reduced child welfare system involvement is particularly noteworthy given the potential of ''surveillance bias'' to mask ECE maltreatment prevention effects. ECE professionals, like other social service providers, are mandated reporters of suspected child maltreatment. Therefore, even if ECE services reduce maltreatment, families who participate in these services may still be at greater risk of being reported to the child welfare system simply due to their increased exposure to ''surveillance'' by social service professionals (Chaffin & Bard, 2006; Fluke, Yuan, & Edwards, 1999).

Several neighborhood-level studies of child maltreatment grounded in social disorganization theory further suggest that the availability of ECE resources within communities may help prevent abuse and neglect. ''Child care burden,'' or the dearth of informal resources to supervise children within neighborhoods, has been repeatedly associated with elevated rates of maltreatment. Child care burden is frequently measured as the ratio of males to females and children to adults, as well as the percentage of the population who are elderly within a community. Women continue to bear the primary responsibility for child care and elder care in the United States, and thus neighborhoods with large numbers of children and older adults relative to the presence of adult females may experience a strain on the capacity of residents to help supervise neighborhood children (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007; Freisthler, Merritt, & LaScala, 2006).

Several studies also link elevated child maltreatment rates to lower neighborhood levels of participation in school-based ECE (Garbarino, 1976; Garbarino & Crouter, 1978). Moreover, a comparison study of two otherwise similar neighborhoods with contrasting levels of child maltreatment found that mothers in the high-risk community perceived child care services to be less accessible (Garbarino & Sherman, 1980). Residents of neighborhoods with high maltreatment rates in another similarly structured study reported having significantly fewer neighborhood facilities, including day care facilities, than

residents of neighborhoods with low maltreatment rates (Coulton, Korbin, & Su, 1996). These findings are suggestive. However, none of the neighborhood studies that addressed ECE access mapped the actual availability of ECE resources or explored ECE supply in relationship to demand. Nor did they address the potentially confounding effects of spatial autocorrelation, that is, the tendency for contiguous neighborhoods to possess similar characteristics. Spatial autocorrelation can bias estimates of coefficients and statistical significance when left uncontrolled (Ward & Gleditsch, 2008).

Apart from the studies described above, neighborhood research on child abuse and neglect has focused largely on demographic characteristics of neighborhoods that are related directly to maltreatment or indirectly via parenting. These studies have found that poverty and related forms of socioeconomic disadvantage such as unemployment, single parenthood, and public assistance use, as well as the geographic concentration of African American families and immigrants, residential instability, and population density (population per square mile) are associated with higher rates of abuse and neglect (see Coulton et al., 2007; Freisthler et al., 2006 for a review of this literature). Freisthler and colleagues have also documented a positive relationship between the local availability of drugs and alcohol and substance abuse treatment and child maltreatment rates (Freisthler, Gruenewald, Remer, Lery, & Needell, 2007; Freisthler, Gruenewald, Ring, & LaScala, 2008; Freisthler & Weiss, 2008). Additionally, research on the community context of parenting indicates that residents in impoverished and socially disorganized neighborhoods tend to experience greater parenting stress and poorer quality parenting (Franco, Pottick & Huang, 2010; Greenman, Bodovski & Reed, 2011; Guterman, Lee, Taylor, & Rathouz, 2010). With only one exception (Coulton et al., 1996), however, none of these studies have focused on how the ecology of neighborhoods specifically affects maltreatment risk for young children. This is significant because child maltreatment risk and protective factors for this vulnerable age group may differ, at least in part, from child maltreatment risk and protective factors for older children.

The current study examines the relationship between ECE availability and neighborhood rates of early child maltreatment while controlling for several established neighborhood-level risk factors for child maltreatment (i.e., socioeconomic disadvantage, child care burden, residential instability, and immigrant concentration), as well as two other variables previously unstudied in relationship to child maltreatment: concentrated affluence and ethnic heterogeneity. Concentrated affluence is included because of the growing number of neighborhood-level studies that link this variable to other child and family outcomes, such as preschool IQ (Brooks-Gunn, Duncan, & Aber, 1997; Duncan & Raudenbush, 1999). Ethnic heterogeneity is included because of its wide use in the social disorganization literature as an indicator of weak social ties between neighbors (Osgood & Chambers, 2000; Sampson & Groves, 1989). Cultural differences between residents, exacerbated by racism, are thought to impede the development of mutual trust and supportive relationships, which in turn limit neighbors' capacity to band together in order to exercise social control to reduce undesirable behavior such as child abuse and neglect.

Based on the empirical and theoretical literature summarized above, the current study hypothesizes that

1. Neighborhoods with a greater density of licensed child care spaces will have lower rates of early maltreatment;
2. Neighborhoods with a greater supply of licensed child care relative to demand will have lower rates of early maltreatment; and
3. Neighborhoods with a higher rate of preschool/nursery school attendance will have lower rates of early maltreatment.

