Child Maltreatment and School Performance Declines: An Event-History Analysis

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This article presents a longitudinal analysis of school performance declines among abused and neglected children. The analysis is based on the maltreatment and school histories of a large random sample of maltreated children from one North Carolina county. The analysis finds a significant relationship between maltreatment and declines in a diverse set of school outcomes, including falling grades, increasing absenteeism, worsening elementary school deportment, retention in grade, and involvement in special education programs. Early onset and recent maltreatment each are related to these school performance declines. Differences in the relationships of abuse and neglect to school performance declines and the importance of accumulated maltreatment are unclear.

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Child maltreatment is widely believed to be closely related to poor school performance, but careful supporting scholarship has only recently begun to accumulate. The belief that maltreatment is responsible for poor school performance reflects the claims of four theories. The first, social learning theory (Iverson & Segal, 1990), suggests that abused children may apply what they have learned about violence at home to their school lives, developing disruptive behaviors that may also interfere with their learning. The second, developmental theory, suggests that parental neglect in attending to a child’s developmental growth and needs may lead to intellectual limitations that are expressed in school as poor achievement (Erickson, Egeland, & Pianta, 1989). The third, which involves a traumatogenic approach (Finkelhor & Browne, 1985), suggests that the combination of the trauma of maltreatment and the resulting experiences of stigmatization, betrayal, and powerlessness can lead to diminished self-esteem and self-efficacy, problems in managing anger, and mistrust of adults and authority figures. All of these share a clear potential to weaken the child’s ties to school. The fourth, behavior modification theory (Skinner, 1971) suggests that, as punishment, physical abuse at home may result in generalized diminishing of behaviors. These processes may affect learning and participation at school, with the impact being greatest immediately after the abuse. Conversely, abuse that attempted to punish undesired behaviors might intensify those behaviors if it failed to extinguish them.

Recent studies have overcome widespread problems with earlier ones that left claims about the link between maltreatment and poor school performance based on these theories largely unsubstantiated. The literature now features several analyses of reasonably large and representative samples of maltreated children, collected under prospective designs and compared with nonmaltreated samples, with controls for key confounding variables—most importantly, poverty.

Eckenrode, Laird, and Doris (1993) compared a random sample of 420 children with substantiated maltreatment reports to an equally large group of children not reported as maltreated but matched with the maltreated group on gender, school, grade level, residential neighborhood, and, when possible, classroom. They controlled for age and receipt of public assistance. Compared with the control group, maltreated children performed significantly lower on standardized achievement tests in both reading and mathematics, earned lower grades in these subjects, were more likely to repeat a grade, and had higher rates of disciplinary referrals. Neglected children were especially likely to have low test scores and grades, and physically abused children were more likely to receive disciplinary referrals, but sexually abused children (unless also neglected) did not differ significantly from the control group.

Kurtz, Gaudin, Wodarski, and Howing (1993) followed various aspects of school performance over a year for 59 school-age children whose recent physical abuse or neglect had been substantiated. They compared these groups of maltreated children to 60 children from the same age range and
schools who did not have a maltreatment record. In comparison with the nonmaltreated sample and controlling for SES, both maltreated groups had significantly lower verbal, mathematics, and overall achievement, as measured by various indices that combined standardized test scores, grades, teacher assessments, and grade retentions, although achievement did not change significantly over the observation period. The physically abused children, moreover, tended to have more behavior problems according to teacher and parent ratings. The authors characterized the physically abused children's school performance and behavior as having "deteriorated rather sharply" over the year of the study, "going from bad to worse" (p. 587).

Our own earlier analysis (Leiter & Johnsen, 1994) examined various aspects of school performance, aggregated over entire school careers through 1989, for 660 children randomly sampled from those children in the study county who had substantiated maltreatment reports during the previous 6 years, for 330 children randomly sampled from the county public school's enrollment lists for that period who did not have maltreatment reports, and for 189 children randomly sampled from those children who were served by the county Department of Social Services (DSS) from 1986–1989. With many background factors controlled, including receipt of public assistance, maltreated children showed poorer school outcomes, especially cognitive ones, than both comparison groups. The relationship of neglect to school outcomes was most pervasive, but we could not distinguish a pattern in the relationships of different types of maltreatment with different school outcomes.

Each of these studies of maltreatment and school performance has made important strides over the methodologically flawed ones on which earlier assertions were based. Lacking a full-scale longitudinal analysis, however, each faced the need to compromise either maximum use of available information or clear sequencing of maltreatment and school outcomes. Eckenrode et al. (1993) relied on school performance at the time of the study and on maltreatment reported before the study. But they discarded information on earlier school performance, so the similarity of current to earlier levels of school performance remains unknown. Nor could they explore maltreatment relationships with change in school performance.

Kurtz et al. (1993) used recent maltreatment reports and school performance scores over a subsequent 1-year period. This allowed them to assess the relationship between maltreatment and levels of, and indeed change in, school performance. They detected few performance declines, perhaps because of their small sample and short data collection period. Moreover, their design prevented examination of predisposing effects of earlier maltreatment and school performance.

Our own previous study (Leiter & Johnsen, 1994) maximized use of available information, aggregating maltreatment and school performance measures across the child's entire family or school life to the point of the data collection. In the process, however, our analysis did not account for the time order of individual maltreatment and school events, and we did not examine
change in school performance at all. Our findings did not demonstrate that maltreatment causes poorer school performance, only that maltreatment and poor school performance are associated. The present study moves toward a causal explanation by establishing not only association but also order of events. The findings, however, will not establish the causal impact of maltreatment on school performance (see Draper, 1995, on levels of causal inference), but, to the best of our knowledge, this analysis is the first to use maltreatment and school performance time series.

Research Design

Advantages of Event-History Analysis

The event-history analysis of maltreatment effects on school outcomes presented in this article has several advantages. A central advantage is the ability to use time-varying as well as time-invariant predictors (Singer & Willett, 1993). The critical variable that acts as a time-varying predictor in this analysis is the report of maltreatment. If we can tie a report to a particular time period, we can model school outcomes more sensitively than if we included maltreatment as a time-invariant characteristic of a particular child. A second advantage and a key corollary of the first is increased attention to timing: Here we have some certainty that maltreatment events precede downturns in school performance.

A third advantage is that this analysis did not rely on comparisons with nonmaltreated children, who may be otherwise and in unmeasured ways quite different from maltreated children, for its estimates of the effect of maltreatment. Instead, the analysis was restricted to children reported as maltreated, comparing times in their school lives when they were not reported as maltreated with other times when there were such reports. Because the demographic characteristics of children with and without maltreatment reports differed in important ways, we did, however, make efforts to correct for possible selection biases.

As an outgrowth of restricting our attention to children reported as maltreated, we included in the analysis maltreatment characteristics that have no meaning for nonmaltreated children in comparison groups. Counts of various types of maltreatment reports, where available, were not a problem in the earlier analyses because the count for nonmaltreated children was 0. Other measures of the seriousness of maltreatment, such as age at first report of maltreatment, however, could not be included. In this event history analysis, these measures of seriousness could be included.

