A Multilevel Study of Neighborhoods and Parent-to-Child Physical Aggression: Results From the Project on Human Development in Chicago Neighborhoods

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The majority of children in the United States experience parent-to-child physical aggression (PCPA), a disciplinary strategy out of favor with many experts. Several decades of research have documented a link between community characteristics and severe child maltreatment. None have taken a multilevel approach to study whether neighborhoods affect the amount of corporal punishment and/or physical abuse used by individual families. Data for this article come from the Project on Human Development in Chicago Neighborhoods and were analyzed using hierarchical linear modeling. An interval scale of PCPA was developed. Values obtained show that several neighborhood characteristics were associated with PCPA. Immigrant concentration remained significant after controlling for family composition. A cross-level interaction was found between neighborhood social networks and Hispanic race/ethnicity. The article's conclusion is that neighborhood characteristics may influence the amount of PCPA used by families. Neighborhood intervention strategies hold promise.

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The majority of children in the United States experience physical aggression from parents or other caregivers (Gallup, Moore, & Schussel, 1995; Straus & Stewart, 1999). Parent-to-child physical aggression

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(PCPA) is typically assessed in surveys by items that range from relatively minor acts such as spanking or slapping a child to the severe behaviors of beating up, burning, or scalding a child (Straus, 1990; Straus, Hamby, Finkelhor, Moore, & Runyan, 1998). Minor PCPA, also referred to as corporal punishment, is considered by many parents to be a standard part of disciplining children. However, some argue that even minor acts of physical aggression can be deleterious to healthy development of children and contribute to the culture of violence in present-day society (Durrant, 1999; Straus, 1996, 2001). A recent meta-analysis of 88 studies of corporal punishment and associated sequelae over the past 62 years found that corporal punishment was associated with 1 positive outcome (increased compliance) and 10 negative outcomes, including mental health and behavior problems and increased risk for physical abuse (Gershoff, 2002). Severe PCPA is often referred to as parental physical abuse and is sometimes also used in a disciplinary context. The typically accepted conceptual difference between minor PCPA (corporal punishment) and severe PCPA (parental physical abuse) is that the latter may cause physical injuries or death. Severe PCPA is consistently viewed as deleterious to children's mental and physical health and may result in involvement with Child Protective Services (CPS) (Barnett, Miller-Perrin, & Perrin, 1997). Many researchers view PCPA as a continuum from minor acts of corporal punishment to severe acts of parental physical abuse (Gershoff, 2002; Graziano, 1994).

A child's environment is best understood as a series of settings nested within each other from the microenvironment of his or her family to the macroenvironment of society (Bronfenbrenner, 1977; Bronfenbrenner, Moen, & Garbarino, 1984; Garbarino & Barry, 1997). As children develop, they encounter a greater number of social contexts. Studies showing that neighborhood conditions affect the health and well-being of children, especially young children, as well as families, date back several decades (Leventhal & Brooks-Gunn, 2000; Melton, 1992). It has been suggested that neighborhood features might conspire to intensify or counteract the vulnerabilities or deficiencies of parents (Garbarino & Barry, 1997). Economic disadvantage and inequality have been shown to predict rates of community violence (Sampson, Raudenbush, & Earls, 1997); thus, negative, stress-inducing neighborhood contexts may also influence the level of violence in parent-child relationships. Critics of this line of research argue that neighborhood effects are simply an aggregation of family conditions rather than a separate set of risks. Others posit that certain factors associated with child maltreatment, such as poverty, can operate as both individual and aggregate phenomena at the same time (Coulton, Korbin, & Su, 1999). Studies of neighborhood effects on individual outcomes require a large sample of neighborhoods, which can be expensive and difficult to obtain (Brooks-Gunn, Duncan, & Aber, 1997). There are no previous studies to our knowledge that have investigated whether deleterious neighborhood conditions exacerbate caregivers' use of PCPA, or whether positive neighborhood social processes influence lower use of PCPA, taking family characteristics into account.

Scope of PCPA

The prevalence of PCPA in the United States is estimated in several distinct ways. The first is through counts of reports made to government agencies such as (CPS). Compilations of these reports across states are a component of the National Incidence Studies (NIS) (Sedlak & Broadhurst, 1996) and the National Child Abuse and Neglect Reporting System (NCANDS) (U.S. Department of Health and Human Services, 1999). CPS reports represent the number of children for whom reports of child physical abuse were made by teachers, neighbors, police officers, or other responsible adults, and separate estimates are given for the number of reports that are substantiated by CPS officers. Other studies of PCPA administer surveys to clinical, community, or national samples, typically asking parents about their own aggressive behavior, and yielding much higher estimates than CPS reports. There are three nationally representative surveys that supply much of the prevalence data on PCPA in the United States. The first was the 1975 National Family Violence Survey (NFVS), a national probability sample of 2,143 households (Straus, Gelles, & Steinmetz, 1980), followed up by the Second National Family Violence Survey in 1985, a national probability sample of 6,002 households (Wolfner & Gelles, 1993). The second NFVS estimated the prevalence of physical punishment, or minor PCPA, at 62% and the prevalence of severe PCPA at 11%. These prevalence estimates were not significantly different from the first NFVS (Straus, 1999). In a third national study, the Gallup organization interviewed a nationally representative sample of 1,000 parents in 1995 and also estimated the rate of minor PCPA at 62% and the rate of severe PCPA at 4.9% (Gallup et al., 1995). This 1995 survey-derived rate of severe PCPA was 15 times the rate of officially reported cases of severe PCPA/physical abuse in the United States for 1995 (0.32%) and 1997 (0.34%) (U.S. Department of Health and Human Services, 1999), demonstrating that survey-derived rates can be far higher than compilation of

official reports. If samples are carefully selected, surveys also yield less biased, more generalizable estimates of PCPA because there is considerable evidence that families who are poor and/or members of ethnic minority groups are more likely to be reported to CPS for child maltreatment (Ards, Chung, & Myers, 1998).