Method

Sample and Procedures

This study uses a cross-sectional ecological design to assess the spatial relationship between the local availability of ECE resources and early child maltreatment referrals and substantiations in neighborhoods, defined by the 2,052 contiguous Census tracts that compose "mainland" Los Angeles County, California. Los Angeles County consists of a total of 2,054 Census tracts but the two tracts that represent Catalina Island are excluded from this analysis because their spatial discontinuity with the rest of the county prohibits a meaningful assessment of, and adjustment for, spatial effects that may bias analytic results. Because the unit of analysis is neighborhoods, the study is designed to contribute to knowledge about relationships between *community-level* characteristics and child maltreatment risk for young children. Readers are cautioned against committing the "ecological fallacy" (Robinson, 1950) by inappropriately concluding that observations about relationships at this broader (macro) level can also be inferred to exist at more micro (i.e., individual- and family-) levels.

Los Angeles encompasses 4,752 square miles and is the most populous county in the United States. In 2006, when most of the data in the current study were collected, Los Angeles County had almost 10 million (9,948,081) people living in it, 7.5% of whom were children under the age of five. The residents were 47.3% Hispanic (any race), 46.9% White, 13.0% Asian, 8.9% African American, 0.5% Native American, 0.3% Pacific Islander or Native Hawaiian, and 2.9% multiracial. More than half (59.6%) spoke a language other than English at home, and more than a third (35.4%) were foreign born. The median family income was $56,930 and 15.4% of the population lived in poverty (U.S. Census Bureau, 2006).

This study uses Census tracts to represent neighborhoods for several reasons. First, the U.S. Census Office considers the homogeneity of residents and the presence of physical features, such as major highways that may dissect and define how residents perceive their neighborhoods, when constructing tract boundaries (U.S. Census Bureau, n.d.). An additional advantage of using Census tracts is that they are small enough to capture local effects that might be diluted or biased downward if a larger, more heterogeneous spatial unit were used (Ernst,

2001). They are also large enough to capture variability in low base rate phenomena like early child maltreatment.

Measures

Dependent variables. Both substantiated and unsubstantiated allegations of child maltreatment for the year 2006 involving children birth through 5 years were obtained directly from the Los Angeles County Department of Children and Family Services (DCFS). By California state law (Penal Code Section 11165.12), referrals alleging child maltreatment are substantiated when a Child Protective Services (CPS) investigator determines that it is ''more likely than not'' that maltreatment has occurred. CPS substantiations are widely used and accepted as reliable indicators of the distribution of child maltreatment; however, there is evidence that they may be vulnerable to some degree of reporting and/or investigator bias (Coulton et al., 1996; Trainer, 1983). Moreover, they may fail to capture the full scope of child maltreatment because substantiations only include maltreatment that is investigated and verified by child protection authorities. This last point is a particular concern for the current study because of its focus on young children who do not always have the verbal capacity to describe maltreatment. To help compensate for the limitations of substantiations as the sole indicator of early child maltreatment, this study includes referrals, irrespective of their disposition, as a second dependent variable.

The Los Angeles County DCFS used Environmental Systems Research Institute's ArcGIS 9.2 program and the Thomas Brothers Transportation Street Network Line database to geocode the home addresses associated with all of the 2006 child maltreatment reports that it received involving 0- to 5-year-olds, and then associated the address coordinates with Census tracts in Los Angeles County to calculate the total number of early child maltreatment reports and substantiated reports within each tract. Rates per 1,000 were calculated by applying 2006 estimates of the population of 0–5-year-olds in each Census'' tract. It should be noted that the dependent variables in this study are based on the number of child maltreatment reports, not the number of children reported. Consequently, maltreatment risk may be slightly overstated in Census tracts containing young children who were referred to DCFS multiple times in 2006, and it may be slightly underestimated in Census tracts with early maltreatment referrals involving multiple children (as might happen in the case of a report involving multiple children from the same family). Of the 148,342 reports that DCFS received in 2006, 94% were successfully matched with valid addresses. Because geocoding translated the individual-level data into neighborhood-level data, the University of California, Los Angeles Office for Protection of Research Subjects determined that this research study did not involve ''human subjects'' and therefore did not require Institutional Review Board review or approval.

The average rate of early child maltreatment referrals for Los Angeles County Census tracts in 2006 was 48 per 1,000 children birth to 5 years (range: 0–769). The average rate of early child maltreatment substantiations was 11 per 1,000 children birth to 5 years (range: 0–222). Both of these dependent variables have heavily skewed distributions. Therefore, various power transformations (e.g., logarithmic, square root, and cube root) were explored and a cube root transformation was selected as being most optimal for the data.

