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Family Structure and Differential Child Abuse: the Role of Siblings*

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ABSTRACT

The relationship between child abuse and sibling configuration, including the number of siblings, the number of years between siblings, birth order, and the age-sex distribution of the siblings, was explored in the context of competing models of child outcomes. Equal probability sampling was used to extract archival child protection histories for 108 multi-child families, at least one of whose children was the reported victim of physical or sexual abuse. Random-effects Cox proportional hazards regression was applied to the resulting observations on 332 children in separate models for physical and sexual abuse. The results suggest that children are safer when they live with numerous, older, or widely spaced siblings, controlling for adult composition and prior victimization. Because perpetrators seek privacy, siblings may deter abuse through routine surveillance. Numerous, older, or widely spaced siblings might increase surveillance.

Keywords: Family size, sibling constellation, differential treatment, resource dilution, confluence model

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Introduction

When abusive households include multiple children, why is one child sometimes singled out while others are spared? This study uses child protection data from Orange County, California, to investigate the extent to which sibling configuration (the number, age, and sex of siblings) affects a child's risk of being reported as a victim of physical or sexual abuse. The focus is mainly on within-family differences: factors that elevate risk for some, but not necessarily all siblings. Most other studies have sought to distinguish abusive from non-abusive households, focusing on factors that elevate risk for all children in a household. The particular contribution of this paper lies in the investigation of differential victimization of siblings within households already deemed abusive. This multidisciplinary investigation borrows concepts from demography (resource dilution) and developmental psychology (resource confluence) and insights about surveillance from criminology and injury epidemiology.

The view of families in this study is limited only to co-residential children, siblings, and parents (or surrogate parents). A modest set of demographic attributes, together constituting sibling configuration, or sibling "constellation", are highlighted. These attributes include number of children (sibship size), their ages, their sexes, and three derivative measures: age rank (birth order), density (the age intervals among siblings), and age-sex composition.

Sibling Constellation and Child Outcomes

Family structure has been used to explain a variety of outcomes for children and youth, including children's intellectual achievement (Blake, 1989; Dawson, 1991; Downey, 1995; McLanahan & Sandefur, 1994), behavioral conduct problems (Bank, et al., 1996; Bank, et al., 2004; Farrington, 2005), and substance use (Rende, et al., 2005). Among the various dimensions of sibling configuration, sibship size has been researched extensively. A single, widely replicated finding dominates this enterprise in the educational attainment literature: the negative association between large numbers of brothers or sisters and child educational attainment (Alwin, 1991; Blake, 1989; Blau & Duncan, 1967; Featherman & Hauser, 1978; Mercy & Steelman, 1982; Powell & Steelman, 1993; Steelman, 1985; Steelman & Mercy, 1983; Steelman & Powell, 1989). This educational disadvantage is amplified when sibling births occur in quick succession (Zajonc & Markus, 1975).

Notwithstanding the preponderance of studies that indicate a large family-size disadvantage, the issue remains complicated. Guo and VanWey (1999), using fixed effects models to partial out background factors including heredity, intellectual milieu and, most important, changes in sibling configuration over time, found no negative sibship size effects in their nationally representative sample. Children with more siblings, to the contrary, scored higher on math achievement tests than children with fewer (Guo & VanWey, 1999), possibly a benefit of additional siblings who (especially if close in age) furnished additional help with homework (Phillips, 1999). Guo and VanWey highlight two important considerations in the analysis of sibling configuration effects: first, that sibling constellation is dynamic (Heer, 1985) and, second, that any effects (whether harmful or beneficial) may be context dependent.

Sticking with educational attainment as the outcome, studies of birth order, sibling age composition, and sibling sex composition provide little basis for anticipating child abuse effects. Among studies of birth order, some find educational advantages for first-borns (Adams, 1972; Belmont, et al., 1976; Cohen & Beckwith, 1977; Zajonc & Markus, 1975), whereas other results are mixed or inconclusive (Cicirelli, 1978; Ernst & Angst, 1983; Freese, et al., 1999; Retherford & Sewell, 1991; Steelman, 1985; Steelman, et al., 2002; Sutton-Smith, 1982; Sutton-Smith & Rosenberg, 1970). The educational effects of sibling age composition (Cicirelli, 1994; Heer, 1985; Steelman, et al., 2002) and sibling sex composition (Conley, 2000; Hauser & Kuo, 1998; Steelman, et al., 2002) are similarly unclear.

Besides affecting external outcomes, sibling configuration may shape sibling-to-sibling interactions (Cornoldi & Fattori, 1976; McCartney, et al., 1991; White, 1975). Siblings close in age spend more time together than siblings distant in age (Ross & Milgram, 1982). Siblings who are closer in age and are closer as friends are more likely to mimic the others' behaviors, even if deviant (Slomkowski, et al., 2001). Older siblings often assume the role of protector or caretaker (Brody & Stoneman, 1994; Daniels & Plomin, 1985; Hetherington, 1989). Sisters are more apt to preserve family relationships than their brothers (Cicirelli, 1994), and emotional bonds among sisters are more durable (Cicirelli, 1982; Kier & Lewis, 1998).

Sibling bonds may intensify under stress. Siblings become closer to each other to compensate for parental absence or other family stresses or deficits (Abbey & Dallos, 2004; Brody, et al., 1987; Brody, et al., 1994; Deković & Buist, 2005; Dunn, 1984; Eno, 1985; Price & McHenry, 1988). The foregoing processes, in particular the protectiveness of elder siblings and the general closing of ranks under stress, though observed among non-abusive families, may still persist in abusive households. To that extent, large sibships may counteract child abuse risk for some. This explanation cannot explain all abusive behavior, however. It is possible that the elder siblings could become the abusers. There certainly are other explanations.

Sibling Constellation and Child Abuse Risk

Child abuse researchers have generally focused their investigations around the attributes of perpetrators or victims. Few have focused explicitly on sibling constellation, though many have included household size (or numbers of children or siblings) as control variables. Four recent community studies, each finding a positive correlation between family size and child abuse risk, serve as examples.

Berger's (2005) analysis of the 1985 National Family Violence Survey (n = 6,002) applied micro-economic gaming models to investigate risk factors for physical abuse among families. Children with larger numbers of siblings were still more likely to be victimized, after controlling for a range of other factors, most notably violence among adults. Radhakrishna and colleagues (2001) followed a North Carolina birth cohort of high risk families, selecting for analysis 70 families reported to child protective services (CPS) and 140 case controls. The presence of a biologically unrelated partner was the main risk factor; additionally, there was a modest elevation of risk among large sibships. Wu and colleagues (2004) examined Florida's 1996 birth cohort (n = 189,055), among whom 1,602 had substantiated instances of maltreatment as infants. Having in excess of two siblings was among the five risk factors identified. Similar to the present study, Hamilton-Giachritsis and Browne (2005) examined the risk of abuse to siblings in families already deemed abusive. They found, in their sample of 400 abused index children and their 795 siblings in Birmingham, England, that in larger families, siblings of the index children were more likely to have been abused in the past. Although all of the foregoing analyses obtain a positive correlation between sibship size and abuse risk, the causal mechanisms are unclear.

Other analysts have outlined indirect mechanisms. Sidebotham and colleagues (2002) used birth cohort data from the Avon (England) Longitudinal Study of Parents and Children (n = 14,256) to examine the impacts of social class and material deprivation in maltreatment risk among children under age six. That reported victims were more likely than non-victims to live in overcrowded housing implies an indirect link between sibship size and abuse risk through housing occupancy. Kotch and colleagues (1995) investigated the interactions among social stress, social support, and child abuse or neglect in a North Carolina high-risk birth cohort (n = 1,111). The authors, finding that the number of dependent children (along with maternal characteristics such as education and mental health) predicts maltreatment, speculate that large families abbreviate school attendance among poor adolescent mothers. Thus, lack of education, more directly than sibship size, is the risk factor (Kotch, et al., 1995). Finally, in an overview of scientific progress in the field of child abuse prevention, Finkelhor (1999) asserts that a general decrease in family size, and thus in unwanted children, has led to a long-term decline in child maltreatment rates. No empirical support is cited. Finkelhor's statement is conspicuous in its articulation of a direct causal link between sibship size and child abuse risk.