Community-Level Findings

Several studies have reported associations between neighborhood conditions and levels of PCPA (Limber & Nation, 1998). For example, in a study of the 185 zip codes with 1,000 families or more in Missouri, neighborhoods with a higher percentage of single-parent families (often used as an indicator of economic disadvantage) had higher rates of severe PCPA, defined as substantiated physical abuse cases in the Missouri child abuse and neglect database for 1992 (Drake & Pandey, 1996). Garbarino and Crouter (1978) found that socioeconomic and demographic factors differentiated child maltreatment rates (including physical abuse, sexual abuse, and neglect) between 20 "community subareas" in Omaha, Nebraska. Garbarino and Kostelny (1992) found variation in child maltreatment rates among four predominantly African American and Hispanic communities in Chicago that was accounted for by socioeconomic characteristics. Over the span of 6 years, in two of the sections, the rates increased well above average, whereas the other two had rates close to or below the city average. Reports of social deterioration by neighborhood informants matched these increases in child maltreatment, whereas positive community trends matched decreases. In studies conducted in Baltimore at the level of census tracts, residential density (Zuravin, 1986) and other measures of economic stress and inadequate social resources (Zuravin, 1989) were associated with higher rates of reported child physical and sexual abuse. Neighborhood structural factors such as impoverishment, child care burden, and instability were correlated with substantiated child maltreatment rates in Cleveland, Ohio (Coulton, Korbin, Su, & Chow, 1995). Impoverishment had a stronger effect on rates of child maltreatment in predominantly European American census tracts than in predominantly African American tracts (Korbin, Coulton, Chard, Platt-Houston, & Su, 1998).

A limitation of these studies is that they were not multilevel; instead, they studied solely neighborhood-level features. Coulton et al. (1999) addressed this limitation by conducting a community-level study of child maltreatment that also incorporated family factors. In a sample of 400 households within 20 neighborhood units in Cleveland, Ohio, they found differences between households in child abuse potential (CAP) but few differences between neighborhoods. Neighborhood structural and process characteristics were correlated with each other and with mean rates of substantiated child maltreatment reports. Structural variables (but not process factors) were predictors of CAP. They found two neighborhood-family interactions, suggesting that adverse neighborhood conditions weakened the risky effect of violence in the family of origin and the protective effect of higher parental education on CAP (Coulton et al., 1999).

Prior Individual and Family Risk Factor Findings

A comprehensive review of risk factors for minor and severe PCPA was published recently (Black, Heyman, & Smith Slep, 2001). For the sake of brevity, we summarize some examples that informed our hypotheses about family factors. In the 1975 Family Violence Survey, more mothers than fathers reported PCPA, both minor and severe. However, 10 years later, the 1985 NFVS found no differences by sex of the caretaker (Wauchope & Straus, 1999). Boys were more likely than girls to suffer minor and severe PCPA (Wolfner & Gelles, 1993). Younger caregivers compared with older reported more minor but not more severe PCPA. The risk of PCPA appears to be highest among younger children and decreases as children mature (Wauchope & Straus, 1999). The prevalence of minor PCPA in the 1995 Gallup survey ranged from 35% for infants to a peak of 94% at ages 3 and 4 and decreased steadily between 5 and 17 years (Straus & Stewart, 1999). Studies of family socioeconomic status (SES) have found mixed results, even within the same data set. Both minor and severe PCPA were found to vary by income levels of families in the 1995 Gallup survey of parents (Gallup et al., 1995). However in multivariate analysis, the SES gradient in minor PCPA held up only for older parents (ages 30 and above) (Straus & Stewart, 1999). Reanalyzing the same data set, Dietz (2000) found that those with lower income and lower educational attainment were more likely to use hitting the child with an object; shaking or pinching the child; or slapping on face, head, or ears. Using two waves of Epidemiologic Catchment Area (ECA) study data, Chaffin, Kelleher, and Hollenberg (1996) did not find an association between severe PCPA and SES; nor did Ross (1996) in the NFVS. However, Straus (1994) found that the higher the SES of the parents, the less they used minor PCPA, using a composite of SES that combined occupation, income, and education of the parents in the NFVS. Family structure combined with income did not predict substantiated cases of severe PCPA in the National Incidence

Study of Child Abuse and Neglect (the NIS-2); instead, children in single-parent households were no longer at higher risk of severe PCPA when income differences were taken into account (Sedlak, 1997). Similarly, race/ethnicity findings have been mixed. Studies using the NFVS sample found that non-White parents were at increased risk for using both minor PCPA (Straus, 1994) and severe PCPA (Connelly & Straus, 1992). In the 1995 Gallup survey data, Dietz found that African American parents reported more spanking (looking at just one item of PCPA) than Whites. Straus et al. (1998) found the same for severe PCPA but found no race/ethnic differences in the use of minor PCPA.

In this study, we seek to identify features of neighborhoods that may affect the amount of PCPA used by residents. We begin by examining how much variance exists between neighborhoods in a measure of individually reported PCPA. We next introduce measures of neighborhood disadvantage, as well as social processes of the neighborhoods, and examine their independent association with PCPA. We also examine whether differences between neighborhoods remain significant after accounting for family factors. Finally, we subject the data to the most conservative test, investigating whether there are neighborhood effects that persist when family characteristics are taken into account. We recognize the hierarchical nature of the urban environment under study and use appropriate multilevel statistical methods (Boyle & Willms, 2001; Bryk & Raudenbush, 1992). We hypothesize that levels of PCPA, a within-family phenomenon, will vary between families as well as between neighborhoods that differ in socioeconomic circumstances, social and organizational characteristics, and level of violence. We investigate this hypothesis in a unique study design that incorporates data from individuals and families living in 80 diverse neighborhoods in Chicago.