Finally, by examining data over distinct time periods, we could assess maltreatment relationships to declines in school performance rather than to overall levels. Instead of evaluating whether maltreatment is associated with low levels of school performance, we could determine whether the advent of maltreatment (or an increase in its seriousness) preceded downturns in school performance. It is these adverse changes that we modeled in this analysis.
Data Collection

Our design focused on children from Mecklenburg County, NC, which includes Charlotte, the state's most populous city. Although a single location limits generalization, our data requirements left us no alternatives. We needed to track individual children through the records of several agencies, each of which maintains separate records. In the absence of coordinated statewide inter-agency record keeping, our research team had to do the tracking and matching. This led us to a single-county design, which allowed us to concentrate our resources to locate hard-to-find children who might have been lost in a more dispersed study design.

Our sample of maltreated children was drawn from the North Carolina Central Registry of Child Abuse and Neglect (Registry), maintained by the state's Division of Social Services. The Registry has been computerized since October, 1983. This determined the temporal limit of our population of children. From that time until the data were delivered to us at the end of June, 1989, 166,973 reports of child abuse or neglect were made to the Registry, 8,051 from Mecklenburg County. These reports concerned 6,945 children. Of these children, we randomly sampled one in three. Of these, 1,861 had reached school age by September, 1988, and, thus, might have had school records we could recover in September, 1989. Our coders, who were school district employees specially trained for their role in this study, searched extensively for school records in the central and school building files of the Charlotte–Mecklenburg Schools. They found records for 1,369 children in the maltreatment sample who constitute the cases for this analysis. These cases constitute 74% of those children in the maltreatment sample old enough to have attended school. The 26% of the sample for whom we did not have school data was due to some unknown combination of outward migration, failure to register for school, private school attendance, lost or misfiled records, coder oversight, and differences in name and other identifiers in registry and school records. Schulman and Hahn's (1993) study of the California Birth Defects Monitoring Program Registry suggests how extensive errors in recording identifying information in such registries may be. They found a surprisingly high 17% error rate. Analogous errors in the registry used in this study might account for a substantial portion of cases where no match was found between registry and school records.

We further excluded children whose first reported maltreatment incident preceded their start in the Charlotte–Mecklenburg Schools. Such children's first year's school performance might already have shown the effect of their maltreatment and, therefore, could not serve as a baseline comparable to that available for other children against which to assess declines in school performance. This exclusion may lead to underestimation of the maltreatment–school performance relationship.

Our final sample size was 967. The children included in the sample ranged from 5 to 23 years of age as of June, 1989 (mean age = 14.5 years). We collected information about their entire school careers to that date,
including repeated grades. School data covered 12 or more years of school for only 11.8% of our sample. For half the sample, we collected 8 or more years of school. As Singer and Willett (1993) noted, event-history analyses, such as the ones presented, accommodate cases with information from different numbers of time periods.

The profile of our sample includes a series of socioeconomic disadvantages. Sixty-six percent lived with only one or neither of their biological parents when they started school. Thirty-seven percent had received public assistance. Fifty-seven percent were African American.

Our analysis used all reports of maltreatment recorded in the Registry for this sample of children. Eighty-eight percent had only one report of maltreatment. Forty-nine percent of them had an abuse report. Sixty percent had a neglect report.

In this analysis, we moved away from heretofore standard practice by including in the maltreatment sample children with only unsubstantiated reports as well as children with substantiated reports. Some background discussion about this decision and the resulting meaning of maltreatment reports may be in order. The decision to substantiate a report of maltreatment is made by the county DSS after investigation of the report. Earlier studies using state registries as their data source have generally included only children with at least one substantiated report. In effect, these studies have taken the substantiation decision at face value as distinguishing "real" from "insubstantial" or "fabricated" maltreatment.

Our decision to include unsubstantiated reports is based on three observations. First, reports of maltreatment and the subsequent investigations may influence school performance. Second, maltreatment that falls below the legal thresholds required for substantiation may still affect school performance. Debate over the legal definition of maltreatment (e.g., actual vs. potential harm, National Center on Child Abuse and Neglect, 1988) suggests that the legal threshold may be too high for some purposes. Third, the substantiation decision may reflect a considerably more complex set of influences than simply the seriousness of the maltreatment. With these reasons in mind, we previously analyzed the school outcomes of children from the maltreatment sample according to the proportion of their maltreatment reports substantiated (this proportion is 0 or 1 for the large number with only one report) and controlling for other possible influences (Leiter, Myers, & Zingraff, 1994). The proportion of the reports substantiated had no statistically significant relationship with any of a broad range of school outcomes considered, except teacher reports of behavior problems in elementary school. The fundamental lesson learned from these analyses was that, in most ways, children reported as maltreated and children substantiated as maltreated were more alike than different on a wide range of cognitive and non-cognitive outcomes in school. This result and our previous discussion led us to include children with any report of maltreatment in this analysis. Our sample, therefore, includes children who have been maltreated and/or reported for maltreatment. The same is true of conven-
tional samples of children whose reported maltreatment was substantiated on investigation (due to the presence in the sample of children with maltreatment substantiated in error). To preserve our ability to distinguish any effects of substantiation, we included in the analysis information about substantiation as part of the characterization of each report of maltreatment.

Analysis Plan

To advance our understanding of temporal order in the maltreatment-school-performance-decline relationship, we needed a method of analysis that could both take account of the timing of maltreatment events and school performance declines and allow for the possibility that children still in school at the end of the data collection period might subsequently experience the school performance decline. Event-history analysis fits both of these requirements. The recording of school performance data on an annual basis adds the peculiarity that the exact moment of the decline may be hidden. This peculiarity leads us to discrete time survival analysis, a type of event-history analysis (see Singer & Willett, 1993). In this kind of analysis, estimated relationships of the various predictors to school performance declines must be understood as conditional on the student's not having previously experienced the decline.

The unit of analysis in these event-history analyses was not the child, as in cross-sectional analyses, but the child-year, with years counted relative to the child's birth date. Some variables, such as gender, are constant for a given child regardless of the year in question. Others, such as how many neglect reports the child had experienced up to the year in question, varied over time; these are referred to as time-varying. Still others, such as family structure, are, in actuality, time-varying but were treated as constant in this analysis due to data limitations.

We demarcated the passage of time into years in accordance with the annual units for which we have school performance measures (e.g., days absent in second grade). We could not say when during the school year a school performance decline took place. Therefore, we distinguished the timing of maltreatment incidents, for which we have the exact date reported, between those dated before the start of the school year and those dated during the school year. Only the former unambiguously preceded an observed school performance decline. The latter tapped recent maltreatment.

The relationship of maltreatment to school performance declines was estimated by observing the circumstances, represented by a configuration of independent variables, under which the child suffered a substantial decline in school performance. The event-history analysis estimated the effects of the independent variables on the probability of such a decline, conditional on the child's having earlier experienced no such decline. Our most basic question was, does all available information about the accumulation, timing, and type of maltreatment improve our prediction of the decline in question

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over the prediction achieved with the background variables alone for a sample of children who have been or will be reported as maltreated? This question was answered by estimating two equations for each school performance outcome, one with background characteristics (including a sample selection bias correction, which will be described later) only, the other with both background and maltreatment characteristics. The increment in the \( \chi^2 \) achieved by adding the maltreatment variables provides a statistical test of the overall relationship of the maltreatment characteristics with the school performance decline in question. The analysis also estimated the effects of specific maltreatment characteristics, including type, accumulation, and timing—both recency and age at onset.