Theoretical Models

Two models provide the theoretical underpinnings for nearly all studies of sibling configuration: resource dilution and confluence. These models suggest alternative mechanisms for the relationship between sibship size and child abuse. The resource dilution model posits that a relatively fixed pot of family resources results in diminishing per child resource allocations as the number of children increases or the spacing between children decreases (Downey, 2001). Children, as a result, do less well in terms of school and other outcomes (Downey, 1995; Lindert, 1977; Powell & Steelman, 1993; Steelman & Powell, 1989). Refinements to this model include recognition that the individual impacts of sibling number may be filtered by child age, sex, and birth order, and that some family resources are more sensitive to dilution than others (Downey, 1995).

The confluence model posits that a household's intellectual environment is an average of the intellectual endowments of its members (Zajonc & Markus, 1975; Zajonc & Sulloway, 2007). The intellectual environment of the household, according to the model, becomes diluted when additional children are born into the home because "infants are intellectually immature" (Zajonc, et al., 1979, p. 1327). Closely-spaced births concentrate the disadvantage (Zajonc, et al., 1979). Though generally consistent with the resource dilution model, the confluence model diverges in its elaboration of birth-order and birth-spacing effects. With optimal birth spacing, older siblings actively aid in the socialization of their younger brothers or sisters (Zajonc, et al., 1979). Thus, children may create resources as well as consume them (Corsaro, 2005). The confluence model emphasizes that the effect of birth order on intellectual growth is dependent upon the ages of the children under consideration. The intellectual environment of the family is a dynamic process that is differentially impacted by family size and changes when new children enter the home and grown children or adults leave the home (Zajonc, et al., 1979).

The resource dilution and confluence models together provide a novel framework for reconsidering child abuse risk. The resource dilution model points in two opposing directions. On the one hand, if a "fixed" amount of abuse is to be meted out (Downey, 1995), then a particular child's probability of physical or sexual victimization should decline as the number of siblings increases. On the other hand, to the extent that greater numbers of children exhaust parental equanimity and material resources, the risk of abuse should rise as the number of siblings increases. The confluence model suggests that sibling configuration mediates child abuse risk. Based on the confluence model, closer spacing in age of siblings and later birth order may be disadvantages, but having older siblings who act as resources in the family may minimize these disadvantages. The resource dilution and confluence models, however, may only help us to understand abuse in certain types of families.

If the protective role assumed by older children during family crises extends to child abuse, what form might it assume? Studies from criminology and epidemiology suggest that protection may occur in the form of surveillance. In devising a "routine activities theory of crime," criminologists Cohen and Felson (1979) explained that residential burglaries peak in the daytime in some communities because residents may need to be away at work and surveillance is at a minimum. Such a theory may help to explain specific types of crimes in specific communities, but they are unable to provide a broad explanation for criminal activities. Epidemiologists Chew and McCleary (1994) used analogous logic to explain the low suicide rates among residents of large or close-knit households. As an alternative to the conventional explanation, that social integration among large families minimizes the *motives* for suicide (Durkheim, 1951/1897), Chew and McCleary proposed that lack of privacy among large families could produce the same effect, by minimizing the *opportunities* for suicide. Suicides often occur shielded from public view and the possible intervention of family members or peers. Lack of opportunity and increased surveillance may characterize large families, thus, decreasing the risk of child abuse.

Common among the perpetrators of burglary, suicide, and child abuse, is that they seek concealment. Perpetrators of sexual abuse, for example, seek seclusion of their victims (Finkelhor & Baron, 1986; Lawson, 2003; Sherley, 2005). This isolation may stem not just from a lack social integration (of friends or confidants) per se, but specifically from the absence of routine surveillance that companions and additional family members provide (Freisthler, et al., 2004). Some parents or siblings, however, may be unable to stop abuse from occurring in the home (Sasse, 2005). In their article, Elliott and co-authors recommend that, "whenever possible, children should go together in groups, as abusers usually target children who are alone" (Elliott, et al., 1995, p. 594). Thus, to the extent that intra-household surveillance is heightened as a function of household size, additional siblings may confer some protection against sexual abuse. Physical abuse, however, may occur in full view of other family members regardless of family size.

Hypotheses

Considering the wealth of research from numerous fields that documents the lifelong disadvantages arising from large or dense sibships (Parr, 2005; Smith, et al., 2002), similar harm may occur with child abuse. Most studies of child abuse do find that larger family size is a risk factor for abuse when compared to non-abusive families. Does this same finding apply to siblings within already abusive families? This study examines more closely abusive families and asks whether the number of children, as well as other sibling structure variables, is related to the probability of a reported abuse incident. None of the studies summarized articulates a clear, much less direct, causal pathway. Only diffuse or indirect effects are invoked, for example the unspecified secondary effects of economic stress (Kotch, et al., 1995; Sidebotham, et al., 2002; Wolfner & Gelles, 1993). At other times, the authors simply note that their household size correlations are consistent with the earlier results of others (Berger, 2005; Radhakrishna, et al., 2001; Wu, et al., 2004). In short, the deleterious effects of large or dense sibships on child abuse risk are widely assumed but poorly articulated. The theoretical models discussed (resource dilution, confluence, and surveillance) provide alternative ways of conceptualizing sibling configuration and the risk of child abuse.

Three sets of hypotheses can be drawn from the above literature. The first set comes from the resource dilution model. The resource dilution model focuses on sibship size and age spacing. Family resources, according to the model, are diluted as family size increases, resulting in negative child outcomes. The impact of family size on the risk of child abuse, however, may depend upon other aspects of the sibling structure, such as the ages and sexes of children and their birth orders. Parents in a household with several children under the age of five, for example, may find that their energy levels are depleted much more quickly compared to a household with many older children. On the one hand, if child abuse is sensitive to dilution, then many siblings in the home (high sibship size) may be expected to protect against the risk of abuse. This may be more relevant for sexual abuse. Larger sibship size may deter sexual abuse because of lack of opportunity. It is also possible, however, that larger sibship size allows for greater opportunities for abuse because there is a greater chance that there will be a child present in the home at that moment. Physical abuse, however, may occur in full view of other family members. On the other hand, if more children exhaust parental attention and resources, the risk of abuse may be expected to rise with increased sibship size. This may be more applicable to physical abuse. That is, physical abuse may result from a stretching of parental resources that is expected with larger numbers of siblings.

The second set of hypotheses is derived from the confluence model. This model emphasizes the importance of optimal birth spacing and the age-dependency of birth-order effects. Closer age spacing leads to greater disadvantages. Birth order, according to the model, does not exert an independent effect, but rather depends on the ages of the children under consideration. It also suggests that children help to create resources in the home in addition to depleting them. Based on this model, closer age spacing of siblings may be expected to be related to a greater risk of abuse. On the other hand, considering that children are potential resource contributors, siblings close in age (high sibship density) may protect from abuse. Siblings closely spaced in age likely share more in common and spend more time together than siblings widely spaced. The effect of birth order on child abuse risk should also be considered in the context of the ages of the siblings in the household. The expected direction of this relationship is unclear.

The third set of hypotheses is derived from the surveillance model. This model builds on the confluence model's suggestion that siblings can also be resource contributors in the home rather than just resource consumers. Older siblings may protect their younger counterparts from abuse because they are more capable than younger siblings of surveillance (and potential intervention). Additional siblings, similarly, could minimize the opportunities for physical or sexual abuse. The surveillance models from suicide studies (Chew & McCleary, 1994) and criminology (Cohen & Felson, 1979) lead to the suggestion that sibship size and density could protect directly against child abuse. The causal pathway for a protective effect of large or dense sibships is straightforward, requiring only two assumptions: first, that surveillance minimizes perpetrator opportunity and, second, that additional siblings mean additional surveillance. Finally, the studies of sibling bonds (as affected by age density or family stresses and deficits) suggest that children having denser or larger sibships are more apt to look out for one another. Because sisters are more likely to preserve family bonds

(Cicirelli, 1994), sisters may be more likely to protect other siblings from familial abuse.

Our three sets of hypotheses address sibship size, density, and, indirectly, age rank and age and sex composition. The following section describes the methodology used in this study.