METHOD

Data come from the Project on Human Development in Chicago Neighborhoods (PHDCN), a transdisciplinary study aimed at deepening our understanding of the multilevel pathways to child and adolescent criminal behavior, psychiatric disorder, and prosocial behavior. The sample is diverse with respect to race/ethnicity, SES, and family structure. Data come from four sources: a Community Survey (CS) of 8,872 residents of Chicago conducted in 1995 (Earls & Buka, 1997); 1990 census data (U.S. Census Bureau, 1990); 1995 crime data; and an ongoing Longitudinal Cohort Study (LCS) of families (N = 4,252 children ages 3 to 15 years and 3,465 caregivers with complete data on PCPA; Earls & Buka, 1997).

Sampling

Sampling for PHDCN occurred in two stages (Earls & Buka, 1997). First, 847 census tracts within the city of Chicago were examined for naturally occurring clusters of city blocks that were geographically compact and similar in socioeconomic and ethnic mix, housing density, and family structure. Through statistical analyses of census data, a total of 343 neighborhood clusters (NCs) were identified. NCs were grouped according to 7 levels of race/ethnicity composition and 3 levels of average SES into 21 strata. The goal was to draw as evenly as possible from these 21 strata to achieve a balanced design. There were 3 strata that were empty of NCs: specifically, there were no neighborhoods that were both 75% or more Hispanic and high SES, none that were more than 75% non-Hispanic White and low SES, and none that were mixed Hispanic and African American and high SES (see Table 1). From the remaining 18 strata, 80 NCs were chosen for intensive study, using stratified probability sampling (except for 3 strata with fewer than 5 NCs that were sampled with certainty).

In the second stage of sampling, dwelling units were enumerated within each NC. In the majority of NCs, all dwelling units were listed; however, in some very large NCs, census blocks were sampled for enumeration using probability proportional to size. For the community survey, blocks were selected with probability proportion to size, then dwelling units within blocks, and finally persons within dwelling units were selected at random. For the longitudinal cohort study, approximately 35,000 households were screened for eligible children. The ages and sex of household members were used within the 80 selected neighborhoods to select households with children within 6 months of one of the target cohort ages (0, 3, 6, 9, 12, 15, and 18 years), including all pregnancies. All eligible participants within a selected household were invited to participate. A primary caregiver of each child enrolled was also recruited, except for those in the 18-year-old cohort. Data used in the current analysis come from children in the 3-, 6-, 9-, 12-, and 15-year-old cohorts and their caregivers.

Community Survey—1995

To characterize Chicago's neighborhoods from the point of view of its residents, 8,782 study participants representing all 343 NCs were interviewed in their homes in 1995, reflecting a response rate of 75%. Higher numbers of respondents were sampled within the 80 selected neighborhoods than in the

TABLE 1: Distribution of 343 Neighborhood Clusters (NCs) in Chicago by Racial/Ethnic Composition and Socioeconomic Strata

Racial/Ethnic Strata[b]	*Socioeconomic Status*[a]		
	Low	*Medium*	*High*
75% African American or more	77 (9)	37 (4)	11 (4)
75% Non-Hispanic White or more	0 (0)	5 (4)	69 (8)
75% Hispanic or more	12 (4)	9 (4)	0 (0)
20% Hispanic or more/20% White or more	6 (4)	40 (5)	12 (4)
20% Hispanic or more/20% African American or more	9 (4)	4 (4)	0 (0)
20% African American or more/20% White or more	2 (2)	4 (4)	11 (4)
NCs not classified above	8 (4)	15 (4)	12 (4)
Total	114 (27)	114 (29)	115 (24)

NOTE: The corresponding distribution of a subsample of 80 NCs selected for more intensive study is shown in parentheses.
a. Based on levels of poverty, public assistance, income, and education using U.S. Census data from 1990 (U.S. Census Bureau, 1990).
b. Determined using U.S. Census data from 1990.

remaining 263 nonsampled NCs. The survey included items to measure both demographics and social and organizational characteristics of neighborhoods.

U.S. Census Data—1990; Crime Data

Data from the 1990 census were used to create additional neighborhood-level variables (see below). Homicide data for 1995 were obtained from the Chicago Police Department and aggregated to the NC level.

Longitudinal Cohort Study—1995 to the Present

Baseline interviews of children and their caregivers were conducted face-to-face in respondents' homes from 1995 to 1996 and provide the individual-level data for this analysis. Informed consent procedures were followed with both parents and children at each assessment. Primary caregivers were questioned about their own physically aggressive behaviors toward the children in the study, violence between themselves and their romantic partners, and many other dimensions of their families and children's lives. PCPA was measured by a subset (seven out of nine items; see Table 4) of the original Conflict Tactics Scales (CTS) that measures physical assault (Straus, 1979). We also created two subscales of minor PCPA (three items: slap/spank with open palm, threw something at child, push/grab/shove) and severe PCPA (four items: kick/bite/hit with fist, hit/try to hit with something, beat up, burn/scald). The decision to drop two items of the original CTS regarding use of knives or guns was made by the project staff after pretesting the instrument in a similar population in Boston. None of the respondents endorsed either of these items, and some voiced concern about whether their severity might put off respondents in the larger study. The response scale for each item was *never* (0), *once* (1), *twice* (2), *3-5 times* (3), *6-10 times* (4) *11-20 times* (5), and *more than 20 times* (6). Each item was read aloud to the participants, preceded by, "When you had a problem with (child's name) in the past year . . . " We hypothesized that responses to the CTS items would correspond to a single latent variable that reflects the degree, severity, and individuals' propensity toward physically aggressive behavior directed at children. We used the item response theory (IRT) approach of Rasch analysis (Wright & Masters, 1982) to test this hypothesis. IRT provides a methodology for using persons' responses to questionnaire or test items to construct a latent variable scale that takes into account degree, severity, and individuals' propensity toward a behavior (Mellenbergh, 1994; Thissen & Steinberg, 1988). Rasch models, a specific type of IRT analysis, use item responses as realizations of the probabilities of item endorsement given a person's propensity and the level of that item's extremity. Our resulting linear interval scale of PCPA has acceptable psychometric properties and construct validity (Molnar, Brennan, Kindlon, & Buka, 2002). Due to a skewed distribution of the resulting PCPA Rasch scores, with few children subjected to the most extreme PCPA and most experiencing levels of PCPA that were comparatively low, the scale was transformed by taking the square root to conform to the distributional assumptions of our hierarchical linear modeling method.