Early Care and Education. Access to ECE services was operationalized in three ways. *ECE service density* reflects the number of licensed ECE spaces or ''slots'' per square mile. The density of family child care spaces and center-based child care spaces, which include school-based ECE programs, are measured separately. The data on the location and capacity (''slots'') of licensed ECE facilities were obtained from the Los Angeles County Office of Child Care's (LACOCC) interactive, web-based *2006 Child Care Assessment Reporting Tool*. California law requires that anyone who provides care for children from more than one family to whom the provider is not related must obtain an operating license from the California Department of Social Services, Community Care Licensing Division (CCL). This includes center-based child care as well as family child care provided in a caregiver's home. Data from the *2006 Child Care Assessment Reporting Tool* were geocoded by the LACOCC. The original data were provided to LACOCC by CCL in a spreadsheet reflecting a 2006 point-in-time snapshot of the locations and capacity of licensed homes and facilities in Los Angeles County. LACOCC assigned latitude and longitude coordinates to the addresses using Environmental Systems Research Institute's ArcGIS 9.2 program and mapped them to Thomas Brothers road files. Ninety-five percent of the addresses were successfully geocoded.

The second measure of ECE service access, *ECE supply*, represents the availability of ECE within a family's neighborhood relative to demand. It is the total number of licensed ECE spaces or ''slots'' available within a Census tract (supply) minus the number of young children 0–5 years living in the Census tract who have working parents (estimated demand). Positive numbers indicate a surplus of locally available ECE spaces while negative numbers represent a shortfall. This measure takes into account the supply of ECE available in the neighborhood in which a family lives, but not the supply of ECE services near a parent's place of work, as these data were not available. A child was considered to have a working parent(s) if he or she was living with a single parent in the workforce or had two parents both of whom were in the workforce. While work is not the only reason that families use ECE services, it is one of the most reliable indicators of need. In 2005, Los Angeles County's Child Care Resource and Referral agencies reported that 85% of the requests that they received for assistance involved a parent-seeking child care because of employment or because a parent was looking for employment (California Child Care Resource and Referral Network, 2005). Data on the capacity (slots) of licensed ECE facilities and the number of 0–5-year-olds with working parents used to construct this variable were also obtained from the LACOCC's *2006 Child Care Assessment Reporting Tool*.

The final measure of ECE service access, *preschool/nursery school attendance*, is the percentage of 3- and 4-year-olds regularly attending a ''nursery school or preschool'' according to the 2000 U.S. Census. It should be noted that the 2000 Census did not define ''nursery school'' or ''preschool'' for survey respondents and so this measure reflects respondents' personal interpretations of whether their ECE provider qualified as a ''nursery school or preschool.''

Control variables. Several demographic variables that have been used as indicators of social disorganization and linked to child maltreatment in prior research were included in the analysis as control variables. In most cases, these variables were provided by, or constructed using, 2006 U.S. Census estimates from GeoLytics, a demographic data and market research company that uses vital records and U.S. Postal Service data to create updated annual estimates for a number of U.S. Census variables (see http://geolytics.com/USCensus, Annual-Estimates-2001-2005, Data, Methodology, Products.asp for more details about the construction of these estimates). However, two of the constructs, concentrated disadvantage and ethnic heterogeneity, were derived from 2000 U.S. Census data because GeoLytics did not have 2006 updates for the source variables.

Concentrated disadvantage. Concentrated disadvantage is based on an index that was originally developed by Jeffrey Morenoff and colleagues (2001) at the Project on Human Development in Chicago Neighborhoods to represent ''economic disadvantage in racially segregated urban neighborhoods'' (p. 527). It combines several known socioeconomic predictors of neighborhood rates of child maltreatment that have loaded on the same factor in previous ecological studies of abuse and neglect and that were highly correlated in this study: (a) percentage of families below the poverty line, (b) percentage of families receiving public assistance, (c) percentage of unemployed individuals in the civilian labor force, (d) percentage of female-headed families with children, and (e) percentage of residents who are African American. The concentrated disadvantage scale is based on the summation of equally weighted *z* scores for each of these items divided by the total number of items. Following the example of Pebley and Sastry (2003) and Sampson (2001), this study also used the percentage of households with a minimum annual income of $75,000 as a separate measure of *Concentrated Affluence*. The $75,000 cutoff is supported by the California Budget Project (2007), which reports that a family with two working parents living in Los Angeles County would need a minimum annual income of $74,044 in order to make ends meet.

Blau's (1977) diversity index was used to measure *Ethnic/Racial Heterogeneity*, which is the percentage of times, expressed as a ratio, in which two people randomly selected from an area will differ by race/ethnicity. The index is calculated by squaring the percent of each racial/ethnic group in a community, then summing the squares and subtracting the total from 1.00 The following racial/ethnic categories were included in the construction of the measure: (a) Hispanic/Latinos of any race, (b) non-Hispanic Whites of one race, (c) non-Hispanic African Americans of one race, (d) non-Hispanic American Indians and Alaska Natives of one race, (e) non-Hispanic Asians, Native Hawaiians, and other Pacific Islanders of one race, (f) non-Hispanics of some other race, and (g) non-Hispanics of two or more races. The diversity index ranges from a theoretical value of 0, signaling that all residents share the same race/ethnicity, to +1, which represents extreme diversity.