In this analysis, we examined only the relationships of maltreatment and a child’s first decline in school performance of the type under consideration. Of course, a child may experience successive declines, but the contingencies governing those after the first are not modeled here. A decline in school performance is signified differently for categorical outcomes (e.g., retention in grade) and for continuous outcomes (e.g., grade point average). For categorical outcomes, decline means occurrence. For continuous outcomes, we took decline to mean a substantial downturn. In the absence of previous work that distinguished substantial from insubstantial downturns and given that small downturns may be common in the general student population, we created a series of decision rules for how big a change to require in each continuous school outcome before we would code the change as a substantial decline. We used data from a random sample \( (N = 386) \) of the total Charlotte–Mecklenburg Schools population (see Leiter & Johnsen, 1994, for details about this sample) to establish these decision rules. For each outcome, we examined the distribution of school performance declines (arrayed from smallest to largest) in this general school population sample. We established the 75th percentile as the transition criterion. That is, our operationalization defines a substantial decline in school performance for the maltreatment sample as any decline larger than the 75th percentile decline in the general school sample. For example, 75\% of increases in annual days absent in the general school sample were smaller than or equal to 8 days, so, in the maltreatment sample, we coded any increase in annual days absent larger than 8 days as a substantial decline in school performance. Our choice of the 75th percentile decline leaves no question that we have coded only very substantial changes as declines for this analysis.

The model we estimated took the form:

\[
\mathbf{Y} = \mathbf{X}\mathbf{\beta} + \mathbf{\varepsilon}
\]

where \( \mathbf{Y} \) is a vector of the log of school performance decline times, \( \mathbf{X} \) is a matrix of independent variables, \( \mathbf{\beta} \) is a vector of regression parameters, and \( \mathbf{\varepsilon} \) is a vector of exponentially distributed errors (SAS Institute, 1988, p. 642; see also Allison, 1995). Among the independent variables, we included: maltreatment characteristics, background characteristics, a group of dummy
variables defining certain age ranges, and a correction for sample selection bias. This is the event-history technique known as the method of piecewise constants (Yamaguchi, 1991). This method is distinguished by assuming that the hazard rate represented by the dependent variable is constant within specified time periods but may vary between those periods. We demarcated these time periods by one or two dummy variables chosen specifically for each dependent variable after examining the survival function for that dependent variable. The algorithm (proc lifereg under SAS 6.10) fits the data to an exponential curve as is conventional for such decay processes.

The unusual demographic character of our sample of maltreated children led us to take steps to correct for possible selection bias (Berk, 1983). In this case, such background factors as family composition, receipt of public assistance, and race may be associated with both poor school performance and maltreatment. That is, error terms for poor school performance and maltreatment may be correlated, leading to specification errors in the estimation of the effects of maltreatment characteristics on declines in school performance.

To correct our estimates of maltreatment effects for possible selection bias, we included a sample selection bias correction in the equations. This variable represents the predicted probability of the child's being maltreated. To estimate this probability, we followed McCarthy and Hagan's (1992) example by introducing data from a random sample of children, not reported as maltreated, in the Charlotte-Mecklenburg public schools (N = 386). We duplicate these cases to create a sample in which our maltreated cases were 6.5% of the total, the same proportion the 1986 National Incidence Study (National Center on Child Abuse and Neglect, 1988) found nationally for children reported as maltreated. Using this sample, we regressed (proc logistic under SAS 6.10) a dummy variable (1 = maltreated) on all available background variables (i.e., race, gender, age at end of study period, parental education, poverty program participation, family composition, number of children in household, and sibship density) to derive the predicted probability of being maltreated for each case. This value is our sample selection bias correction, which we utilized as a variable in estimating the hazard functions that form the bulk of our analysis. We interpret the effect coefficient for this correction as the impact of being at risk of maltreatment. With this correction, we could interpret the coefficients for background and maltreatment variables in the analysis as effects on the risk of school performance decline over and above the probability of being maltreated.

Variables

Maltreatment Measures

Table 1 summarizes the variables included in this analysis.

Abuse and neglect reports were counted separately, enabling us to
### Table 1

**Measures of Maltreatment, School Performance Decline, and Background Characteristics**

| Maltreatment characteristics (from Central Registry) (Distribution across children at end of study in parentheses) |
|---|---|
| Age at first reported maltreatment | Age in years at first reported incident (mean = 10.90 median = 11.04) |
| Substantiated reports | Numbers before and during this year (total reports: 0–47.8% 1–50.7% 2–1.6%) |
| Abuse reports | Numbers before and during this year (total reports: 0–50.7% 1–45.6% 2–3.1% 3–0.1% 4–0.1%) |
| Neglect reports | Numbers before and during this year (total reports: 0–40.3% 1–53.5% 2–5.6% 3–0.4% 4–0.2%) |

| School performance declines (from cumulative school records) (Proportion of sample exhibiting this decline during study in parentheses) |
|---|---|
| Grade point average | 1 = GPA went down at least a full point (letter grade) this year (43.2%) |
| Dropped out | 1 = dropped out during or at end of this year (33.1%) |
| Absences | 1 = days absent increased by more than 8 days this year (48.5%) |
| Elementary grades behavior problems | 1 = number of problems recorded increased 2 or more this year (26.8%) |
| Retained in grade | 1 = retained in grade after this year (46.5%) |
| Special program involvement | 1 = referred, eligible, or placed in special program this year (23.8%) |

**Background characteristics**

(Time-variant and invariant variables designated V and I, respectively, in brackets) (Distribution information in parentheses)

| Race | 0 = White, 1 = African American (56.7%). Others excluded [I] |
| Gender | 0 = male, 1 = female (55.0%) [I] |
| Family structure (from school registration form) | 3 dummy variables [I]: blended family (2 parents, 1 biological) (9.4%) single parent (1 biological parent) (45.0%) no biological parent (20.5%) reference category is 2 biological parents (25.1%) |
| Age | At start of this year [V] (mean = 14.5, median = 14.5 years) |
| Number of other children in household | Brothers, sisters, other children listed on school registration form (mean = 1.0, median = 0) [I] |
| Sibship density | 1 = 1 or more other children listed on school registration form with birth year plus or minus 2 years (20.3%) [I] |
| Poverty program participation | 1 = Family on AFDC, Medicaid, or food stamps before this year [V] (37.2% of families ever on one of these before end of study) |
estimate their separate relationships with school performance declines. If the report was substantiated on investigation, we classified it as an abuse report or a neglect report according to the judgment of the investigator. If the report was not substantiated, we relied on the type of maltreatment reported. Arguably, this approach incurs some risk of error, but, overall, the risk of error in using type of maltreatment reported for unsubstantiated reports appears to be limited largely to the risk of misclassifying neglect as abuse in about one in five unsubstantiated cases. We estimated the magnitude of this risk by comparing type reported and substantiated for the 438 substantiated abuse reports and the 657 substantiated neglect reports in our data. One hundred thirty-three abuse reports were reclassified as neglect on substantiation. Six neglect reports were reclassified as abuse on substantiation. This measurement error will have the likely effect of reducing the distinctions between abuse and neglect in these analyses.