Method

Sources and Sampling

Data for this study were extracted from the archives of the CPS agency in Orange County, California. The county, whose population grew from roughly 2 to 3 million over the period spanned by our data (1981-1997), is located within the metropolitan Los Angeles region (U.S. Census Bureau 1999, Table 43). Although physical abuse comprises a somewhat higher proportion of total reports in the data used here, they track national data (U.S. Department of Health and Human Services, 1997) in all other respects (age and sex of victims, relation to perpetrator) (Table 1). Access to the archives was court-approved under a memorandum that formalized a consulting relationship with CPS. From the outset, it should be emphasized that the data were transcribed from paper case files not originally intended for research, as is true of most archival data. Consequently, from a research perspective, the source material varied considerably both in quality and completeness.

Variable	Present sample (reported victims)	1995 NCANDS victim data (nation)
Ratio of physical to sexual abuse reports	3:1	2:1
Sex of victim		
Physical abuse	49.8% male	52.0% male
	50.2% female	48.0% female
Sexual abuse	17.1% male	24.7% male
	82.9% female	75.2% female
Age of victim – Physical abuse		
0-3	24.8%	20.0%
4-7	23.3%	26.3%
8-11	24.3%	22.4%
12+	27.6%	31.3%
Ages of victim – Sexual abuse		
0-3	12.9%	11.6%
4-7	24.3%	29.1%
8-11	21.4%	23.7%
12+	41.4%	35.7%
Perpetrator-victim relationship		
% parents	82%	80%

Table 1: Comparison of Present Sample to National Child Abuse and Neglect Data System (NCANDS) Data

The sampling pool consisted of closed cases used by CPS in support of child custody hearings spanning the years 1981 to 1997. The closed cases were drawn using equal probability sampling, and the resulting 250 households were included in the study. Thus, each household included one of these court-substantiated abuse cases. Many household files included additional abuse reports, most with indeterminate substantiation. The reported abuse victims and their siblings from these abuse incidents are the subjects of this study. Because earlier investigators have found no clear justification for segregation of substantiated and non-substantiated events (Drake, 1996; Drake, et al., 2003; English, et al., 1999; Way, et al., 2001), we kept all abuse reports regardless of substantiation status. Because of insufficient evidence, an abuse report becomes unsubstantiated, even when a CPS worker may believe that the abuse occurred (English, et al., 1999).

We adapted the original sample of households in two stages. In the first stage we culled 142 households (of the 250 original households) that did not meet our analytic criteria. The exclusions were as follows. First, because this is an investigation of sibling effects, we excluded incidents in which the reported victim was an only child. A child is at-risk for abuse even if he or she is an only child, but our focus is on factors differentiating children from their siblings. Next, case files involving "neglect only" were excluded because neglect usually affects all children in a household, mooting the issue of differential victimization. Drug-positive births, which were inconsistently categorized by CPS as either physical abuse or severe neglect, were excluded next. Finally, we excluded several cases of "emotional abuse only." Because the conceptual and operational definitions of emotional abuse are still unsettled (Glaser, 2002), potential gains from including emotional abuse did not appear to justify the attendant complications. In the end, the sample comprised 108 files representing an equal number of families with the following characteristics: (1) two or more children under the age of 18, (2) at least one child who was a substantiated victim of physical or sexual abuse, and (3) the perpetrator of the substantiated abuse was either a parent, caretaker, or an informal partner of the parent (for example, the mother's boyfriend).

From the 108 households, we identified 214 total incidents of physical or sexual abuse representing records on a total of 332 children. We refer to observations on these 332 children as "victim-incidents" or "child-incidents" because we have multiple records of abuse in some families. Each child, victim or not, was treated as an "index" child in each observation; that is, the data were coded to reflect the child's unique situation in the home at each particular abuse incident. This method allows us to capture variables that change over time, such as household composition and the aging of children. The observations totalled 638 records of data.

In each observation, or child-incident, we coded characteristics of: 1) the individual (such as age and sex), 2) relationships to siblings (such as the number of siblings, birth order, the denseness of the sibship group, and the age and sex of the index child's siblings), 3) relationships to adults in the household (whether their biological parents, a mother's boyfriend, a grandparent, or an unrelated adult lived in the home, and the percentage of adults in the household), and 4) data pertaining to the alleged incident (including type of abuse, perpetrator, date of incident, and whether the child or a sibling was previously reported for abuse).

Reconstituting the data from the children's perspective provides two advantages. First, it focuses on particular children irrespective of any changes in the composition of their households (an especially frequent occurrence for children in abusive families). Children age and their household compositions change over time as individuals move in and out of the household. Second, it differentiates the impact of factors otherwise measured identically at the family or household level on the various siblings in that family or household (Blackwell & Reed, 2003). Parameters that siblings may experience differently include the mean age of a child's siblings, the number of older siblings and, for households with stepsiblings, the presence of a biological mother or father.

Measures

Dependent Variable. The dependent variable in the hazard rate model is the rate of reported, or alleged, victimization. It is the probability of a child being reported for victimization at a particular point in time. A higher abuse rate indicates greater risk for being reported for victimization, whereas a lower abuse rate indicates greater protection. The rate of abuse is determined by an "event" variable, the transition from at-risk to victim. This variable is dichotomous: whether during the observation period a particular child was reported as a victim of physical or sexual abuse (1=event was reported, 0=censored). As noted earlier, the report could either be substantiated or not. Observation intervals measuring the time-to-the-event begin when there are at least two children in the family, because the interest of the study is the differential victimization of siblings. The time at risk is defined as the length of time a child spent living in a multi-child household until the reported incident. Children "exit" the study at the last reported incident in their households.

Independent Variables. The independent variables correspond to three nested structures: individual children, their sibling set, and their entire household including adults. Child-level variables comprise age, sex, ordinal rank (a proxy for birth order), and abuse history. In measuring ordinal rank, children who did not qualify as either eldest or youngest in their sibling set were consolidated as "in-betweens." Each child's victimization history was coded with separate dummy indicators for prior physical abuse, prior sexual abuse, and for prior victimization of any other sibling through either physical or sexual abuse.

Measures for the sibling set include sibship size, density, age composition, and sex composition. Sibship size was the total number of co-resident siblings at the time of an incident. Following Kidwell's (1981) measure of sibling age spacing (density), the sibling age gaps were summed and averaged by the number of siblings, reflecting the disproportionate influence of siblings who are close or far apart in age (Heer, 1985; Kidwell, 1981; Lawson & Brossart, 2004; Waldrop & Bell, 1964). The age composition for each child is measured by the percentage of the child's siblings that were older; if more than 50 percent of the child's siblings were older siblings, the variable was coded "1" and "0" for otherwise. An additional variable represents children with equal numbers of older and younger siblings. The reference category is having a disproportionate percentage of younger siblings. Similar coding was employed for variables measuring sex composition. The two indicator variables include: 1) whether the index child's siblings were mostly brothers or 2) the child had equal numbers of brothers and sisters (mostly sisters being the reference category).

A third set of independent variables pertains to the entire household or its adults. These comprise the number of co-resident adults as a percentage of total household size at the time of the reported incident, mother's age at the birth of each index child, and the relationship of co-resident adults to that child. To measure adult relationships, household members 18 or over were coded as: biological mother, biological father, stepparent, other related adult (including grandparent, aunt, or uncle), unrelated adult (generally the mother's boyfriend), or adult sibling. Following convention, all models omit perpetrators. Since the identities of perpetrators were unknown prior to abuse, they were not included as risk factors but are examined in the descriptive statistics.

The final set of variables includes interaction terms that may affect the risk of abuse. These include mostly interaction effects between the child's sex and characteristics of the sibling structure, and two involving other sibling variables, including interactions between age and sex composition and sibling density. The variables include: 1) child's sex interacted with siblings disproportionately brothers, 2) child's sex with siblings disproportionately older, 3) child's sex with biological father present, 4) child's sex and unrelated adults present in the household (such as mother's boyfriend), 5) siblings disproportionately brothers with mostly older siblings, and 6) siblings disproportionately brothers with average spacing of siblings (density).

Data Challenges and Statistical Method

Several features of the data prevent appropriate analysis with conventional ordinary least squares (OLS) regression. A random-effects survival analysis, however, is an ideal method for the data. First, each observation in the data contains information about a child particular to the abuse incident. To model time to abuse, the data must represent a span of time. These "snapshot" data are easily converted to survival-time data within Stata such that each observation represents a period of time. The time at risk "begins" when the child enters the multi-child household (either at the child's birth or the birth of a new sibling) and "ends" on the date of the abuse incident.