Residential instability. This was defined as the percentage of the population that moved between 1999 and 2006 relative to the national average. A residential instability score of 100 indicates that a Census tract had the same degree of population turnover between 1999 and 2006 as the nation as a whole (45.9%). A score of 75 indicates that the proportion of recent movers is 25% below the national average, while a score of 150 indicates that the proportion of recent movers is 50% above the national average. Although this measurement approach is less intuitive than using the unadjusted percentage of recent movers, it is the format that GeoLytics used to produce the updated 2006 estimates. Similarly, *Concentration U.S. Born* reflects the percentage of residents born in the United States relative to the national average. It is interpreted in the same way as the residential instability variable, that is, a score of 100 indicates that a Census tract had the same concentration of U.S. born residents as the national average (87.7%).

Young child population density. This variable was operationalized as the number of 0–5-year-old residents per square mile and represents the spatial density of this population. Consistent with several of the neighborhood studies of child maltreatment mentioned earlier, *Child Care Burden* was measured by the ratio of males-to-females, the ratio of children-to-adults, and the percentage of the population 65 years and older.

Data analysis procedures. This study uses spatial error regression models to examine how the availability of ECE services is related to neighborhood rates of early child maltreatment. This analytic approach was selected because exploratory data analysis determined that positive spatial autocorrelation was present in the data, which is a frequent concern in neighborhood-level analyses. Spatial autocorrelation refers to the tendency of variables with similar values to cluster together geographically. Unlike a randomly selected group of subjects whose individual risk of maltreatment may be independent from each other, proximal spatial units such as neighborhoods usually share similar features. As a result, measures for these units and their measurement errors are frequently correlated. To assess for this possibility, the Moran *I* statistic was calculated for both dependent variables. Moran *I* measures global autocorrelation across all the spatial units in a data set. It has a range of −1 to +1, with a zero value indicating a completely random spatial pattern, a negative value indicating dispersion, and a positive value indicating spatial clustering. Positive Moran *I* values were found for both

Table 1. Descriptive Statistics for Independent Variables

Variable	*M*	*SD*	MIN	MAX
Early care and education access				
ECE resource density (slots per mile^2):				
Family childcare home density	234.09	209.76	0	2195.17
Childcare center density	124.67	124.60	0	1086.15
ECE supply (slots per tots with working parents):	−75.66	77.22	−500.00	351.00
Preschool/nursery school attendance:	0.50	0.22	0	100.00
People and place characteristics				
Young child population density (tots per mile^2):	1340.58	1,445.00	0	16742.59
Concentrated disadvantage:	0	.79	−1.26	5.08
Poverty rate	17.87	13.03	0	100.00
Unemployment rate	5.05	3.35	0	72.20
Female headed families	14.44	7.85	0	66.93
Public assistance utilization	7.00	6.12	0	49.06
African-American population	9.82	15.85	0	93.57
Concentrated affluence:	24.07	17.80	0	100.00
Residential instability:	100.51	46.15	0	501.00
Childcare burden:				
Child/adult ratio	32.93	10.47	0	75.00
Male/female ratio	107.26	327.71	0	14903.33
Elderly population	12.42	5.93	0	75.00
Concentration U.S. born	72.08	18.79	0	112.00
Ethnic/racial heterogeneity	0.47	.18	0	1.00

Note. ECE = early care and education services; MAX = maximum; mile^2 = square mile; MIN = minimum; U.S. = United States.

dependent variables (see Table 3) confirming the presence of positive spatial autocorrelation in the data.

Autocorrelated measurement error poses a particular threat to standard ordinary least squares (OLS) regression models because it violates the OLS assumption of unit independence, potentially biasing parameter estimates and, in the case of positive spatial autocorrelation, increasing the chances of a Type I error (Haining, 2003). To avoid this problem, a generalized least squares (GLS) spatial error regression model was used to control for spatial patterning, which it does by isolating the spatial correlation between the residuals and placing it in the model's error term. The spatial error regression model used in this study can be expressed as follows:

$$y_i = x_i\beta + \lambda w_i\xi_i + e_i,$$

where y is the dependent variable, x is the independent variable, and β is the coefficients for the independent variable. The overall error, $\lambda w\ \xi + e$, consists of a spatially uncorrelated error term, e, that satisfies the normal OLS regression assumption of unit independence, and a spatially correlated error term, ξ, that does not. The parameter λ denotes the strength of the correlation between neighboring spatial units, and w is a prespecified spatial weights matrix that provides the structure of the assumed spatial relationship between the units (Ward & Gleditsch, 2008).