Theoretically, abuse can take many forms. In practice in North Carolina, substantiating investigators record physical abuse and sexual abuse but almost never emotional abuse. We have separately estimated the effects of physical and sexual abuse in previously published work where we restricted ourselves to substantiated reports (Leiter & Johnsen, 1994; Zingraff, Leiter, Johnsen, & Myers, 1994; Zingraff, Leiter, Myers, & Johnsen, 1993). The present analysis, however, includes both substantiated reports, which reported the type of abuse, and unsubstantiated reports, which did not. This means that our abuse reports category includes physical, sexual, and emotional abuse reports without differentiation. From examination of substantiated abuse reports, we estimate that physical abuse constitutes almost two thirds of these abuse reports.

In addition to distinguishing abuse and neglect, our remaining maltreatment variables measured various dimensions of seriousness. Cicchetti and Barnett (1991) urged attention to the frequency, duration, and age at onset of maltreatment as key aspects of seriousness. The numbers of abuse and neglect reports before the school year in question served as proxies for frequency or accumulation. Note that almost 88% of the sample had only one report by the end of the study. We measured age at onset as the number of years, including fractional years, between the birth date and the date of the first reported incident. If we could assume that serious maltreatment is usually reported when it occurs, this variable would tell us at what stage in the child’s socialization the maltreatment began with younger ages associated with more adverse consequences (Erickson et al., 1989). For some children, however, an older age at first reported maltreatment may instead indicate longer victimization without official attention and intervention (Terr, 1991). We are, thus, left with ambiguity about the direction of this indicator of seriousness of maltreatment: Is younger or older age at first reported maltreatment more deleterious for school performance? The findings may shed some light on this question.

We had no measure for duration of maltreatment but approximated this concept by using the combination of age at onset and recency of reports as
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a proxy. Recency of maltreatment may be an important aspect of the seriousness of maltreatment for some school outcomes. To examine recency, we included the numbers of abuse and neglect reports during the school year in question. We also include numbers of substantiated reports before and during the school year in question. Substantiation would conventionally be taken as adding information about seriousness, although our earlier analysis (Leiter et al., 1994) did not support this assumption.

As a group, the available information portrays the type, accumulation, onset, recency, and substantiation of a child’s maltreatment. As a shorthand, we will refer to this group of maltreatment characteristics as the type and seriousness of maltreatment. In the analysis, we distinguish these factors from the fact of being at risk of maltreatment, the effect of which is estimated by the sample selection bias correction.

Throughout this study, we depended exclusively on reported maltreatment for measures of maltreatment. This incurred the unavoidable loss of data on unreported maltreatment. If we assume that, in general, reported maltreatment is more severe than unreported maltreatment (Groeneveld & Giovannoni, 1977), then the consequences of reported maltreatment may be more serious than those of unreported maltreatment. At the very least, we are unlikely to underestimate the consequences of maltreatment by operationalizing maltreatment with reported cases only.

School Outcomes

School outcomes have a profound impact on later life chances (Blau & Duncan, 1967; Knottnerus, 1981; Thornberry, Moore, & Christenson, 1985). Educational outcomes, thus, are central to considering the consequence of maltreatment for both proximate effects and the mediation of wide-ranging, long-term ramifications. We distinguished three types of school outcomes: cognitive learning, which is the official goal of schooling; participation, which is a precondition for such learning and for earning school credentials; and integration into the normative structure of the school, which is important for the socialization function of schooling and identifies the child as “normal.”

Following both radical and mainstream research traditions in the sociology of education (e.g., Bowles & Gintis, 1976; Jencks et al., 1972), we distinguished what students learn in school from the credentials they earn for staying in school. Both play a role in determining successful passage into the adult society. We measured what students learned with the average of the annual grades teachers assign in reading/language arts/English, mathematics, social studies/history, and science (A = 4 points, B = 3 points, C = 2 points, D = 1 point, F = 0 points).

Obtaining the high school diploma requires some minimum of knowledge necessary for promotion. In addition, staying in school until graduation can be compromised by frustration with and alienation from school (Finn, 1989); being overage for the grade, which often results from retention (Roderick, 1994); the temptation of work; and flight from problems at home.
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We measured progress toward high school graduation by its inverse, the dichotomy of dropping out or staying in school after reaching the age of 16 at which leaving school is legal. Coders looked for formal documentation or informal indication by the counselor that the student had dropped out or had transferred to another school district. Consistent with recent practice (Ensminger & Slusarcick, 1992; Morrow, 1986), students whose enrollment records ended after they had reached age 16 without graduation and without indication or suggestion of transfer were coded as having dropped out. Our coders' decisions were further checked to ensure that children had turned 16 years old and hence were eligible to drop out. Because students are at risk of dropping out only after turning 16, the case base for the analysis of this outcome is considerably smaller than for the analyses of risk of the other school performance declines.

For younger students and on a day-to-day basis, continuing motivation to participate in school is measured by annual days absent, which includes components of sickness and truancy in some unknowable combination. Absenteeism has been shown to have an adverse impact on cognitive learning and likelihood of graduation (Bond & Beer, 1990; Rutter, Maughan, Mortimore, & Ouston, 1979; Weitzman et al., 1985). These impacts arise from the dual role of attendance in exposing children to instruction and as an essential step in integration into the normative structure of the school.

The dimensions of integration into the normative structure of the school include normal progress, normal placement, and acceptable behavior. Normal progress was measured, in inverse form, by retention in grade while in the Charlotte–Mecklenburg Schools. Retention in grade indicates academic failure, although behavior problems may be confounded with academic ones in the decision to retain a child.

Normal placement was determined by its inverse: involvement in one of the mandated special education programs, including being eligible, referred, or placed in a program for children identified with learning disabilities, behavioral or emotional handicaps, mental retardation, or physical or sensory impairments, but not including involvement in a special program for children identified as academically gifted. We recognize the great variety of impairments to which these special programs respond and realize that folding them all into a single measure risks a loss of sensitivity to the effects of maltreatment.

Acceptable behavior in school was indicated, again by its inverse, as the number of check marks the teacher recorded on report cards (Grades K-6 only) to indicate behavior problems. These include the three areas of follows directions, respects property and rights of others, and observes school and class rules. Coders counted mention of a problem on any report card as a problem for that year. Thus, the maximum possible number of behavior check marks in a year was three. Only students with elementary school records in the Charlotte–Mecklenburg Schools were at risk for decline in this aspect of school performance. This reduced the case base somewhat for this outcome.

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Undoubtedly, learning, participation, and integration are related in reciprocal, cumulative, and self-reinforcing patterns (see Reyome, 1994, for consideration of some of these connections in the school careers of maltreated children). Moreover, these patterns may differ according to whether the child has been maltreated. In this study, we did not consider these important interrelationships.