Second, abuse can occur more than once, known as recurrent event data. Thus, multiple records of data exist for some children and their siblings. Some episodes of abuse involved multiple victims (42 of 214 incidents, or 20 percent), some families experienced multiple episodes of abuse (58 of 108 families, or 54 percent), and some children were victimized more than once (58 of 332 children, or 17 percent). Nearly half of the 108 families (46 percent) were involved in only one reported physical or sexual abuse incident. Another 26 percent were involved in 2 reports and the remaining 28 percent in 3 or more incidents.

Along the same lines, another challenge is the dependency, or clustering, of observations. Observations are dependent because siblings from the same family comprise the data and because multiple observations represent a single child's experience. Some families are more abusive than others, and as a result, the risk to children within these families is correlated. At the extreme, the three most "prominent" families in our sample (2.8 percent of families) produced 25 (or 9 percent) of victim-incidents (observations) and 60 (or 16 percent) of at-risk, or non-victim, observations in the sample of 638 records of data. For example, in one of the families, the oldest boy was targeted for physical abuse in several incidents by his biological father. In the last few incidents, the youngest child was targeted for physical abuse, again by the father. In this family, the large number of incidents, as well as increasing sibship size from 2 to 4 children over the course of their involvement with CPS, contributed to their prominence in the study. The dependency issue must be handled to prevent incorrect estimation of the regression coefficients (Sargent, 1998). The random-effects component of the model represents effects common to members of a family that cannot be observed. They are treated as unobservable random effects that allow children of the same family "to share a baseline hazard function while allowing this hazard function to differ between clusters" (Sargent, 1998, p. 1487).

In an analysis using OLS regression, the sample would lend disproportionate weight to the experience of children from families with multiple abuse incidents or with multiple siblings. Recurrent event data, however, are easily handled in the survival analysis framework. Further, to gauge the analytic threat from overrepresentation of these families, a pilot analysis was conducted using a randomly drawn subset of observations limited to one victim-incident per household. The Cox regression results without random effects (not shown) were consistent with those obtained for the full sample with random effects (to be reported below).

The subjects enter the study continuously throughout the years 1981 to 1997. This is in contrast to studies in which all subjects enter on the same date. When the data are converted from snapshot to survival-time data, three unique variables are created, one recording the start time of the period, a second for the end time, and an indicator of whether the event occurred or right-censoring occurred at the end of the period (Cleves, et al., 2004). A central feature of proportional hazards (PH) regression, a form of survival analysis, is its control for variation in spells of observation, and constitutes further justification for its application.

The data contain right-censored observations because not all children experienced abuse during the observation interval. Censoring occurs when the absence or cessation of maltreatment is confounded with the absence or lapse of CPS scrutiny. Right censoring can occur when a family temporarily or permanently moves out of the county. An absence of problems during this gap could be real or simply the result of suspension in scrutiny. Censoring is statistically controlled in the study by analyzing time spans of observation, which record in each span, whether the child was reported for abuse (=1) or censored (=0).

Period-to-period variation in household composition exists in the data. The children age and their household composition changes over time as additional abuse reports are filed. These time-varying covariates present challenges in OLS regression, but are addressed in PH regression. The analysis defines all variables (with the exception of child's sex) as time-varying covariates. Linked records are also specified through individual and household identification numbers. Thus, the analysis handles records whose variables are allowed to change over time.

By contrast, the gap caused by lack of systematic cultural or socioeconomic measures (income or educational attainment, occupation or work status, and race or ethnicity, for example) remains a serious limitation of this study. Although such attributes can in many cases be inferred, CPS procedures do not mandate their collection and thus, reliability would be suspect.

A Cox proportional hazards regression with random effects, or shared frailties, allows for full use of the data within Stata software (Cleves, et al.; Cox, 1972; Sargent, 1998). The model is:

$$\lambda_{ij}(t; \chi_{ij}, z_j) = \lambda_0(t) \exp(\chi_{ij} \beta + z_j),$$

where $\lambda_{ij}(t; \chi_{ij}, z_j)$ represents the hazard function at risk time t for a child ($j=1,\ldots,n_i$) within a family ($i=1,\ldots,n$) and with a vector of covariates χ_{ij}, including child, sibling, and adult household characteristics. The other parameters of the model include: z_j (the within-group correlations of siblings); $\lambda_0(t)$ (an arbitrary, unspecified baseline hazard function for continuous time), and β (the estimated regression coefficients). When β is exponentiated ("exp β"), it is interpreted as the hazards ratio for a one-unit change in the corresponding predictor (Cleves, et al., 2004). There is no intercept because it is contained in the baseline hazard $\lambda_0(t)$.

Results

Variable	Mean	SD	#missing
Victim Status			
Reported physical abuse victim (yes=1, censored=0)	0.33	0.47	0
Reported sexual abuse victim (yes=1, censored=0)	0.11	0.31	0
Victim status (reported victim=1, censored=0)	0.42	0.49	0
Child Characteristics			
Age (0-17 years)	7.30	4.83	0
Sex (female=1)	0.53	0.50	0
Prior Victimization			
Prior physical or sexual abuse on sibling (yes=1)	0.41	0.49	0
Prior physical (only) abuse on child (yes=1)	0.23	0.42	0
Prior sexual (only) abuse on child (yes=1)	0.07	0.25	0
Sibling Configuration			
Sibship size (2-7 siblings)	3.46	1.34	0
Sibling density (most dense=0 yrs to least dense=15 yrs)	4.68	2.61	3
Ordinal rank (youngest=-1, middle=0, oldest=+1)	-0.01	0.83	0
Disproportionately older siblings (yes=1)	0.45	0.50	0
Siblings equally older & younger (yes=1)	0.11	0.31	0
Disproportionately brothers (yes=1)	0.37	0.48	0
Siblings equally brothers & sisters (yes=1)	0.16	0.37	0
Adult Composition			
Percent adults in household (14-71%)	37.8	12.0	0
Mother's age at child's birth (14-44 years)	24.7	5.8	21
Presence of biological mother (yes=1)	0.92	0.28	0
Presence of biological father (yes=1)	0.44	0.50	0
Presence of step-parent (yes=1)	0.20	0.40	112*
Presence of relative (yes=1)	0.11	0.31	1
Presence of unrelated adult (yes=1)	0.22	0.41	1
Presence of sibling adult (yes=1)	0.07	0.25	0
Perpetrators (of victims only, N=268 observations)			
Biological mother (yes=1)	0.42	0.49	0
Biological father (yes=1)	0.30	0.46	0
Mother's boyfriend (yes=1)	0.12	0.33	0
Unrelated adult (including father's girlfriend) (yes=1)	0.03	0.17	0
Stepfather (yes=1)	0.11	0.32	0
Sibling (yes=1)	0.04	0.20	0
Relative (grandparents, aunts & uncles) (yes=1)	0.04	0.21	0
Stepmother (yes=1)	0.01	0.09	0

Table 2[*]: Descriptive Statistics for the Study Sample (*N* = 638 observations)

[*] **Note:** The sum of the means for perpetrators is 1.07 because sometimes a child was abused by more than one perpetrator. *Because of an irreversible misfortune during coding, step-parent data were missing for 112 of the 638 observations.

Descriptive statistics for the sample observations are set forth in Table 2. Roughly 33 percent of the observations (n = 638) involved physical abuse (sample mean = 0.33) and another 11 percent involved sexual abuse (sample mean = 0.11). An alternative view is to examine the occurrence of abuse in terms of the 332 children; 44 percent of the children were the reported victims of physical abuse one or more times, and 16 percent were the reported victims of sexual abuse at least once (not reported in Table 2). There were six incidents in which the same child (but different families) was reported for both physical and sexual abuse. Information was recorded for both types of abuse in the same record, and analyses were conducted separately for physical and sexual abuse incidents. Given the sample of abusive households, these levels of victimization suggest two possibilities that are tested in the multivariate models: first, that a significant proportion of children escaped direct victimization, and second, that individual victims within households were singled out.