The weights matrix used in this study was a binary rook's first-order connection matrix that assigned a value of "1" to Census tracts sharing a boundary with each other (neighbors) and a "0" to all other pairs of tracts. This connection matrix was constructed using GeoDa 0.9.5-I. In order to adjust for variation in the number of neighbors possessed by each Census tract, the matrix was "row standardized," meaning that each element in the matrix was divided by the sum of the elements in its row so that they summed to one. While a GLS spatial regression approach offers the advantage of controlling for spatial effects, one disadvantage of this analytic approach is that it does not produce standardized regression coefficients nor offer a reliable means of calculating the effect size of independent variables.

Spatial lags. The same connection matrix was used to create spatial lags for the ECE access variables. Spatial lags help researchers model the ways in which characteristics of adjacent neighborhoods, not just neighborhoods of residence, effect people. They are useful tools in spatial analysis because spatial units are generally permeable (e.g., people may live in one Census tract, but send their children to an ECE program in a neighboring tract). This study created spatial lags for two of the ECE access variables, preschool/nursery school attendance and ECE supply, by averaging the values of these variables for all adjacent Census tracts and then adding the lag variables to the regression model as additional predictors. This allowed the analysis to determine whether the rate of early child maltreatment reporting and substantiation in Los Angeles County Census tracts was related to the availability of ECE services in surrounding tracts. Lag variables were also created for the ECE density variables but they were not included in the final models because of extreme multicolinearity.

Table 2. Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. RefRate	1.00														
2. SubRate	0.75	1.00													
3. FCCDens	0.07	0.08	1.00												
4. CCCDens	0.30	0.25	0.54	1.00											
5. ECE Supply	−0.01	0.01	0.10	0.03	1.00										
6. PreschAtt	−0.22	−0.23	−0.08	−0.17	0.29	1.00									
7. 0–5Dens	0.06	0.05	0.74	0.48	−0.28	−0.26	1.00								
8. ConcDisadv	0.50	0.43	0.43	0.67	−0.08	−0.30	0.46	1.00							
9. ConcAffl	−0.31	−0.31	−0.42	−0.50	0.27	0.51	−0.53	−0.71	1.00						
10. ResInstab	0.20	0.15	0.40	0.20	−0.15	−0.17	0.45	0.34	−0.38	1.00					
11. Chld: Adlt	0.36	0.29	0.21	0.49	−0.38	−0.40	0.48	0.65	−0.52	0.24	1.00				
12. Male: Female	−0.02	−0.01	−0.01	−0.01	0.03	−0.06	−0.02	−0.02	−0.04	−0.03	−0.07	1.00			
13. %Elderly	−0.21	−0.16	−0.27	−0.31	0.29	0.32	−0.43	−0.44	0.45	−0.43	−0.63	−0.05	1.00		
14. %U.S. Born	0.03	0.02	−0.36	−0.21	0.29	0.37	−0.55	−0.30	0.56	−0.23	−0.34	0.01	0.25	1.00	
15. EthHetero	0.02	0.02	0.02	−0.06	0.10	0.00	−0.29	−0.09	0.03	0.03	−0.41	0.03	0.08	0.13	1.00

Note. All correlations at or above /0.05/ are significant at $p < .05$.
1. RefRate = early child maltreatment referral rate; 2. SubRate =early child maltreatment substantiation rate; 3. FCCDens = family childcare home density; 4. CCCDens = childcare center density; 5. ECESupply = ECE supply; 6. PreschAtt = preschool/nursery school attendance; 7. 0–5 Dens = young child population density; 8. ConcDisadv = concentrated disadvantage; 9. ConcAffl = concentrated affluence; 10. ResInstab = residential instability; Chld: Adlt = child to adult ratio; 12. Male: Feml = male to female ratio; 13. %Elderly = elderly population; 14. %U.S. Born = concentration U.S. Born; and 15. EthHetero = ethnic/racial heterogeneity.

Heteroskedasticity. Because population size is distributed unevenly across neighborhoods creating heteroskedasticity, spatial models involving population characteristics frequently have unequally distributed error terms. Using early child maltreatment rates instead of counts helps address this problem, but rates based on spatial units with small populations remain vulnerable to artificial elevation resulting from insufficient data as opposed to true risk. To address this potential source of bias in risk estimation each model was also adjusted with the square root of the 0–5 child population for that area (Freisthler et al., 2006).

The base model for the first dependent variable regresses the demographic control variables on neighborhood rates of early child maltreatment referrals per 1,000 children birth through 5 years, and the base model for the second dependent variable regresses the demographic control variables on neighborhood rates of substantiated early child maltreatment referrals per 1,000 children birth through 5 years. Each of these base models are then compared to a second model that adds the variables representing ECE availability to the control variables. The log-likelihood test is used to assess whether addition of the ECE variables improves model fit.