Background Variables

Controls for gender, race, age, poverty, parental education, parental configuration, and sibship size and density (i.e., number of and spacing among other children in household) are important because these variables are well-established correlates of school outcomes and may also be related to maltreatment. Omission of a variable that is associated with both independent and dependent variables constitutes a specification error that can bias the estimate of the effect of the independent variable on the dependent variable. Studies generally find better school performance among girls than boys, Whites than African Americans, children who are not poor rather than children who are poor, children with better educated rather than poorly educated parents, children living with two parents rather than one or none, children living with fewer rather than many other children, and children living with fewer rather than more siblings close to their own age (Astone & McLanahan, 1991; Blake, 1989; Downey, 1995; Kominski, 1988; Murnane, Maynard, & Olds, 1981; Powell & Steelman, 1990; Stockard, Long, & Wood, 1985; Thompson, Alexander, & Entwisle, 1988). In reporting these findings, we realize that these trends may reflect school response as well as individual behavior. This does not diminish the importance of controlling for these factors.

Several control variables require additional explanation. We have operationalized race as a White/African-American dichotomy, omitting the small numbers of Asian, Native American, and Hispanic children in our sample from the analyses. Their numbers are too small to allow separate analysis, but taken together they do not constitute a meaningful group.

Family structure, number of other children in the household, and sibship density are based on information coded from the school registration form. This form was completed at the time the child first enrolled in the Charlotte-Mecklenburg Schools. Updated information was not available, so we treated these time-varying factors as constants over time.

Poverty was measured as prior participation in a public assistance program for which a maximum income was an eligibility criterion. Receipt of public assistance is a narrow measure of poverty, but data for a broader measure, such as receipt of subsidized school lunches, were not available from the Charlotte-Mecklenburg Schools. Our time-varying operationalization for this analysis was receipt of public assistance at any time before the school year in question. We left analysis of the effects of current or recent receipt of public assistance for future exploration. The data on receipt of public
Child Maltreatment and School Performance Declines

assistance came from state Division of Social Service records which were searched for matches on name, date of birth, race, and gender.

Results

The Risk of Declining School Performance

First, we examined the risk of school performance decline. Table 1 reports the proportion of the sample that experienced declines for each of the six measures of school performance. The exact percentages should not be compared because many of the measures are highly sensitive to the decision rules for what constitutes a substantial decline discussed earlier, and even those measures that do not involve such decision rules are probably influenced by the vagaries of school record keeping. In addition to the prevalence of decline, we describe the hazard function for each of these measures, noting especially the ages at which the risk changes. To conserve space, these graphs are not presented here, but they are available on request.

Just over 43% of the sample experienced a decline in grade point average. The risk of this downturn rose dramatically after age 14. Thirty-two percent of those who reached age 16 during the study period dropped out of school, with the rate increasing steadily after that age.

Over 47% of the sample exhibited increased absenteeism, with the hazard of more absenteeism rising sharply after age 14. Almost 47% of the sample were retained in grade at least once. The rate of retention increased over the entire age range but rose more quickly, as did most of these hazards, after age 14. Almost 27% of the children in the sample with elementary grades records exhibited heightening problems with deportment during the elementary grades. This risk rose slowly until age 11, but then it accelerated sharply and may have been concentrated among children who were retained in the elementary grades. Finally, almost 24% of the sample was referred to, declared eligible, or placed in a special program. The rate of special program involvement rose slowly until age 14 and then rose quickly.

Overall, between a fifth and a half of those at risk experienced a downturn in each of these aspects of school performance. These are substantial figures. Still, for each measure, the majority of maltreated children did not experience a decline. Maltreatment did not necessarily or usually relegate a child to difficulty in school. The risk of decline rose as these children aged, and the beginning of adolescence brought a great intensification of the risk. This finding of deterioration in attendance and grades is not surprising, but the uniformity of the finding suggests that the adolescent school experience might be unusually difficult for children reported as maltreated.

Tables 2 and 3 report the results of the event-history analyses. The analyses reported in Table 2 treat school achievement outcomes. Those in
### Table 2

**Relationship of Maltreatment and Background Variables With the Rate of Decline in School Achievement**

<table>
<thead>
<tr>
<th>Background variables</th>
<th>Grade point average</th>
<th>Dropped out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race (1 = African-American)</td>
<td>1.186</td>
<td>0.501*</td>
</tr>
<tr>
<td>Gender (1 = female)</td>
<td>0.898</td>
<td>0.837</td>
</tr>
<tr>
<td>Age dummy I (1 = see parentheses)</td>
<td>0.930 (&lt; 12)</td>
<td>0.648 (= 16)</td>
</tr>
<tr>
<td>Age dummy II (1 = see parentheses)</td>
<td>1.301 (= 18)</td>
<td></td>
</tr>
<tr>
<td>Blended family</td>
<td>0.829</td>
<td>1.549</td>
</tr>
<tr>
<td>Single-parent family</td>
<td>1.055</td>
<td>1.908*</td>
</tr>
<tr>
<td>No biological parent in family</td>
<td>0.95</td>
<td>1.811*</td>
</tr>
<tr>
<td>Number other children in household</td>
<td>1.022</td>
<td>0.915</td>
</tr>
<tr>
<td>1 or more children within 2 years</td>
<td>1.105</td>
<td>1.034</td>
</tr>
<tr>
<td>Participated in poverty program before this year</td>
<td>0.652</td>
<td>1.012</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maltreatment variables</th>
<th>Grade point average</th>
<th>Dropped out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at first reported incident</td>
<td>0.971</td>
<td>1.07</td>
</tr>
<tr>
<td>No. reports before this year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substantiated</td>
<td>1.194</td>
<td>1.092</td>
</tr>
<tr>
<td>Abuse</td>
<td>0.768</td>
<td>1.480*</td>
</tr>
<tr>
<td>Neglect</td>
<td>0.963</td>
<td>1.269</td>
</tr>
<tr>
<td>No. reports during this year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substantiated</td>
<td>1.147</td>
<td>0.893</td>
</tr>
<tr>
<td>Abuse</td>
<td>1.394*</td>
<td>1.222</td>
</tr>
<tr>
<td>Neglect</td>
<td>1.158</td>
<td>2.211*</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.011*</td>
<td>0.00</td>
</tr>
<tr>
<td>Sample selection bias correction</td>
<td>3.419*</td>
<td>8.12*</td>
</tr>
<tr>
<td>$\chi^2$ for improvement in model fit over background</td>
<td>53.954*</td>
<td>9.842</td>
</tr>
<tr>
<td>variables and sample selection bias correction only (df = 7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$N$ (child-years)</td>
<td>5,319</td>
<td>665</td>
</tr>
<tr>
<td>Marginal rate of decline</td>
<td>0.079</td>
<td>0.171</td>
</tr>
</tbody>
</table>

*p < .05, one-tailed.

*p < .05, two-tailed.