We treated family-level SES as a composite of three variables—parental income, education, and occupational prestige code—created using principal components analysis. Family-level social support was measured by an adaptation of the Provision of Social Relations scales and consists of a family scale and a friend scale (Turner, Frankel, & Levin, 1983).

Some neighborhood measures were formulated using data from the 1990 census, and others came from aggregated answers from community survey respondents. The census-based measures were derived by factor analysis in an earlier PHDCN study that yielded three factors (Sampson et al., 1997). The first factor was labeled Concentrated Disadvantage and was dominated by high loadings for (a) percentage of neighborhood residents below the poverty line, (b) percentage on public assistance, (c) percentage of female-headed families, (d) percentage unemployed, (e) density of children measured by percent-

age younger than age 18, and (f) percentage of African Americans. A second factor was labeled the Immigrant Concentration of the neighborhood and consisted of (a) the percentage of Latinos and (b) the percentage of foreign-born residents in a neighborhood. The third factor was labeled Residential Stability and consisted of (a) percentage living in the same house as 5 years earlier and (b) percentage of owner-occupied housing. Factor scores for each neighborhood cluster were calculated by weighting each variable by its factor loading.

A neighborhood measure of 1995 homicides was derived from crime data provided by the Chicago Police Department. Homicides are typically measured with reliability and without the problems of reporting bias that occur with other violent crimes such as sexual and physical assaults (Sampson et al., 1997). Measures of neighborhood processes came from scales developed from the 1995 PHDCN CS and included the average number of friends and relatives living in the neighborhood (size of residents' social network), collective efficacy, and the two components of collective efficacy, informal social control and social cohesion (Sampson et al., 1997). These scales all have good reliability in distinguishing between neighborhoods; for example, collective efficacy has a reliability ranging from .80 for neighborhoods with 20 raters to .91 for neighborhoods with 50 or more raters (Sampson et al., 1997).

Statistical Analyses

Analyses were conducted using Hierarchical Linear Modeling software (HLM, Version 5) (Raudenbush, Bryk, Cheong, & Congdon, 2000) to account for clustering by families and neighborhoods and to examine family and neighborhood contextual factors that may influence parenting behavior independent of individual characteristics. In each of the HLM models, we used the square root of the Rasch-derived PCPA scores as the outcome, and the intercept was allowed to be random both across children in the family and across families in the neighborhoods. Level 1 includes information unique to our sample of individual children. Given that approximately 41% of our families had more than one child in the longitudinal cohort sample, and most of the time, the same caregiver answered survey questions about each of the eligible children in the family, we chose to use Level 2 for family variables. The neighborhood variables are included in Level 3. At Level 1 (the individual child), the five age cohorts were represented by indicator variables entered uncentered, leaving out the middle age cohort (referent) of 9-year-olds. Thus, the interpretation of the intercept term at Level 1 is the level of PCPA for a 9-year-old child. Sex of the child was centered around its grand mean, yielding an intercept that is interpreted as the level of PCPA experienced by an "average" child, rather than as the value for a male or female child. At Level 2, we grand-mean centered all of the variables except for the race/ethnicity of the caregivers. Grand-mean centering of the family-level (Level 2) predictors offers a sensible interpretation of the family intercept as being estimated for a family that is average on all of the critical predictors used in our analyses and allowing the statistical tests of Level 3 coefficient estimates to be interpreted as net of all included family characteristics (for a further discussion of centering, see Bryk & Raudenbush, 1992). At Level 3, we also grand-mean centered the neighborhood characteristics; thus, the interpretation of the neighborhood intercepts is for an average Chicago neighborhood.

RESULTS

Table 2 presents the prevalence of minor and severe PCPA as determined by our study, in comparison to estimates from two national sample studies. Our estimates were higher than each of the other studies. Demographics of the sample (N = 4,252 children, N = 3,465 caregivers) appear in Table 3. The sample of children is evenly divided between boys and girls, and five age cohorts are represented, with 3-year-olds being the largest group (23%) and 15-year-olds the smallest (16%). The vast majority (91%) of the caregivers interviewed are female. The largest race/ethnicity group among the caregivers is Hispanic (44%), followed by African American (35%), Whites (17%), and Other (4%). In 30% of the households, the primary caregiver is a female single parent. Also in Table 3, the prevalence and mean scores of PCPA for each subgroup are displayed. There are several differences; for example, male children received more PCPA than female children, those in the 15-year-old cohort received the least, and female caregivers reported using more PCPA than male caregivers. There was not a clear pattern by family socioeconomic status. African American caregivers reported using more PCPA than the other three race/ethnicity groups (though this difference was fully mediated by SES in multivariate models—see Table 5), and female single parents reported more PCPA than parents of other family compositions.