Results

Descriptive statistics for the predictor variables in this study are presented in Table 1. In 2006, child care resources were densely packed within the typical Los Angeles County "neighborhood" or Census tract, with the density of licensed family child care almost twice as great as the density of licensed center-based child care. The average tract was short approximately 76 licensed child care spaces relative to the estimated child care need and half of its 3- and 4-year-olds were attending preschool or nursery school. The average concentrated disadvantage score was zero with considerable variability indicated by the high standard deviation and wide range of scores. Almost a quarter of the households in the sample tracts reported annual incomes of at least $75,000. The average rate of residential instability in Los Angeles County Census tracts was roughly equivalent to the national average. In regard to child care burden, the ratio of children to adults was about 1:3, there were slightly more men to women residents and the average percentage of residents 65 years or older was low. In addition to having a high concentration of immigrants (i.e., concentration of U.S. born was 28% lower than the national average), Census tracts in Los Angeles were also quite diverse, with an almost 50% chance that two residents chosen at random would be a different race/ethnicity from each other.

Table 2 provides the simple correlations among all the variables in the study. Most of the relations are significant, but their magnitude is not so great as to raise concerns regarding multicolinearity. Both dependent variables (i.e., early child maltreatment referral rates and substantiation rates) are positively related to the density of licensed family child care and the density of licensed child care centers, and they are negatively related to preschool/nursery school attendance rates. However, the simple correlations between the dependent variables and ECE supply are not significant.

Table 3 depicts the results of the spatial models, their pseudo-R^2 values, and the model fit statistics (log likelihood). In the first base model, young child population density, concentrated disadvantage, child care burden, population U.S. born, and ethnic/racial heterogeneity are associated with higher rates of early child maltreatment referrals, while concentrated affluence is associated with lower rates of early maltreatment referrals. When the ECE variables are added

Table 3. Generalized Least Squares (GLS) Spatial Error Regression Models of 2006 Neighborhood Child Maltreatment Rates for 0–5-Year-Olds ($N = 2,052$) in Los Angeles County

	0–5-Year-Old Referral Rates				0-5-Year-Old Substantiated Referral Rates			
	Base Model		Base Model + ECE		Base Model		Base Model + ECE	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Constant	−1.4095	1.4268	−6.7121**	2.3918	−8.0332***	1.6223	3.1871	2.5671
People and place characteristics:								
Young child population density (tots per mile^2)	−8.7e−005***	1.3e−005	−0.0001***	1.9e−005	−7.9e 005***	1.5e−005	−0.0023***	.0006
Concentrated disadvantage	0.2597***	.0371	0.2595***	.0395	0.1778***	0.0401	0.2110***	.0432
Concentrated affluence	−0.0155***	.0019	−0.0129***	.0020	−0.0212***	0.0021	−0.0170***	.0022
Residential instability	−0.0001	.0005	0.0002	.0005	−0.0009	0.0005	−0.0004	.0005
Childcare burden								
Child/adult ratio	0.0572***	.0020	0.0527***	.0023	0.0393***	0.0021	0.0344***	.0025
Male/female ratio	0.0024***	.0007	0.0020**	.0007	0.0024**	0.0008	0.0022**	.0008
Elderly population	0.0550***	.0045	0.0547***	.0046	0.0328***	0.0050	0.0374***	.0051
Population U.S. born	0.0078***	.0013	0.0086***	.0013	0.0081***	0.0014	0.0099***	.0014
Ethnic/racial heterogeneity	1.1335***	.1115	0.9345***	.1182	0.7868***	0.1165	0.6199***	.1225
ECE access:								
Childcare center density			0.0005**	.0002			0.0001	.0002
Family childcare home density			0.0002	.0001			0.0002	.0002
Preschool/nursery school attendance			−0.2896***	.0896			−0.4854***	.1039
Adjacent preschool/ nursery school attendance			−0.5263***	.1618			−0.9271***	.1730
ECE supply			−0.0009***	.0003			−6.8e-005	.0003
Adjacent ECE supply			9.2e−005	.0003			−0.0003	.0003
Lambda	.4316***		.4170***	.0286	.2695***		.2307***	.0324
Pseudo-R^2	.813		.816		.627		.634	
Log likelihood test	−8,195		−8,177		−8,502		−8,475	

Note. ECE = early care & education.
**$p < .01$. ***$p < .001$.

to this model, these control variables remain significant. In addition, the spatial density of licensed child care center spaces is positively associated with neighborhood rates of early child maltreatment referrals. Preschool/nursery school attendance, both locally and in adjacent Census tracts, is negatively related to early maltreatment referral rates, and the local supply of licensed child care spaces relative to demand is also negatively related to early child maltreatment referral rates. The log likelihood for the child maltreatment referral rate model that includes the ECE variables is greater than for the base model, indicating that inclusion of the ECE variables provides a better fit for this data. The final model explains 82% of the variance in early maltreatment referral rates between neighborhoods.