Table 3 examine school participation and integration outcomes. In these tables, the unit of analysis is the child-year. The number of cases for an equation reflects the total number of years children in the sample were at risk for the school performance decline in question. The marginal rate of decline shown at the bottom of the table gives the ratio of the number of
### Table 3
Relationship of Maltreatment and Background Variables With Rate of Decline in School Participation and Integration

<table>
<thead>
<tr>
<th>Background variables</th>
<th>Absences</th>
<th>Retained in grade</th>
<th>K-6 behavior problems</th>
<th>Special program involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race (1 = African-American)</td>
<td>0.828</td>
<td>1.629*</td>
<td>1.363*</td>
<td>1.506*</td>
</tr>
<tr>
<td>Gender (1 = female)</td>
<td>0.912</td>
<td>0.737*</td>
<td>0.647*</td>
<td>0.574*</td>
</tr>
<tr>
<td>Age dummy I (1 = see parentheses)</td>
<td>1.309 (&lt;15)</td>
<td>0.854 (&lt;15)</td>
<td>0.684*</td>
<td>0.563* (&lt;12)</td>
</tr>
<tr>
<td>Age dummy II (1 = see parentheses)</td>
<td>2.231 (&gt;18)</td>
<td></td>
<td>2.072*</td>
<td>1.813*</td>
</tr>
<tr>
<td>Blended family</td>
<td>1.309</td>
<td>0.998</td>
<td>2.072*</td>
<td>1.813*</td>
</tr>
<tr>
<td>Single-parent family</td>
<td>1.065</td>
<td>1.22</td>
<td>1.663*</td>
<td>1.28</td>
</tr>
<tr>
<td>No biological parent in family</td>
<td>0.938</td>
<td>1.470*</td>
<td>1.472</td>
<td>1.809*</td>
</tr>
<tr>
<td>Number other children in household</td>
<td>1.029</td>
<td>0.995</td>
<td>1.007</td>
<td>1.001</td>
</tr>
<tr>
<td>1 or more children within 2 years</td>
<td>0.864</td>
<td>1.004</td>
<td>1.216</td>
<td>0.904</td>
</tr>
<tr>
<td>Participated in poverty program before this year</td>
<td>1.186</td>
<td>0.85</td>
<td>0.72</td>
<td>0.964</td>
</tr>
<tr>
<td>Maltreatment variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at first reported incident</td>
<td>1.026</td>
<td>0.880*</td>
<td>0.891*</td>
<td>0.884*</td>
</tr>
<tr>
<td>No. reports before this year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substantiated</td>
<td>1.083</td>
<td>1.186</td>
<td>1.07</td>
<td>0.913</td>
</tr>
<tr>
<td>Abuse</td>
<td>0.983</td>
<td>0.59*</td>
<td>1.063</td>
<td>0.757</td>
</tr>
<tr>
<td>Neglect</td>
<td>1.237*</td>
<td>0.444*</td>
<td>0.969</td>
<td>0.605*</td>
</tr>
<tr>
<td>No. reports during this year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substantiated</td>
<td>1.037</td>
<td>1.24</td>
<td>0.765</td>
<td>1.022</td>
</tr>
<tr>
<td>Abuse</td>
<td>1.355*</td>
<td>1.014</td>
<td>1.232</td>
<td>1.135</td>
</tr>
<tr>
<td>Neglect</td>
<td>1.561*</td>
<td>0.93</td>
<td>0.998</td>
<td>0.698</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.005*</td>
<td>0.041*</td>
<td>0.015*</td>
<td>0.014*</td>
</tr>
<tr>
<td>Sample selection bias correction</td>
<td>4.039*</td>
<td>4.954*</td>
<td>4.594</td>
<td>3.118</td>
</tr>
<tr>
<td>$\chi^2$ for improvement in model fit over background variables and sample selection bias correction only ($df = 7$)</td>
<td>73.994*</td>
<td>113.770*</td>
<td>57.772*</td>
<td>87.404*</td>
</tr>
<tr>
<td>$N$ (child years)</td>
<td>5,276</td>
<td>4,650</td>
<td>4,450</td>
<td>5,847</td>
</tr>
<tr>
<td>Marginal rate of decline</td>
<td>0.089</td>
<td>0.097</td>
<td>0.053</td>
<td>0.039</td>
</tr>
</tbody>
</table>

* $p < .05$, one-tailed.
* $p < .05$, two-tailed.

Child years with a decline to the total number of child years. Except for dropping out, where the number of years at risk was much lower, the marginal rate of decline was less than .10.

### Overall Effect of Serious Maltreatment

First, we estimated the overall association of serious maltreatment, as captured by the combination of seven maltreatment characteristics, with
each of the six school performance decline measures. To do so, we compared the model fit for the fully specified equation with that for the background variables and sample selection bias correction alone. All children in this sample at one time or another were reported as maltreated, so the maltreatment characteristics in the equations in Tables 2 and 3 portray the type and seriousness of the maltreatment, and the effects on the risk of school performance decline are over and above the effects of background characteristics and over and beyond being at risk of having a maltreatment report. The result is given in the row labeled \( \chi^2 \) for improvement in model fit over background variables and sample selection bias correction only.

We found that for each school outcome, except dropping out, the overall experience of serious maltreatment was associated with increased risk of decline. This finding applies to a broader range of school outcomes than detected in any of the three studies reviewed above. Part of the reason for this more robust finding is probably the greater sensitivity that comes from the time-sensitive, event-history analysis. No longer must we strain to recognize possibly short downturns in school performance hidden by aggregation or selection procedures used to create school performance measures for cross-sectional analyses. In contrast with our own earlier cross-sectional analysis (Leiter & Johnsen, 1994), we found consistent overall effects on participation and integration outcomes, perhaps because of the additional information on age at first reported maltreatment that we were able to include in the event-history analysis. This variable has a significant relationship with three of the four participation and integration outcomes.

We would note that the sample selection bias correction is statistically significant in half of these equations. This means that, for these school outcomes, being at risk of maltreatment increased the risk of school performance decline. In all those equations, however, the overall seriousness of maltreatment is significant, as well. Indeed, its impact on the odds of school performance decline is statistically significant over and above the effect of being at risk of maltreatment.

Dropping out is the only adverse school outcome for which the event-history analysis did not find an overall relationship with seriousness of maltreatment. Although the same arguments about gains in sensitivity and information, made above, obtain in this case, we are reluctant to conclude that there is no overall maltreatment seriousness relationship with dropping out. Indeed, two maltreatment characteristics have significant coefficients. Still, this sample does not provide support for an overall relationship with dropping out.\(^5\)

**Effects of Specific Aspects of the Seriousness of Maltreatment**

We now turn to specific aspects of seriousness, looking for differences in the ways that serious maltreatment is related to the risk of school performance declines.\(^6\) Here we interpret individual coefficients. Each regression coefficient gives the additive change in the log of the rate of the school performance decline in question associated with a unit change in the...
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independent variable, after adjustment for: all other independent variables, the dummy variables defining age ranges (within which, therefore, the rate is constant but between which it may vary), and the correction for sample selection bias. In reporting these coefficients in Tables 2 and 3, we have exponentiated to derive the multiplicative effect of a unit change in the independent variable on the rate of school performance decline. Usually, but not always, as maltreatment severity increased on one dimension or another, the rate of school performance decline increased.