Table 4 displays the prevalence and chronicity of each item that caregivers reported in the year prior to the baseline interview, which were used to determine the composite interval scale. Children being burned or scalded was reported least often (0.3%), and chil-

TABLE 2: Comparison of the Prevalence of PCPA Across Three Studies, Using Dichotomous Versions of the Conflict Tactics Scales

	% Past Year PHDCN Wave 1 Age Cohorts 3-15 (n = *4,252*)	*% Past Year 1995 Gallup Survey* (n = *1,000*)[a]	*% Past Year 1985 National Family Violence Survey* (n = *3,232*)[b]
Minor PCPA (includes slapped/spanked, pushed/grabbed/shoved, threw something at)	69.9	57	20.9 to 90.5[c]
Severe PCPA (includes hit/tried to hit with object, beat up, kicked/bit/hit with fist, burned/scalded)	32.0	26	11.0
Severe PCPA (same as above but without hit/tried to hit with object)	5.5	5	2.3

NOTE: PCPA = parent-to-child physical aggression.
a. Gallup, Moore, and Schussel (1995).
b. Wolfner and Gelles (1993).
c. Depending on age of the child.

dren being slapped or spanked with an open palm was reported most frequently (60%). Among those children who experienced the more extreme behaviors, the caregivers reported doing each one from an average of two times per year (burning/scalding) to an average of four times per year (kicked/bit/hit with fist/beat up/tried to hit with object). They reported children experiencing the more common behaviors from an average of five to six times per year.

Three-level hierarchical models are presented in Table 5, with child variables at Level 1, family variables at Level 2, and neighborhood variables at Level 3. In the first model (not shown), sex and age cohort of the children alone are included, as they are in all subsequent models. We consider this our null model, estimating baseline variance that can be compared with subsequent models. An intraclass correlation was calculated based on this model, estimating the proportion of variance between individuals within families, the proportion between families within their NCs, and the proportion of variance between NCs. We found that 44% of the variance was observed between individual children within a family, after controlling for age and sex of the child, 54% between families, and 2% between NCs. In this baseline model, children in the 6-year-old cohort were significantly more likely to receive PCPA compared with 9-year-olds, and

TABLE 3: Levels of Past Year PCPA as Reported by Caregivers of 3- to 15-Year-Olds, by Demographic Characteristics (*N* = 4,252 children, *N* = 3,465 caregivers)

	Percentage of Sample	*Minor PCPA (%)*	*Severe PCPA (%)*	*Severe PCPA Without Hit/Tried to Hit With Object (%)*	*Mean PCPA Score* (SD)
Child sex					
Female	50	67.2	29.4	4.4	12.4 (11.4)
Male	50	72.6	34.7	6.5	14.1 (10.7)
Age cohort					
3	23.1	78.6	23.1	3.1	14.7 (10.5)
6	22.8	76.0	34.0	3.1	14.8 (10.7)
9	19.1	71.1	38.2	6.4	13.7 (10.8)
12	19.0	63.2	36.6	5.9	11.8 (10.8)
15	16.0	55.1	29.3	10.5	10.2 (11.0)
Sex of primary caregiver					
Female	91.9	71.2	32.8	5.6	13.6 (10.9)
Male	8.1	55.5	22.8	4.0	9.7 (9.8)
Age of primary caregiver					
15 to 29 years	26.0	80.4	36.4	4.7	16.5 (10.8)
30 to 35 years	24.1	74.0	34.4	6.9	14.3 (10.6)
36 to 40 years	23.8	67.2	28.7	4.7	12.2 (10.4)
41 to 83 years	26.1	58.2	28.4	5.9	10.4 (10.6)
Race/ethnicity of primary caregiver					
African American	34.7	73.4	39.6	5.8	15.4 (11.2)
Hispanic	44.9	68.0	31.8	5.7	12.4 (10.5)
White	16.1	70.3	17.1	4.0	12.1 (10.2)
Other	4.2	55.6	28.6	3.9	9.9 (10.7)
Family socioeconomic status in quartiles					
Lowest	25.0	67.9	31.1	4.6	12.9 (11.1)
Second	24.5	70.7	35.8	7.1	14.0 (11.0)
Third	25.5	70.2	35.1	5.8	13.9 (11.0)
Highest	25.0	70.8	26.3	4.3	12.8 (10.3)
Caregiver is female single parent					
Yes	30.3	72.5	37.3	7.2	15.1 (11.3)
No	69.7	68.7	29.7	4.7	12.5 (10.5)
Caregiver or partner unemployed some/all of past 5 years					
Yes	9.4	76.8	39.4	5.8	16.0 (11.1)
No	90.6	69.1	31.1	5.4	13.1 (10.8)

NOTE: PCPA = parent-to-child physical agression.

TABLE 4: Estimates of Past Year Parent-to-Child Physical Aggression as Measured by Seven Items of the Conflict Tactics Scales Reported by Parents of 3- to 15-Year-Olds in Chicago Neighborhoods (N = 4,252)

Scale Item	*Number of Persons Endorsing Each Item (%)*	*Mean Times Past Year*[a]
Burned or scalded	11 (0.3)	1.9
Kicked, bit, hit with a fist	96 (2.3)	3.6
Beat up	157 (3.7)	3.7
Threw something at	487 (11.5)	3.7
Hit or tried to hit with an object	1,287 (30.3)	5.4
Pushed, grabbed, or shoved	1,659 (39.0)	5.4
Slapped or spanked with open palm	2,535 (59.6)	6.1

NOTE: Two items of the standard, original CTS were omitted: "threatened with a knife or gun" and "used a knife or gun." Sample size represents children whose caregivers answered the Parent-to-Child Physical Agression version of the Conflict Tactics Scales; caregivers with more than one child in the study are represented multiple times in these counts.

a. Among those reporting each behavior in the past year.