Similar to the early maltreatment referral rate base model, young child population density, concentrated disadvantage, child care burden, population U.S. born, and ethnic/racial heterogeneity are associated with higher rates of substantiated early child maltreatment rates, while concentrated affluence is associated with lower rates. When the ECE access variables are added to the substantiation rate base model, preschool/nursery school attendance, both locally and in adjacent Census tracts, is associated with lower early maltreatment substantiation rates. The log likelihood for the child maltreatment substantiation rate model that includes the ECE variables is greater than for the base model, indicating that inclusion of the ECE variables provides a better fit for these data as well. The final model explains 63% of the variance in rates of substantiated early maltreatment between neighborhoods.

An assessment of residual spatial autocorrelation in the final early child maltreatment referral and substantiation rate models was positive and significant in both cases, confirming that a GLS spatial model was more appropriate for the data than an OLS regression model. Because a large number of Census tracts in the data set had zero values for the dependent variables, raising the possibility that distributional problems might bias results, a robustness check of the final models was also conducted. Several count models (hurdle, negative binomial, and zero-inflated negative binomial) were run, all of which had roughly the same coefficients and fit as the rate models reported here, increasing confidence in the validity of the findings.

Discussion

This study explored the relationship between several dimensions of ECE access and maltreatment rates for young children using spatial regression analyses that controlled for young child population density, concentrated disadvantage, concentrated affluence, child care burden, residential instability, concentration of U.S. born, ethnic/racial heterogeneity, and spatial

effects. As hypothesized, neighborhoods with higher rates of preschool/nursery attendance, locally and in surrounding neighborhoods, had lower rates of early child maltreatment referrals and substantiations. These findings are consistent with a small set of older studies that link neighborhood- and county-level child maltreatment risk to the availability of institutional resources, including ECE services (Coulton et al., 1996; Garbarino, 1976; Garbarino & Crouter, 1978; Garbarino & Sherman, 1980; Korbin & Coulton, 1994, 1997; Spearly & Lauderdale, 1983). The validity of these earlier studies was in question, however, because they did not use spatial methods. The current study does control for spatial effects, and it corroborates their findings, thereby strengthening the argument that the availability of ECE services within neighborhoods mitigates child maltreatment risk.

In keeping with this conclusion, the current analysis also found that neighborhoods with a more abundant supply of licensed child care relative to demand had lower rates of early child maltreatment referrals, albeit not lower rates of substantiations. One possible explanation for this discrepancy is that access to local child care services may protect children from types of maltreatment that may be harder to confirm when victims are young and/or preverbal (e.g., inadequate supervision and general neglect) by buffering parents against toxic levels of stress that would otherwise compromise their parenting, but that it does not prevent more extreme and readily verifiable forms of child abuse and neglect (e.g., nonorganic failure to thrive, cigarette burns, and spiral fractures) that stem from parental pathology. Another explanation for why the preschool/nursery school attendance findings are consistent across both outcomes while the ECE supply findings are not is that school-based ECE may be more effective at preventing maltreatment than other types of ECE. This explanation is consistent with Reynolds and colleagues' theory that ECE reduces child maltreatment in part through the promotion of children's socioemotional and cognitive development and a resulting decrease in parent–child conflict over behavioral problems and school failure (Mersky et al., 2011; Reynolds and Roberston, 2003); hence, it follows that school-based ECE programs, which tend to emphasize early child development and school readiness, would have a greater impact on reductions in child maltreatment. It is also consistent with Zhai and colleagues' (2011) finding that children in Head Start, a preschool program with a strong child development emphasis, had significantly lower rates of child neglect than children in other center-based ECE programs. Alternatively, the preschool/nursery school attendance variable, which is based on the U.S. Census rather than service data, may simply reflect demographics more than ECE availability as assessed by the supply variable.

Inconsistency between the findings for preschool/nursery school attendance in adjacent neighborhoods and ECE supply in adjacent neighborhoods may be explained by some of the dynamics noted above for the nonlagged versions of the variables. In addition, the differential findings for the lagged variables may reflect the fact that the preschool/nursery school attendance measure includes ECE participation irrespective of program location, while the ECE supply variables only account for services available where parents live, not near their place of work. Parents who do not take advantage of ECE services in their immediate neighborhood (ECE supply) may be using services near their jobs instead, which would help explain why adjacent ECE supply is not related to the child maltreatment variables.

Contrary to hypothesis, the spatial density of child care services within neighborhoods was not related, at least not consistently, to early child maltreatment. It appears that the immediate proximity of ECE services is not as important as whether slots exist somewhere in the neighborhood and whether they are being used. The only exception to this rule concerns the density of licensed child care center spaces. Neighborhoods with numerous child care center slots per square mile actually had higher rates of early child maltreatment referrals. This could mean that the agglomeration of child care center resources somehow increases rates of hard-to-substantiate maltreatment; but, more likely, it reflects a surveillance effect. Child care center staff are mandated reporters of suspected abuse and neglect and so communities that are densely packed with these services may have more maltreatment referrals.