The accumulation of maltreatment reports before the current school year is our measure for frequency of maltreatment, one of the key aspects of seriousness identified in the literature (Cicchetti & Barnett, 1991). Multiple maltreatment reports may reflect a child's chronic exposure to maltreatment and have a cumulative effect. At some point, the accumulation of maltreatment reaches a threshold and spills out of the confines of family life to affect the child's school life adversely. Accumulated maltreatment had a significant relationship with only two school performance declines, increasing absenteeism where neglect was implicated and dropping out where abuse was important. Children subject to poor supervision may be more likely to miss days of school. Children subject to abuse at home may drop out of school as part of their flight from the abuse.

Maltreatment reports before the current school year had significant relationships with the likelihood of retention in grade after that year and with special program involvement during that year. For these outcomes, however, accumulated reports diminished the risk. The predicted effect, therefore, is restricted to absenteeism and dropping out. One possible reason that accumulated maltreatment had such a limited impact is that only 12% of the children in the sample had more than 1 maltreatment report; only these children could show an accumulation of maltreatment beyond an initial report.

The timing of maltreatment, in contrast, had a more pervasive effect. The number of maltreatment reports during the current school year measured recency of maltreatment, but recall the ambiguity of time ordering for such reports and school performance declines that year. Age at first reported maltreatment incident can signal the importance of early or more recent maltreatment, depending on the direction of the relationship with school performance declines. Either reports during the current year or age at first maltreatment was significant for each school performance decline.

Recent maltreatment had significant relationships with increasing absenteeism, falling grades, and dropping out. Neither abuse nor neglect appears regularly to have been more important, and, for increasing absenteeism, both types of recent maltreatment were implicated. Among the effects of maltreatment reports during the current school year, the neglect effect on dropping out was the strongest. We do not know why recent neglect but prior abuse should have increased the risk of dropping out. Both types of maltreatment appear to have been important for dropping out. We interpret the finding of a significant recency effect as reflecting the lack of time for
the child to adjust to continuing maltreatment or to recover from maltreatment if it has stopped.

Early onset of maltreatment was associated with the other three school performance declines: retention in grade, increasing behavior problems in elementary school, and special program involvement. Early onset of maltreatment is generally thought to have worse impacts than later onset (Erickson et al., 1989). The possibility that late reported onset regularly hides years of damaging maltreatment (Terr, 1991) is not supported here. The impacts are concentrated in the integration rather than the learning and participation areas. Children whose maltreatment started early in their lives appear to have had special difficulties in making normal progress, behaving acceptably, and being placed in mainstream programs.

The substantiation of maltreatment reports, either before or during the current school year, had no significant relationship with any of the six school outcomes. This finding corresponds to our earlier analysis of substantiation (Leiter et al., 1994) and confirms our decision to include unsubstantiated reports for this analysis.

Overall, the event-history analysis suggested a more pervasive maltreatment effect than other recent analyses. It pointed to the importance of recency of maltreatment for downturns in some aspects of schooling. It added to the evidence for the influence of early maltreatment on other school performance declines. Timing of maltreatment, either recency or early onset, was crucial for school outcomes. The accumulation of maltreatment reports, which may signal chronic maltreatment, did not have a widespread impact here.

With one exception, the significant background variable effects were in the expected direction, given studies of these variables in general samples. The exception is the race effect on dropping out, where maltreated African Americans were less likely to drop out when eligible than maltreated White students. This finding is in line, however, with work of Cairns, Cairns, and Neckerman (1989) who found that, after controlling for other factors, Black teens did not show higher dropout rates than White teens. They suggested three possibilities: (a) There may be less stigma attached to school retention among Black than White students; (b) employment may have been less available to Black than White students; or (c) Black students may hold stronger beliefs that education is a reliable route for economic and social advancement. For our sample of maltreated children, we may add an elaboration: The attraction of school may be especially strong in the face of the adversities of maltreatment, poverty, and racial disadvantage.

**Discussion**

The discussion of these results focuses on the relative support for each of the four theories that posit a relationship between maltreatment and school performance. These four were social learning theory, developmental theory, the traumagenic approach, and behavior modification theory. Aspects of all four theoretical perspectives were supported in this event-history analysis.
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The first, social learning theory, suggested that maltreatment, especially abuse, could teach the child that violent behaviors are acceptable. To the extent that our measure of behavior problems includes behavior of this type, the event–history analysis uncovered this link, identifying significant maltreatment effects. We did not find the special relationship of abuse to behavior problems that social learning theory would suggest (see Kendall-Tackett & Eckenrode, 1996, who found a distinct neglect relationship with behavior problems). We did find an age effect: The earlier the age at which maltreatment begins to teach that violence is acceptable, the greater the likelihood of increasing behavior problems in the elementary grades.

Developmental theory suggests that early maltreatment, particularly neglect, would worsen cognitive performance. Consistent with this line of reasoning, we found maltreatment associated with falling grades and involvement in special programs. Contrary to expectations from developmental theory, however, abuse rather than neglect and recent rather than early maltreatment were implicated in falling grades. The findings for special program involvement, where early onset increased the risk, are consistent with developmental theory.

The traumagenic approach suggests that maltreatment may ultimately weaken ties to school. In this analysis, this might have been seen in falling attendance and dropping out. The strongest evidence for the traumagenic approach is found in the analysis of absences, where both prior and recent maltreatment were associated with declining attendance. The analysis found no overall relationship of serious maltreatment with dropping out where the traumagenic approach would predict one, although effects of some individual maltreatment characteristics were detected.

Recency effects in these analyses are consistent with a behavior modification approach in which punishment at home may be expected to lead to depressed learning and participation at school, with the impact most pronounced soon after the punishment. Abuse lends itself to such an approach more readily than neglect: The child reduces activity in order to avoid more punishment. Indeed, abuse during the current school year was important for some outcomes. Because neglect reports during the current year were significant for some outcomes as well, we are led to speculate that neglect at home may have parallel impacts with abuse–punishment: The withdrawal of nutritional or emotional sustenance may lead the child to reduce activity in order to conserve resources for survival.

Conclusions and Implications

Through this event–history analysis, we have demonstrated a statistically significant adverse relationship of serious maltreatment with school performance declines, even after controlling for a diverse set of known correlates of school performance. This relationship held over a wide range of school outcomes, including aspects of cognitive achievement, participation in school, and integration in school. This finding suggests that a full understanding of the relationship between maltreatment and school performance
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may require use and expansion of several theoretical approaches, including developmental, social learning, traumagenic, and behavior modification theories.

Interpreting the implications of the seriousness factors requires an evaluation of their substantive significance. How great an increase in the rate of school performance decline do these findings portray? For the six variables for which the metric is the maltreatment report, the increase in the rate of school performance decline associated with an additional report was, with the exception of the effect of neglect reports during the current school year on the risk of dropping out, between 20% and 50%. This is far from a trivial increase, but it is not a very large increase either, as would be a tripling or quadrupling of the rate. Only for a child where the increment is more than one report does the rate mount to a truly high level. In the most extreme case, a hypothetical child over 16 years old who has had three neglect reports, rather than none, during the current school year is at almost 11 times (antilog(3ln2.211)) the increased risk of dropping out that year, net of the other variables. This would be a pronounced increase.