The largest percentages of children were victimized by their biological parents; 42 percent of victim-incidents involved reported abuse by mothers, and another 30 percent involved reported abuse by fathers. Fifteen percent involved reported abuse by a mother's boyfriend or another unrelated adult. Eleven percent involved reported abuse by stepfathers. Siblings and other relatives (including grandparents or uncles) were the reported perpetrators in another 4 percent each. Finally, 1 percent of victim-incidents involved stepmother perpetrators.

Multivariate models for physical and sexual abuse are presented separately in two models each (Table 3). The first model includes child age and sex, victimization history, sibling configuration, and adult composition variables. The second model introduces a set of interaction terms. Some interaction terms were too highly correlated ($r > 0.9$) with variables already in the model and thus, could not be included. The models do not include the effects of stepparents due to the number of missing values (noted in Table 2). They also do not include ordinal rank (birth order) because of its high bivariate correlation with siblings disproportionately older ($r = -0.82$). All other bivariate correlations of the main variables of interest were less than 0.53; thus, multicollinearity is not of concern in the models presented. Parameter estimates are shown as exponentiated coefficients, or hazard ratios (HR), where a value of 1.0 would indicate no impact by a given independent variable on the ratio of the hazards of abuse for the different covariate levels. A HR of 1.0 corresponds to a regression coefficient of 0. A HR of 1.2 would indicate an effect 20 percent more than the previous covariate level, whereas a HR of 0.5 would imply a diminution of risk to one-half the level.

Variable	Physical Abuse Model 1		Model 2		Sexual Abuse Model 1		Model 2	
Child Characteristics								
Age	0.06***	(0.01)	0.06***	(0.01)	0.03***	(0.01)	0.02***	(0.01)
Female	0.83	(0.15)	0.81	(0.27)	3.67**	(1.85)	54.54***	(65.89)
Prior Victimization								
Any prior on sibling	0.37***	(0.10)	0.38***	(0.11)	0.29***	(0.11)	0.30***	(0.11)
Prior phys. On child	2.49***	(0.64)	2.42***	(0.64)	2.43***	(0.67)	2.28*	(0.78)
Prior sex. on child	1.48	(0.62)	1.36	(0.62)	2.07†	(0.87)	2.09	(1.04)
Sibling Configuration								
Number of siblings	0.57***	(0.09)	0.59***	(0.09)	0.56*	(0.16)	0.50*	(0.14)
Sibling density	0.92*	(0.03)	0.97	(0.04)	0.92	(0.06)	0.93	(0.08)
Older siblings	0.48***	(0.10)	0.57†	(0.17)	1.02	(0.32)	2.09	(1.89)
Equal old & young	0.41**	(0.13)	0.38**	(0.13)	0.96	(0.36)	0.91	(0.35)
Brothers	1.16	(0.21)	3.41*	(1.68)	1.58	(0.76)	19.43**	(18.92)
Equal bros & sis	0.94	(0.31)	0.97	(0.32)	2.10*	(0.74)	2.01†	(0.74)
Adult Composition								
Percentage of adults	0.95***	(0.01)	0.95***	(0.01)	0.96	(0.03)	0.94*	(0.02)
Mother's age	1.04*	(0.02)	1.04*	(0.02)	1.03	(0.03)	1.03	(0.04)
Biol. Mother	2.06*	(0.64)	1.96*	(0.62)	5.00*	(3.32)	5.63*	(4.07)
Biol. Father	1.19	(0.26)	0.97	(0.28)	0.39*	(0.18)	2.97	(3.62)
Relative	0.99	(0.29)	0.83	(0.25)	0.70	(0.39)	0.85	(0.50)
Unrelated adult	1.39	(0.34)	1.31	(0.51)	3.29**	(1.33)	24.24*	(31.39)
Sibling adult	1.10	(0.48)	0.98	(0.45)	1.49	(0.78)	1.75	(0.95)
Interactions								
Female & Brothers			0.62	(0.26)			0.08**	(0.07)
Female & Older			1.19	(0.41)			0.38	(0.34)
Fem. & Biol. Father			1.48	(0.61)			0.11†	(0.13)
Fem. & Unrelated			1.06	(0.54)			0.15	(0.19)
Brothers & Older			0.52†	(0.21)			1.27	(0.75)
Brothers & Density			0.87†	(0.07)			0.91	(0.14)
Model Information								
# of subjects	320		320		320		320	
# of failures	201		201		65		65	
# of observations	613		613		613		613	
Time at risk (days)	912,318		912,318		912,318		912,318	
Log pseudolikelihd.	-561.85		-556.88		-132.06		-126.02	
Wald chi-sq. (df)	477.33 (18)***		597.84 (24)***		237.86 (18)***		241.84 (24)***	
# clusters adj. İn SE	104		104		104		104	
Link test: coeff2 (p)	0.00 (0.07)		0.00 (0.17)		0.00 (0.77)		0.00 (0.79)	

***** p<0.001, ** p<0,01, * p<0.05, † p<0.10**

Table 3[*]: Hazard Ratios (and Robust Standard Errors) from Cox Proportional Hazards Models with Random-Effects for Physical and Sexual Abuse

The bottom rows of Table 3 present measures of model improvement, vis-à-vis the null hypothesis, in explanatory power (Log pseudolikelihood and Chi-square). Individual coefficients in each of the summarized models were statistically (and substantively) significant. The overall models also achieved statistically significant reductions in unexplained variance. When null hypotheses were evaluated using the log likelihood and Chi-square tests, the

[*] **Note:** Robust standard errors (in parentheses) are standard errors adjusted for clustering.

resulting p-values (.000) supported their rejection. Furthermore, an increase in the log likelihood and Chi-square values between Models 1 and 2 suggests that interaction terms improved the explanatory power of the models. The link test verifies that the model is adequately specified. The resulting zero values of the squared coefficients and corresponding non-significant p-values suggests that this is the case. Finally, further tests of the proportional hazard assumption (not presented) were performed separately for each covariate by interacting analysis time with each predictor and re-estimating the model. The majority of variables passed the test. For the handful of variables that appeared to be correlated with time (in other words, not proportional), the proportionality of the hazard ratios was assessed via graphical methods. Most of the plotted curves were fairly parallel and not of concern for the model.

Physical Abuse

Beginning with the first model, the risk of reported physical abuse is greatly reduced as children gain in absolute age (HR = 0.06). A quadratic form of age was explored in a separate analysis to determine if the risk of abuse changed direction at a certain age. Age-squared, however, was found to be non-significant ($p>0.10$). Thus, the reduction in risk continues throughout childhood. A child's sex does not appear to affect his or her likelihood of being targeted. Prior victimization substantially increases risk (HR = 2.49) but, if the prior victim is a sibling, risk is substantially reduced (HR = 0.37). This pattern is consistent with repeated victimization of particular children. More siblings in a family is associated with a lower hazard of reported abuse (HR = 0.57). Less sibling density confers similar protective effects (HR = 0.92). Risk is also greatly reduced if one's siblings are disproportionately older. Children whose siblings are disproportionately older have half the hazard ratio of abuse compared to children with mostly younger siblings (HR = 0.48). As the percentage of adults in the household increases, children are slightly more protected from abuse (HR = 0.95). Having a mother living in the household also increased the risk of reported abuse (HR = 2.06).

To further investigate sibling effects, a model containing interaction effects was created (Model 2). This model confirms the protective effects of age, large numbers of siblings or adults, and having disproportionately older siblings, and the harmful effects of having been victimized previously. New factors also emerge. Having mostly brothers greatly increases the hazard ratio of reported abuse (HR = 3.41). Thus, sisters emerge as a protective factor. It is possible that rather than being protective, brothers, especially older ones, may act as perpetrators of abuse. Two of the interaction effects were statistically significant at the 0.10 level – the interaction of mostly brothers with both mostly older siblings and with sibling density. The presence of older brothers (HR = 0.52) and brothers who are spaced further apart in age (HR = 0.87) may actually protect from physical abuse in some households. The presence of brothers closely spaced together may result in more rough-housing than in households with other sibling compositions. Too few cases of sibling perpetrators in the sample do not allow for adequate explanation of these interactions. Finally, based on Hamilton-Giachritsis and Browne's (2005) finding that larger families were more likely to contain a sibling with a prior abuse, we tested for interaction effects between prior abuse history and sibling number but found no statistically significant effects (results not presented).