12- and 15-year-olds were less likely to receive PCPA than 9-year-olds. Boys were significantly more likely to receive PCPA than girls.

Next, we entered neighborhood characteristics at Level 3, with individual age and sex at Level 1, but no variables at the family level. In Model 2a, we entered the three neighborhood factors derived from census data. These neighborhood factors were highly correlated with the 1995 neighborhood murder rate; thus, Model 2b has solely the murder rate at Level 3. These multilevel models assess whether the neighborhood characteristics are associated with PCPA before introducing family composition. There was a significant estimate of between-NC variance remaining when the three neighborhood factors were in the model (0.73%, p = .02) and when the 1995 neighborhood murder rate was in the model (1.4%, p = .001). Two of the neighborhood factors, Concentrated Disadvantage and Immigrant Concentration (inversely associated) were significantly associated with PCPA, as was the 1995 murder rate, controlling for age and sex of the children, whereas Residential Stability was not. Collective efficacy, which was shown by PHDCN researchers to be associated with lower rates of community violence, and its components, social cohesion and informal social control (Sampson et al., 1997), were not significantly associated with PCPA. A measure of the social network of the neighborhood was not associated with samplewide levels of PCPA, but for Hispanic families, social networks at the neighborhood level were associated with PCPA. This cross-level interaction is discussed below.

To determine whether there remained significant between-neighborhood variation after controlling for family composition, in Model 3 we entered family characteristics that have been shown to be associated with PCPA in previous research. Very little between-NC variance remained after entering family characteristics (0.61%, p = .07). We found among the caregivers that younger age, female sex, being unemployed in the past 5 years, and being a female single parent were associated with higher levels of PCPA. Although there were higher mean scores of PCPA for African American caregivers in unadjusted models, once we included family SES and two-way interaction terms between the three race/ethnicity categories and family SES, there was not a significant difference for African Americans or Hispanics compared with Whites. There was still a significant effect of SES and significantly lower reports of PCPA for those of Other race/ethnicity. Race/ethnicity by SES interaction terms were significant for Hispanic × SES and for African American × SES but not for Other × SES. Graphs of the relationship between family SES and PCPA for each of the race/ethnic groups (not shown) indicated that higher family SES was associated with lower PCPA among White, Hispanic, and Other race/ethnicity families; but among African American families, the slope was in the opposite direction, indicating that higher family SES was associated with higher PCPA.

We ran a set of models (Model 4) that included individual-, family-, and neighborhood-level predictors to see if any of the neighborhood effects would remain statistically significant in this conservative test. There was one neighborhood factor out of the three that remained statistically significant after entering family factors; this was Immigrant Concentration, which had an inverse association with PCPA (i.e., as the Immigrant Concentration of a neighborhood increased, PCPA decreased after controlling for all other predictors in the model). Effects of the other two neighborhood factors and the 1995 neighborhood murder rate do not persist once family composition and family SES are entered into the models.

Given that the majority of immigrant families in Chicago are Hispanic, we decided to explore the protective effect of Immigrant Concentration further by looking at cross-level interactions between neighborhood characteristics and Hispanic race/ethnicity of the families. We accomplished this by using neighborhood variables to model the slopes of family-level race/ethnicity. We found that among Hispanic families only, having higher numbers of friends or relatives living in the neighborhood was associated with lower PCPA, controlling for family variables (Model

TABLE 5: Results of Three-Level Hierarchical Linear Models of Parent-to-Child Physical Aggression

	Models 2a and 2b:[a] *Individual and Neighborhood Factors*	*Model 3: Individual and Family Factors*	*Model 4: Individual, Family, and Neighborhood Factors*	*Model 5: Three-Level Model With Interaction*
Intercept	3.04**	3.13**	3.15**	4.57**
Individual level				
Male sex of child	.30**	.32**	.31**	.31**
Age cohort of child				
3 years	.17*	–.01	–.01	–.01
6 years	.19*	.11	.11	.11
9 years	—	—	—	—
12 years	–.35**	–.25*	–.25*	–.25*
15 years	–.69**	–.54**	–.54**	–.54**
Family level				
Age of primary caregiver		–.04**	–.04**	–.03**
Family SES[b]		–.14*	–.15*	–.13*
Male sex of primary caregiver		–.45**	–.45**	–.48**
Race/ethnicity of primary caregiver				
African American		.12	.04	.19
Hispanic		–.17	–.13	–.13
Other		–.55*	–.58*	–.52*
White		—	—	—
Unemployment past 5 years		.26*	.25*	.31*
Single female parent household		.19*	.19*	
Social support from family members				–.49**
Neighborhood level				
Concentrated disadvantage	.16*		.02	
Immigrant concentration	–.14**		–.09*	
Residential stability	.05		.01	
1995 murders in neighborhood	.05*			
Size of social network[c]				–.43*

NOTE: Intraclass correlations based on Model 1 (not shown) containing only individual characteristics: .439 between individuals, .542 between families, .018 between neighborhood clusters. A dash indicates comparison category.

a. The three neighborhood factors were entered together in Model 2a, and the number of murders in 1995 in each neighborhood was entered into its own model, 2b. Coefficients for individual-level gender and age cohorts were almost identical in the two models.

b. Statistically significant interactions between socioeconomic status (SES) and African American race/ethnicity and between SES and Hispanic race/ethnicity.

c. Significant only among Hispanic families. Coefficient shown is for Hispanic families.

*p < .05. **p < .001.

5). To test whether this finding was an aggregation of family factors rather than a neighborhood effect, we also included two scales of social support at the family level in this model. Social support from family members was significant at the family level (social support from friends was not), but the neighborhood finding of higher density of social networks predicting lower PCPA remained significant.