Limitations

There are several methodological limitations to the current study that should be taken into consideration when interpreting the results. First, as is the case with most ecological research, this study uses summative statistics to represent underlying neighborhood structures and model their relationship to residential outcomes, thereby raising the possibility of aggregation effects. Observed relationships between ECE access and neighborhood child maltreatment rates may reflect underlying neighborhood processes as theorized, but they could also be the by-product of individual or family-level factors that appear in the aggregate and therefore give the impression of being neighborhood effects. Second, while this study draws on social disorganization theory, the social processes highlighted by this theory, such as collective efficacy and shared norms, are not directly measured; rather, they are inferred from demographic patterns that have been linked to these processes in prior research. Third, this study uses Census tracts as proxies for neighborhoods, which may not coincide with residents' own definition of the communities in which they live, obscuring patterns of social interaction as they actually occur. Additionally, the dependence on 2000 Census data to construct the concentrated disadvantage, ethnic heterogeneity, and preschool/nursery school attendance variables suggests some caution in interpreting findings related to these constructs. Significant population shifts may have occurred between 2000 and 2006, when the outcome measures and other independent variables were measured. Finally, as noted previously, while spatial error regression models offer the advantage of controlling for spatial effects, one disadvantage of this analytic approach is that it does not produce standardized regression coefficients nor offer

a reliable means of calculating the effect size of independent variables. Thus, while the results show a significant relationship between several of the ECE variables and child maltreatment rates, the practical significance of the observed effect cannot be readily determined.

Despite these limitations, the current study makes several contributions to the knowledge base on the community context of child abuse and neglect. It is one of the first studies of the relationship between ECE access and child maltreatment of which the author is aware that measures the actual availability of ECE services and the only study of ECE availability and child maltreatment to control for spatial effects that, if left unchecked, can result in Type I error. The findings clearly support the argument that space and place matter for young children. Risks and resources, particularly ECE resources, are spread across communities unevenly, and this affects residents' ability to parent their children successfully.

Policy and Practice Implications

This study has several implications for policy and practice. Chief among these is that the benefits of ECE services may extend beyond the more traditionally recognized goals of custodial care for children of working parents and promotion of child development to also include child abuse prevention. To the extent that this is true, child protection agencies have a vested interest in ensuring the availability and accessibility of ECE resources, especially in communities with high rates of early maltreatment. This can be achieved by child welfare agencies working strategically with local child care planning commissions, ECE trade associations, State preschool programs, subsidized child care programs for Temporary Assistance to Needy Families (welfare) recipients, and federally funded ECE programs such as Head Start and Early Head Start, to advocate for the development and expansion of ECE services in neighborhoods with high rates of early child abuse and neglect or high-risk neighborhoods experiencing demographic shifts that may foreshadow increased rates of child maltreatment.

ECE professionals can also work with existing ECE programs to increase their capacity to engage and support high-risk families, thereby reducing child maltreatment. The Center for the Study of Social Policy's Strengthening Families Initiative (see http://www.strengtheningfamilies.net/index.php/about/category/the_basics/) offers a training model for early childhood educators designed to help them prevent child maltreatment by nurturing parental resilience, fostering social connections, expanding knowledge of parenting and child development, providing concrete support in times of need, and enhancing children's social and emotional development. Given research evidence that many abusive and neglectful parents are socially isolated (Belsky, 1980), ECE programs in high-risk neighborhoods should be encouraged and equipped to actively reach out to hard-to-engage families, rather than serving only those that proactively seek their services.

At the policy level, the findings in this study linking preschool and nursery school attendance to reduced neighborhood rates of early child abuse and neglect provide support for continued and expanded public investment in school-based ECE programs. Given the high costs of investigating child abuse, foster care, and treating the mental and physical health outcomes associated with child maltreatment (Wang & Holton, 2007), the potential benefits of such a policy include not only the reduction of human suffering but also taxpayer savings that could be reinvested to cover at least some of the ECE program operation costs. Additionally, targeted policy changes could be implemented to increase ECE access specifically for families at risk for maltreatment, including residents of high-risk neighborhoods. Local ordinances and state and federal statutes could prioritize children deemed by social service professionals to be at risk of child abuse or neglect, privileging these children for receipt of child care subsidies and placement on ECE program waiting lists. Approaches such as these may help reverse the increasing rates of infants, toddlers, and young children entering the child welfare system in the United States.

Acknowledgments

The author thanks the Los Angeles County Department of Children and Family Services and the Los Angeles County Office of Child Care for providing the data that made this research possible. The author also thanks Dr. Lisa Schweitzer for her review of, and recommendations regarding, the analytic approach used in this study.

Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author received no financial support for the research, authorship, and/or publication of this article.

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