Sexual Abuse

Results for sexual abuse closely resemble those for physical abuse in the harmful effects of younger child age, prior victimization, smaller sibling number, a smaller percentage of adults, and the presence of the mother (Model 1). The risk of reported sexual abuse is greatly reduced as children gain in absolute age (HR = 0.03). Whereas a child's sex did not affect his or her risk of physical assault, being a girl greatly increases the hazard ratio for reported sexual assault (HR = 3.67). Prior victimization, particularly physical abuse, substantially increases the risk for reported sexual abuse (HR = 2.43). But, if the prior victim in the household is a sibling, risk is substantially reduced (HR = 0.29). This pattern is also consistent with that found for physical abuse, that particular children are repeatedly victimized. Greater numbers of siblings in the family considerably decrease the risk of sexual abuse (HR = 0.56). The presence of a child's biological father more than halves the risk of being reported the victim of sexual abuse (HR = 0.39), whereas the presence of the mother's boyfriend (or some other unrelated adult) greatly increases the risk (HR = 3.29).

Interactions (Model 2) amplify the risk of being a girl (HR = 54.54). A child who has mostly brothers is at a considerable higher risk for sexual abuse compared to a child with mostly sisters; this may be related to the finding for child's sex. Similar to the results for physical abuse, having brothers is not a protective effect; having mostly brothers greatly increases the hazard of sexual abuse (HR = 19.43). We investigate this effect further in an interaction variable. The interaction of female gender with mostly brothers suggests that the sex composition of the sibship matters a great deal; the hazard ratio of 0.08 suggests that sexual abuse risk is reduced in homes where girls have mostly brothers. Although the independent effects of child's gender and sibship sex composition are both positive (greater risk), the interaction effect is negative (less risk). The risk of sexual abuse is also reduced for girls in homes where their biological father resides (HR = 0.11).

Discussion and Conclusion

This paper attempts to clarify the effects of sibling configuration on the risk of physical or sexual abuse allegations among individual children in abusive multi-child households. With rare exception, studies of sibling configuration in normal (non-abuse) contexts have shown that large numbers of siblings, especially if closely spaced, are an impediment to child well-being (Alwin, 1991; Blake, 1989; Blau & Duncan, 1967; Featherman & Hauser, 1978; Mercy & Steelman, 1982; Powell & Steelman, 1993; Steelman, 1985; Steelman & Mercy, 1983; Steelman & Powell, 1989; Zajonc & Markus, 1975). This finding has been generalized to child abuse, with empirical support from a variety of child abuse studies (Berger, 2005; Hamilton-Giachritsis & Browne, 2005; Radhakrishna, et al., 2001; Wu, et al., 2004). Nonetheless, as argued earlier, most of this support has been the by-product of studies whose examination of sibling constellation was incidental and, if for no other reason than that, whose study designs were ill-suited to uncovering sibling configuration effects. Moreover, most studies do not spell out any situation-specific, much less direct mechanism by which large or dense sibships cause harm. Instead, diffuse or indirect mechanisms have been invoked, for example, the exacerbation of family stresses from the burden of surplus children. In short, the link between large and dense sibships and child abuse deserves a fresh look.

The present re-examination of the link between child abuse and sibling constellation rests on two novel features. First, we take a fresh look at the literature, reaching beyond the commonly used resource dilution model to construct alternative hypotheses based on confluence theory (from child development) and surveillance theories (from criminology and suicide epidemiology). Second, our PH-based study design permits the discovery of differential risk for siblings within the same household.

The results show risk effects in three distinct areas: characteristics of individual children, sibling configuration, and adult composition. The results concerning child characteristics and adult composition reinforce existing studies: younger children are at higher risk of physical abuse, girls are at higher risk of sexual abuse, prior victimization elevates the risk of further abuse, and the presence of an unrelated male adult is a strong risk factor for sexual abuse. Our data support the truism that the majority of child abuse perpetrators comprise parents (U.S. Department of Health and Human Services, 1997). The results concerning sibling constellation, by contrast, contradict much of the existing literature. In particular, our finding that large sibships are associated with a decreased risk of physical or sexual abuse is contrary to existing literature, although the result does make some common sense. This finding may represent reality, or it may represent differences in the type of data and analyses used. Still, this is not to dismiss our finding. The richness of our child abuse data on family configuration and its changes over time, as well as the analytic technique employed, are probably superior to other studies.

Even after accounting for age and sex, victimization history, and characteristics of household adults, a child's sibling constellation affects his or her risk of reported abuse, and the effect systematically differs from one child in the sibship to another. We proposed specifically that children with larger or denser sibships, or with predominantly elder brothers or sisters, would be less likely to be singled out for abuse. The data provide some support to all three sets of hypotheses. The protective sibling effect is large: with each additional sibling, the index child's risk declines by 41 percent for physical abuse and by half for sexual abuse (HR for physical abuse = 0.59, for sexual abuse = 0.50 in Model 2). This supports the hypothesis based on the resource dilution model that child abuse is diluted with increased family size. Our hypotheses for the protective effects of closer age spacing of siblings, however, were not supported. Siblings spaced further in age, by contrast, provided greater protection for children from physical abuse; sibling density had no statistically significant effect on sexual abuse risk. This supports the confluence model's original claim that closer age spacing is detrimental for child outcomes. Additional factors also emerge. The age and sex compositions of the sibship appear to be especially important for a child's risk of abuse. Greater surveillance for physical abuse may take the form of having older siblings, especially older brothers and brothers who are further apart in age (interaction effects). If a girl has mostly brothers, then she will be at slightly less risk for sexual abuse than a girl with mostly sisters.

Although sibling protection against both types of abuse is fairly similar, the guardianship of adults varies between physical and sexual abuse. In physical abuse, none of the adults in the household appear to serve as guardians; in sexual abuse, biological fathers serve as guardians. In the case of sexual abuse, the absence of a biological father may imply not just cessation of his guardianship but also his replacement by an unrelated adult male. Potentially worse, the otherwise protective disposition of the mother may be blurred when the new adult male is her boyfriend. It is important to keep in mind that these findings apply to households already deemed abusive; they are not compared to normal families.

A simple mechanism may explain the protective effect of extra siblings. In general, routine surveillance of bystanders deters deviant behaviour (Chew & McCleary, 1994; Cohen & Felson, 1979). At the household level, extra siblings may increase the level of surveillance. The effect is accentuated for children with older (and more capable) siblings, especially if they are brothers. An older brother or sister may be capable of intervening in an unsafe situation, but the presence of younger siblings can still be a deterrent. Three- or 4-year-olds, for example, are fully capable of "innocent" but incriminating questions about what they have seen. Thus, the mere potential for disclosure may suffice as a deterrent. Although the confluence model implies that children may be agents in shaping the environment in which abuse may occur (or be deterred), not just passive targets, deterrence requires little of children beyond their routine presence.

Family structure aside, what is the effect of prior victimization? Do the results support a historical bias toward repeated abuse of particular children, even when other targets are available? The answer is yes. If the index child has experienced previous abuse, then his or her future risk of victimization is elevated. But, if prior abuse was reported for a sibling, the index child's risk declines. More than half of the sampled victims were the sole reported victim in an incident. This level is consistent with national data (U.S. Department of Health and Human Services, 2002). Altogether, the findings suggest the selection of victims for repeated abuse involves an interaction between child attributes (age, sex, and characteristics unmeasured in this study: personality, health or medical challenges, and physical maturation, for example) and sibling constellation. A child's individual attributes are certainly among the primary risk factors for abuse, but their influence can be modified by (among other factors) the child's location in a sibling constellation.

In any case, major limitations apply to these results. First, the data were derived from families whose pathologies were severe enough to trigger sustained interventions by authorities. Their applicability to more mildly abusive (including neglectful) or even non-abusive families is speculative. Second, a large proportion of the sample families were burdened by multiple problems other than child abuse, many stemming from poverty or substance abuse. The inability to exercise statistical control for economic, behavioural, or social characteristics precludes the possibility of addressing such potential confounds. Our findings should be interpreted with caution.

This study is only applicable to families that report victimizations. Many times abuses go unreported. This may be particularly true for second and third instances after a first abuse has already been reported. There may be pressure from family members not to report for fear that children will be removed from the home. Our study, however, is unable to address this issue, but it is an important one to note.