The age at first reported maltreatment variable uses a different metric—age in years. The three significant coefficients for this variable cluster between .880 and .891. Computing the increase in odds of retention in grade associated with having the first reported maltreatment 3 years earlier shows that this variable similarly is of moderate consequence. Such a hypothetical child faces a 68% (antilog(3ln0.880)) increase in this risk.

Not only was the substantive significance of the maltreatment effects moderate or small, but many, in fact 33 out of 42, of the effects investigated were statistically not significant in the predicted direction. Still, each maltreatment characteristic, except substantiation, was statistically significant in the predicted direction for at least one school outcome. Our overall conclusion is that we have demonstrated a pervasive, but moderate, relationship.

The timing of maltreatment incidents is the aspect of seriousness to which the event–history analysis directs special attention. Either recent maltreatment or maltreatment that begins at an early age has a significant relationship with each of the school outcomes. We hope future analyses can determine why some school outcomes are shaped by early maltreatment and others by recent maltreatment.

We have not found pervasive relationships of accumulated or chronic maltreatment with school performance declines. We believe this may be due in part to characteristics of these data and our analytic approach. First, only about one in eight of the children in this sample had more than one maltreatment report, limiting the variation in counts of reports across children. A data source other than a state registry might tap recurrent maltreatment better, although some of a registry's advantages (e.g., large case base) would be lost. Our exclusion of children whose first reported maltreatment predated their school records, while done for good reason, disproportionately eliminated children with an early maltreatment onset and

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a longer risk period for subsequent maltreatment reports. Second, our event-history approach limited our attention to the first measured decline in school performance. Maltreatment reports that followed the first decline did not come into play in this analysis, restricting variation in our measures of accumulation further. This problem was exacerbated when school performance declined quickly in the wake of maltreatment, a possibility underlined by the recency effects. We hope future analyses will use longitudinal techniques that look at school performance trajectories beyond an initial decline and, thereby, take account of the full accumulation of maltreatment incidents throughout the child's school career. Our findings did not support a pervasive accumulation effect, but, in light of these data and analysis considerations, we believe research into the maltreatment–school performance relationship should not focus exclusively on timing but should continue to examine accumulation.

In contrast with some earlier research, we were unable to clearly distinguish among types of maltreatment with regard to the associated school deficits. It may be that such distinctions are not appropriate. Alternatively, it is possible that better measurement of types and seriousness of the maltreatment (recall possible error in measuring type of maltreatment when report not substantiated) will allow such distinctions.

We found an increase in the risk of school performance decline as the child ages, with accelerating increases at adolescence. This finding bears further study. In particular, the possibility that aspects of maltreatment become more harmful with time should be investigated.

This study examined a large range of school outcomes, but future research within a longitudinal framework could widen the scope and improve the estimation still more. Following the example of Eckenrode and his colleagues (Eckenrode et al., 1993; Kendall-Tackett & Eckenrode, 1996), behavior problems after elementary school could be analyzed using data on disciplinary referrals and suspensions. Standardized achievement test scores, which were not used here due to infrequent administration, would give an alternative to grades for assessing declines in cognitive learning. A larger sample of students old enough to leave school would provide statistical power for the analysis of dropping out closer to that available here for the other school outcomes.

The measurement of factors potentially correlated with both maltreatment and school outcomes could be improved in future research, as well. Due to missing data problems, we could not include parents' education, but this would be a desirable control variable in any study of maltreated children's school performance. We had no data on interaction patterns in the family beyond abuse and neglect. Information on such aspects of the home environment as unemployment, substance abuse, and criminal activity might prove very useful in setting the context for maltreatment effects. The effect of poverty has been included here, but the measure was a crude dichotomy that tapped only poverty dire enough to require public assistance. Measurement paralleling that for maltreatment (i.e., timing and chronicity) and
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sensitive to less severe poverty (e.g., receipt of subsidized school lunches) would yield a more adequate control for poverty effects. With such data on family interaction and poverty, one could make some progress toward distinguishing the effects of an adverse environment from the effects of maltreatment incidents.

Programs that effectively help maltreated children either through prevention of maltreatment or through intervention to keep maltreatment from getting worse should result in payoffs on these critical school outcomes. This analysis has shown that, when maltreatment becomes more serious, the child is at a statistically significant increased risk of a wide variety of school performance declines. Investigating the magnitude of this risk shows that the increase is moderate in size. These findings imply that effective intervention may shield children from this moderately increased risk, an implication open to empirical investigation through further specification of the process modeled here. Maltreated children are resilient. Not only do most escape these school performance declines altogether, but, when maltreatment episodes do not accumulate or intensify, their risk of such declines may not mount. This conclusion does not mean that maltreatment per se is not associated with poorer school performance—only that stopping maltreatment from getting more serious may have a real, though moderate, payoff.

Notes

We appreciate the helpful comments of Catherine Zimmer, Theodore Greenstein, Matthew Zingraff, Chequita Smith Owens, and AERJ reviewers. This research was supported by grants from the North Carolina Governor’s Crime Commission (No. 180-187-D3-J093, No.180-188-D3-J093) and the United States Department of Health and Human Services, National Center on Child Abuse and Neglect (No. 90-CA-1455). Our conclusions do not necessarily represent the positions of these agencies.

1The date at which the registry was computerized may appear to present problems in the development of the age at onset variable, but these problems turned out not to be severe. The Registry itself was computerized in October, 1983, but it contains information predating computerization, including the number of previous reports and the date of the report previous to the first computerized report. Most reports in the file are the first reports filed about a particular child (79.9%). An additional 15% of the reports are first computerized reports for a child with the indication that the child had only one previous report. Thus, for 95% of these children, we have full information about the date of first reported maltreatment.

2For detailed consideration of the validity and reliability of the school outcome variables used here, see Leiter et al. (1994).

3We are aware of the possibility that unusual instability in the families and home lives of maltreated children, including unemployment and marital dissolution (Baldwin & Oliver, 1975; Krugman, Lennherr, Betz, & Fryer, 1986) artifactually inflates their measured drop-out rate, especially by increasing the frequency of cross-district moves (unusual transience in families of maltreated children documented by Eckenrode, Rowe, Laird, & Brathwaite, 1995).

4Data on parental education were available for some children from the same school registration forms that yielded other family information. Parental education, however, was missing on many of these forms. Standard list-wise deletion would have resulted, therefore, in the loss of many cases. We decided to omit parental education from the analysis, relying on the poverty variable to tap socioeconomic status.

5The sample selection bias correction here is the largest among the six school outcomes considered. If this coefficient were statistically significant, we would conclude
that the general condition of being at risk of maltreatment, not the seriousness of the maltreatment, increased the odds of dropping out. In another sample, this might be more clearly the case.

Correlations among the maltreatment variables are quite low, never greater than .38 in absolute value. Multicollinearity among these variables should, therefore, not interfere with estimates of their net effects.

References


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Manuscript received April 10, 1995
Revision received September 16, 1996
Accepted October 9, 1996