DISCUSSION

We embarked on this study to see which elements of the neighborhood context may increase or decrease parents' use of PCPA and, in particular, whether neighborhood characteristics appeared to operate above and beyond characteristics of their families. Frequently cited prevalence estimates of PCPA derived from the NFVS (Wolfner & Gelles, 1993) and the Gallup survey (Gallup et al., 1995) are calculated at the level of individual parents and do not take into account the neighborhoods in which families live. CPS report rates can be estimated for census tracts, zip codes, and other aggregated units of analysis but do not take into account individual or family information. They are also estimates of only severe PCPA and are subject to bias in terms of who gets reported. Several studies have shown neighborhood differences in severe PCPA, and many studies have examined family risk factors. We sought to bring this evidence from different levels of analysis together to identify neighborhood influences on individual parenting behavior.

We found that differences in PCPA between families are greater than differences between neighborhoods, based on intraclass coefficients (ICCs) of .54 versus .02, respectively. Accounting for family composition left little variance (.010) to explain with neighborhood characteristics. We do not have other multilevel studies with which to compare our findings, except for the study in Cleveland, Ohio, that measured self-reported child abuse potential instead of parenting behavior as an outcome. That study found a small amount of variance between neighborhoods (.05) and much more variance between families, similar to our results. As that study's authors and others have mentioned, it is common to test multilevel models with ICCs as low as .05 or even lower (Cook, Shagle, & Degirmencioglu, 1997). They found that neighborhood-level impoverishment and child care burden significantly explained the modest variation between neighborhoods (Coulton et al., 1999).

We found that Concentrated Disadvantage (taking into account several poverty-related neighborhood indicators) and community violence (represented by the 1995 neighborhood murder rate) significantly predicted higher use of PCPA, controlling for sex and age of the child. We also found that higher Immigrant Concentration predicted lower use of PCPA. In the same three-level model with family composition, most of the neighborhood characteristics were no longer significant, with the exception of the protective effect provided by having a higher neighborhood Immigrant Concentration. These findings support earlier evidence of associations between neighborhood characteristics and population-level child maltreatment measures but take the work further by (a) predicting individual-level parenting behavior rather than aggregated child maltreatment reports and (b) utilizing data collected from caregivers living within the neighborhoods under study, accounting for multiple levels of influence.

We found a cross-level interaction between the size of the neighborhood social networks of community residents and race/ethnicity of the families. For Hispanic families only, the size of the social network was significantly associated with lower use of physical aggression by caregivers. Families that are economically disadvantaged have fewer personal resources; thus, social resources may be especially important in helping them to succeed as parents. Conversely, families with more personal resources may be less dependent on social resources. Thus, characteristics of communities may affect families differently depending on their economic circumstances (Earls & Carlson, 2001; Garbarino & Barry, 1997; Leventhal & Brooks-Gunn, 2000).

In additional analyses (not shown), we also investigated whether the associated family and neighborhood characteristics differed when the outcome was divided into minor PCPA (corporal punishment) versus severe PCPA (physical abuse). All of the three-level models described above were fit using Rasch-derived scales of these two outcomes. The neighborhood findings were the same for minor PCPA as for the overall scale of PCPA, including the protective effects of both Immigrant Concentration and the cross-level interaction for Hispanic families living in neighborhoods with strong social networks. For severe PCPA, the effect of Immigrant Concentration did not remain significant after family factors were included, but the cross-level interaction was still significant. There were some differences at the family level: Hispanic families reported significantly less minor PCPA but higher severe PCPA compared with White families, African American families reported higher severe PCPA, the interaction between SES and African American race/ethnicity was no longer significant, and being a female single parent no longer predicted either outcome.

Most previous studies of PCPA have failed to incorporate multilevel data analytic strategies (Goldstein, 1995). Failure to use multilevel or hierarchical modeling methods (Bryk & Raudenbush, 1992) introduces great risk of misestimation of standard errors (thus biasing probability estimates), aggregation bias, and an inability to disentangle the effects of neighborhood characteristics from those attributable to individual or family characteristics. Due to the complex, nested design of PHDCN data, we have information on what types of families live in different kinds of neighborhoods, and we have the ability to aggregate information from families. We purposely chose a large sample of families who are living in diverse circumstances: advantaged, less violent neighborhoods or disadvantaged, more violent neighborhoods and some that have a mix of positive and negative characteristics.

We examined both family- and neighborhood-level socioeconomic disadvantage and conclude that both have a relationship with the amount of PCPA reported by caregivers. By examining interactions with family race/ethnicity, though, it appears that lower family SES is associated with higher PCPA only among White families, and higher levels of family SES were associated with higher PCPA among African American families. Other studies have also found mixed results when looking at family SES and PCPA. Controlling for other factors at all levels, the small group of caregivers (n = 181) whom we counted as Other race/ethnicity reported using less PCPA.

Looking more closely within this group, caregivers were quite diverse in ethnic origin: a combination of Asian Americans (29%), Native Americans (27%), mixed race/ethnicity (15%), those who chose not to be categorized (10%), Middle Easterners (7%), Pacific Islanders (6%), and single mentions of other countries (6%). This diversity makes it difficult to account for the lower rate of PCPA reported by this group.