What are the implications for child protection practice? The findings may help justify the efforts among child protection professionals for keeping intact sets of siblings who have been removed from their homes. Siblings, even from abusive families, may still retain some capacity to look out for one another. A survey of child protection risk assessment tools (English & Pecora, 1994) suggests the prevalence of a belief that larger families are more likely to generate the need for intervention (though whether because the risk for each child is higher or simply because there are more children, is unclear). This study may encourage practitioners to discern not only the challenges in large family sizes but to also seek for potential strength in numbers.

REFERENCES

Abbey, C., & Dallos, R. (2004) The experience of the impact of divorce on sibling relationships: A qualitative study. *Clinical Child Psychology and Psychiatry*, 9(2), 241-259.

Adams, B.N. (1972) Birth order: A critical review. *Sociometry*, 35(3), 411-439.

Alwin, D.F. (1991) Family of origin and cohort differences in verbal ability. *AmericanSociological Review*, 56(5), 625-638.

Bank, L., Burraston, B., & Snyder, J. (2004) Sibling conflict and ineffective parenting as predictors of adolescent boys' antisocial behaviour and peer difficulties: additive and interactional effects. *Journal of Research on Adolescence*, 14, 99-125.

Bank, L., Patterson, G.R., & Reid, J.B. (1996) Negative sibling interaction patternsas predictors of later adjustment problems in adolescent and younger adult males. In G. Brody (Ed.), *Sibling relationships: Their causes and consequences* (pp.197-229).

Norwood, New Jersey, United States: Ablex.Belmont, L., Stein, Z.A., & Witteró, J.T. (1976) Birth order, family size and school failure. *Developmental Medicine and Child Neurology*, 18, 421-430.

Berger, L.M. (2005) Income, family characteristics, and physical violence toward children. *Child Abuse & Neglect*, 29, 107-133.

Blackwell, B.S., & Reed, M.D. (2003) Power-control as a between- and within- family model: Reconsidering the unit of analysis. *Journal of Youth and Adolescence*, 32(5), 385-399.

Blake, J. (1989) *Family size and achievement*. Los Angeles: University of California Press.

Blau, P., & Duncan, O.D. (1967) *The American occupational structure*. New York: Wiley.

Brody, G., & Stoneman, Z. (1994) Sibling relationships and their association with parental differential treatment. In E.M. Hetherington, D. Reiss, & R. Plomin (Eds.),*Separate social worlds of siblings: The impact of nonshared environment on development* (pp. 129-142). Hillsdale, New Jersey, United States: Lawrence Erlbaum Associates, Inc.

Brody, G.H., Stoneman, Z., & Burke, M. (1987) Child temperaments, maternaldifferential behavior, and sibling relationships. *Developmental Psychology*, 23, 354 362.

Brody, G.H., Stoneman, Z., & McCoy, J.K. (1994) Contributions of familyrelationships and child temperaments to longitudinal variations in sibling relationshipquality and sibling relationship styles. *Journal of Family Psychology*, 8(3), 274-286.

Chew, K.S.Y., & McCleary, R. (1994) A life course theory of suicide risk. *Suicide &Life-Threatening Behavior*, 24(3), 234-244.

Cicirelli, V.G. (1978) The relationship of sibling structure to intellectual abilities andachievements. *Review of Educational Research*, 55, 353-386.

Cicirelli, V.G. (1982) Sibling influence throughout the lifespan. In M.E. Lamb & B.Sutton-Smith (Eds.), *Sibling relationships: Their nature and significance across thelifespan* (pp. 267-284). Hillsdale, New Jersey, United States: Lawrence Erlbaum Associates, Inc.

Cicirelli, V.G. (1994) Sibling relationships in cross-cultural perspective. *Journal of Marriage and the Family*, 56(1), 7-20.

Cleves, M.A., Gould, W.W., & Gutierrez, R.G. (2004) *An introduction to survival analysis using Stata* (revised edition). College Station, Texas, United States: Stata Press.

Cohen, L.E., & Felson, M. (1979) Social change and crime rate trends: A routine activity approach. *American Sociological Review*, 44(4), 588-608.

Cohen, S.E., & Beckwith, L. (1977) Caregiving behaviors and early cognitive development as related to ordinal position in preterm infants. *Child Development*, 48, 152-157.

Conley, D. (2000) Sibship sex composition: Effects on educational attainment. *Social Science Research*, 29, 441-457.

Cornoldi, C., & Fattori, L. (1976) Age spacing in firstborns and symbiotic dependence. *Journal of Personality and Social Psychology*, 33, 431-434.

Corsaro, W.A. (2005) *The sociology of childhood* (2nd ed.). Thousand Oaks, California, United States: Pine Forge Press, Sage Publications.

Cox, D.R. (1972) Regression models and life tables (with discussion). *Journal of the Royal Statistical Society*, B, 34, 187-220.

Daniels, D., & Plomin, R. (1985) Differential experience of siblings in the same family. *Developmental Psychology*, 21(5), 747-760.

Dawson, D.A. (1991) Family structure and children's health and well-being: Data from the 1988 National Health Interview Survey on Child Health. *Journal of Marriage and the Family*, 53, 573-584.

Deković, M., & Buist, K.L. (2005) Multiple perspectives within the family: Family relationship patterns. *Journal of Family Issues*, 26(4), 467-490.

Downey, D. B. (1995) When bigger is not better: Family size, parental resources, and children's educational performance. *American Sociological Review*, 60, 746-761.

Downey, D.B. (2001) Number of siblings and intellectual development: The resource dilution explanation. *American Psychologist*, 56, 497-504.

Drake, B. (1996) Unraveling "unsubstantiated." *Child Maltreatment*, 1, 261-271.

Drake, B., Johnson-Reid, M., Way, I., & Chung, S. (2003) Substantiation and recidivism. *Child Maltreatment*, 8, 248-260.

Dunn, J. (1984) *Sisters and brothers: The developing child*. London, United Kingdom: Fontana.

Durkheim, E. (1951) *Suicide. A study in sociology* (J.A. Spaulding & G. Simpson,Trans., G. Simpson, Ed.). New York, United States: The Free Press. (Original work published 1897)

Elliott, M., Browne, K., & Kilcoyne, J. (1995) Child sexual abuse prevention: What offenders tell us. *Child Abuse & Neglect*, 19(5), 579-594.

English, D. J., Marshall, D.B., Brummel, S., & Orme, M. (1999) Characteristics of repeated referrals to child protective services in Washington State. *Child Maltreatment*, 4(4), 297-307.

English, D.J., & Pecora, P.J. (1994) Risk assessment as a practice method in child protective services. *Child Welfare*, LXXIII(5), 451-473.

Eno, M. (1985) Sibling relationships in families of divorce. *Journal of Psychotherapy and the Family*, 3, 139-156.

Ernst, C., & Angst, J. (1983) *Birth order: Its influence on personality*. Berlin, Germany: Springer-Verlag.

Farrington, D.P. (2005) Childhood origins of antisocial behavior. *Clinical Psychology & Psychotherapy*, 12(3), 177-190.

Featherman, D., & Hauser, R. (1978) *Opportunity and change*. New York, United States: Academic Press.

Finkelhor, D. (1999) The science. *Child Abuse & Neglect*, 23(10), 969-974.

Finkelhor, D., & Baron, L. (1986) High risk children. In D. Finkelhor, S. Araji, L. Baron, A. Browne, S.D. Peters, & G.E. Wyatt. *A sourcebook on child sexual abuse* (pp. 60-88). Beverly Hills, California, United States: Sage.

Freese, J., Powell, B., & Steelman, L.C. (1999) Rebel without a cause or effect: Birthorder and social attitudes. *American Sociological Review*, 64(2), 207-231.

Freisthler, B., Midanik, L.T., & Gruenewald, P.J. (2004) Alcohol outlets and child physical abuse and neglect: applying routine activities theory to the study of child maltreatment. *Journal of Studies on Alcohol*, 65(5), 586-592.

Glaser, D. (2002) Emotional abuse and neglect (psychological maltreatment): A conceptual framework. *Child Abuse & Neglect*, 26, 697-714.