Immigrant Concentration was inversely associated with PCPA, even with family factors included. The largest group of immigrants in Chicago is of Hispanic origin, with the majority coming from Mexico. The 2000 U.S. Census found that 26.0% of the residents of the city of Chicago reported being Hispanic or Latino, a 6.4% increase from the 1990 estimate of 19.6% (U.S. Census Bureau, 2000). What is it about neighborhoods with a high concentration of Mexican families that may influence parents' lower use of PCPA? We found an interesting interaction between Hispanic race/ethnicity and neighborhood social networks: Having a higher number of friends and family living in the neighborhood, as reported by community residents (not by the families in the study) predicted lower rates of PCPA among Hispanics but not among other race/ethnic groups. In this interaction model, family social support also predicted lower rates of PCPA. Perhaps social support and/or social networks are the mechanism through which Immigrant Concentration affects caregivers' use of PCPA.

Limitations

The CTS measured acts of violence that parents were willing to admit; thus, it is likely to be an underestimate of the full scope of the problem. We also used the original version of the CTS (Straus, 1979) to measure PCPA, an instrument that has both supporters and critics (Straus, 1999). We do not know if there is differential underreporting or overreporting by subgroups that may have influenced our findings. Subsequent to our interviews, a newer version of the CTS was published that shows improved psychometric properties for measuring parent-to-child behaviors (Straus et al., 1998). Overall, it is recommended that caregivers be asked for reports of family violence over children's reports of their parents' behaviors; however, having both parent and child reports may be ideal (Hamby & Finkelhor, 2000).

There is a large amount of variation between families (53% by our calculations) that we have not accounted for with our family model. Researchers have posited a multitude of family processes that influence PCPA in negative ways, such as stress or family dysfunction, and in positive ways, such as having social support (Panel on Research on Child Abuse and Neglect, 1993). We took into account some of these factors in our family models, namely, unemployment, being a female single parent, and, in our multilevel interaction model, having social support. One possible explanation of the remaining variation is that child characteristics and behaviors may increase the potential for use of severe PCPA (Herrenkohl, Herrenkohl, & Egolf, 1983), though others refute the existing findings (Ammerman, 1991; Smith & Brooks-Gunn, 1997). Others argue that temperament difficulties and behavior problems are consequences of both minor and severe PCPA (Herrenkohl & Russo, 2001; Straus & Mouradian, 1998; Straus, Sugarman, & Giles-Sims, 1997; Weiss, Dodge, Bates, & Petit, 1992). We found that child temperament was associated with PCPA in our sample; however, we feel that it is more important to explore this factor in future longitudinal studies of child behavior rather than in a multilevel cross-sectional analysis. Another possible source that we did not measure is the history of receiving PCPA among the caregivers. There is some evidence that a determinant of abusive parenting behavior may be whether the parent received harsh physical punishment as a child (Carroll, 1977; Simons, Whitbeck, Conger, & Chyi-In, 1991; Straus & Moynihan, 2001). However, others have found that such an intergenerational effect is not consistent and may be mediated by protective factors (Kaufman & Zigler, 1987; Widom, 1989).

Although there have been no other studies of PCPA with this large a sample of neighborhoods, we still have limited statistical power to detect small differences between neighborhoods. Some types of neighborhoods are not represented; most important, there are no neighborhoods in Chicago with more than 75% White residents of low SES and no neighborhoods with more than 75% Hispanic residents of high SES for us to sample. There were very few White families in neighborhoods with high levels of Concentrated Disadvantage. The constraint on variation in SES in these two racial/ethnic groups may be one reason why higher SES was associated with less PCPA among Whites but with more PCPA among African Americans. Furthermore, if neighborhood factors affect the age of women bearing children, family SES, becoming unemployed, or family social support among the families in our sample, we may have biased estimates of neighborhood effects.

We also have not accounted for changes in communities in our analyses. Several of the neighborhood measures are based on data from the 1990 U.S. Census being used to predict family behavior 5 to 6 years later. Larger social configurations such as neighbor-

hoods have the capacity to change just as families may change in composition or SES (Earls & Carlson, 2001). Given the changes in public housing in Chicago as well as the great influx of immigrants, it is likely that some of the neighborhoods have changed over time.

Conclusion and Implications

We consider the use of PCPA to be an ineffective parenting behavior that can be deleterious to child development, especially when it is imparted at a severe level. Effective public health and preventive strategies are needed to reduce the unacceptably high rates of family violence in the United States. Additionally, practitioners in psychology, social work, and pediatrics generally do not support the use of corporal punishment by parents as a method of disciplining their children and adolescents (American Academy for Pediatrics, 1998; Smith & Brooks-Gunn, 1997). Although previous research has focused on features of individual children and caregivers likely to be involved in family violence, such information may be of limited utility in broad-scale prevention efforts that could reach the millions of families at risk. Although the logic of neighborhood- or community-targeted preventive interventions is appealing, there have been scant data to date firmly demonstrating those contextual features associated with elevated rates of PCPA. The current analyses have revealed such features: Neighborhoods with higher levels of Concentrated Disadvantage and those with greater murder rates have higher rates of PCPA. Those with greater concentration of immigrants have lower rates of PCPA. Of these, Immigrant Concentration shows a particularly robust association and is associated with lower rates of PCPA independently of the characteristics of families and children residing within the neighborhood. Among Hispanic families, a high density of social networks in the neighborhood seems to be especially important, above and beyond social support they receive from their families. We demonstrated that these findings persisted when either corporal punishment or physical abuse was the outcome, in addition to our treatment of PCPA as a continuum from minor (corporal punishment) to severe (physical abuse).

It has been suggested that perhaps the best way to prevent family violence is to meet the needs of families experiencing socioeconomic disadvantage (Barnett et al., 1997). The current research supports this view because, at both the neighborhood and family levels, socioeconomic disadvantage, unemployment, and female single parent households were associated with higher rates of PCPA. Our research also suggests that individually targeted prevention efforts may not be the sole means to this end. Programs that reduce neighborhood-level disadvantage, reduce community violence, and increase social networks may all prove effective and efficient means of reducing PCPA.

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