Guo, G., & VanWey, L.K. (1999) Sibship size and intellectual development: Is the relationship causal? *American Sociological Review*, 64(2), 169-187.

Hamilton-Giachritsis, C.E., & Browne, K.D. (2005) A retrospective study of risk to siblings in abusing families. *Journal of Family Psychology* 19(4), 619-624.

Hauser, R.M., & Kuo, H.H.D. (1998) Does the gender composition of sibships affect women's educational attainment? *Journal of Human Resources*, 33, 644-657.

Heer, D.M. (1985) Effects of sibling number on child outcome. *Annual Review of Sociology*, 11, 27-47.

Hetherington, E.M. (1989) Coping with family transitions: Winners, losers, and survivors. *Child Development*, 60, 1-14.

Kidwell, J.S. (1981) Number of siblings, sibling spacing, sex and birth order: their effects on perceived parent-adolescent relationships. *Journal of Marriage and the Family*, 43, 315-332.

Kier, C., & Lewis, C. (1998) Pre-school sibling interaction in separated and married families: Are same sex pairs or older sisters more sociable? *Journal of Child Psychology and Psychiatry*, 39, 191-201.

Kotch, J.B., Browne, D.C., Ringwalt, C.L., Stewart, P.W., Ruina, E., Holt, K., et al. (1995) Risk of child abuse or neglect in a cohort of low-income children. *Child Abuse & Neglect*, 19(9), 1115-1130.

Lawson, L. (2003) Isolation, gratification, justification: offenders' explanations of child molesting. *Issues in Mental Health Nursing*, 24(6-7), 695-705.

Lawson, D.M., & Brossart, D.F. (2004) The association between current intergenerational family relationships and sibling structure. *Journal of Counseling and Development*, 82(4), 472-482.

Lindert, P.H. (1977) Sibling position and achievement. *The Journal of Human Resources*, 12(2), 198-219.

McCartney, K., Robeson, W.W., Jordan, E., & Mouradian, V. (1991) Mothers' language with first- and second-born children: A within-family study. In K. Pillemer &K. McCartney (Eds.), *Parent-child relations throughout life* (pp. 125-142). Hillsdale, New Jersey, United States: Lawrence Erlbaum Associates, Inc.

McLanahan, S.S., & Sandefur, G. (1994) *Growing up with a single parent: What hurts, what helps*. Cambridge, Massachusetts, United States: Harvard University Press.

Mercy, J.A., & Steelman, L.C. (1982) Familial influence on the intellectual attainment of children. *American Sociological Review*, 47, 532-542.

Parr, N. (2005, March-April) *Why your siblings cost you grades, income and savings, especially if you're female*. Paper presented at the Population Association of America, Philadelphia, Pennsylvania, United States.

Phillips, M (1999) Sibship size and academic achievement: What we now know and what we still need to know. *American Sociological Review*, 64, 188-192.

Powell, B., & Steelman, L.C. (1993) The educational benefits of being spaced out: Sibship density and educational progress. *American Sociological Review*, 58(3), 367 381.

Price, S.J., & McKenry, V. (1988) *Divorce*. Thousand Oaks, California, United States: Sage

Radhakrishna, A., Bou-Saada, I.E., Hunger, W.M., Catellier, D.J., & Kotch, J.B.(2001) Are father surrogates a risk factor for child maltreatment? Focus section I: Fathers and child maltreatment: Findings from the Longitudinal Studies of ChildAbuse and Neglect (LONGSCAN). *Child Maltreatment*, 6(4), 281-289.

Rende, R., Slomkowski, C., Lloyd-Richardson, E., & Niaura, R. (2005) Sibling effectson substance use in adolescence: social contagion and genetic relatedness. *Journal of Family Psychology*, 19(4), 611-618.

Retherford, R.D., & Sewell, W.H. (1991) Birth order and further tests of the confluence model. *American Sociological Review*, 56, 141-158.

Ross, H.G., & Milgram, J.I. (1982) Important variables in adult sibling relationships: A qualitative study. In M.E. Lamb & B. Sutton-Smith (Eds.), *Sibling relationships: Theirnature and significance across the lifespan*. Hillsdale, New Jersey, United States: Lawrence Erlbaum Associates, Inc.

Sargent, D.J. (1998) A general framework for random effects survival analysis in the Cox proportional hazards setting. *Biometrics*, 54(4), 1486-1497.

Sasse, S. (2005) "Motivation" and routine activities theory. *Deviant Behavior*, 26, 547-570.

Sherley, A.J. (2005) Contextualizing the sexual assault event: images from police files. *Deviant Behavior*, 26, 87-108.

Sidebotham, P., Heron, J., Golding, J., & The ALSPAC Study Team (2002) Childmaltreatment in the "children of the nineties:" Deprivation, class, and social networks in a UK sample. *Child Abuse & Neglect*, 26, 1243-1259.

Slomkowski, C., Rende, R., Conger, K.J., Simons, R.L., & Conger, R.D. (2001) Sisters, brothers, and delinquency: evaluating social influence during early and middle adolescence. *Child Development*, 72, 271-283.

Smith, K.R., Mineau, G.P., & Bean, L.L. (2002, May) *Adult mortality and the effects of sibship size, birth order, and age of parents at birth*. Paper presented at the Population Association of America, Atlanta, Georgia, United States.

Steelman, L.C. (1985) A tale of two variables: A review of the intellectual consequences of sibship size and birth order. *Review of Educational Research*, 55, 353-386.

Steelman, L.C., & Mercy, J.A. (1983) Sex differences in the impact of the number of older and younger siblings on IQ performance (in research notes). *Social Psychology Quarterly*, 46(2), 157-162.

Steelman, L.C., & Powell, B. (1989) Acquiring capital for college: The constraints of family configuration. *American Sociological Review*, 54, 844-855.

Steelman, L.C., Powell, B., Werum, R., & Carter, S. (2002) Reconsidering the effects of sibling configuration: Recent advances and challenges. *Annual Review of Sociology*, 28, 243-269.

Sutton-Smith, B. (1982) Birth order and sibling status effects. In: M.E. Lamb & B. Sutton-Smith (Eds.), *Sibling relationships: Their nature and significance across the lifespan* (pp. 153-165). Hillsdale, New Jersey, United States: Lawrence Erlbaum Associates, Inc.

Sutton-Smith, B., & Rosenberg, B.G. (1970) *The sibling*. New York, United States: Holt, Rinehart and Winston.

U.S. Census Bureau (1999) *1998 Statistical Abstract of the United States* (118thed.). Washington, DC: U.S. Government Printing Office, Table 43.

U.S. Department of Health and Human Services, National Center on Child Abuse and Neglect, (1997) *Child maltreatment 1995: Reports from the states to the National Child Abuse and Neglect Data System*. Washington, DC: U.S. Government Printing Office.

U.S. Department of Health and Human Services, Administration on Children, Youth and Families (2002) *Child maltreatment 2000*. Washington, DC: U.S. Government Printing Office.

Waldrop, M., & Bell, R. (1964) Relation of preschool dependency behavior to family size and density. *Child Development*, 35, 1187-1195.

Way, I., Chung, S., Jonson-Reid, M., & Drake, B. (2001) Maltreatment perpetrators: A 54-month analysis of recidivism. *Child Abuse & Neglect*, 25, 1093-1108.

White, B. (1975) Critical influences in the origins of competence. *Merrill-Palmer Quarterly*, 21, 243-266.

Wolfner, G.D., & Gelles, R.J. (1993) A profile of violence toward children: A national study. *Child Abuse & Neglect*, 17, 197-212.

Wu, S.S., Chang-Xing, M., Carter, R.L., Ariet, M., Feaver, E.A., Resnick, M.B., et al. (2004) Risk factors for infant maltreatment: A population-based study. *Child Abuse & Neglect*, 28, 1253-1264.

Zajonc, R.B., & Markus, G.B. (1975) Birth order and intellectual development. *Psychological Review*, 82, 74-88.

Zajonc, R.B., Markus, G.B., & Markus, H. (1979) The birth order puzzle. *Journal of Personality and Social Psychology*, 37, 1325-1341.

Zajonc, R.B., & Sulloway, F.J. (2007) The confluence model: birth order as a within-family or between-family dynamic? *Personality and Social Psychology Bulletin*, 33 (9), 1187-1194.