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Child and Adult Outcomes of Chronic Child Maltreatment

Melissa Jonson-Reid, Patricia L. Kohl and Brett Drake

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AUTHORS: Melissa Jonson-Reid, PhD, Patricia L. Kohl, PhD, and Brett Drake, PhD

George Warren Brown School of Social Work, Washington University, St Louis, Missouri

KEY WORDS
child abuse, child neglect, child maltreatment

ABBREVIATIONS
AFDC—Aid to Families With Dependent Children
df—degrees of freedom
STD—sexually transmitted disease

Drs Jonson-Reid and Drake had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Dr Jonson-Reid's contributions include study concept and design, acquisition of data, analysis and interpretation of data, drafting of the manuscript, critical revision of the manuscript for important intellectual content, statistical analysis, obtaining funding, and study supervision. Dr Kohl's contributions include analysis and interpretation of data, drafting of the manuscript, and critical revision of the manuscript for important intellectual content. Dr Drake's contributions include acquisition of data, analysis and interpretation of data, drafting of the manuscript, critical revision of the manuscript for important intellectual content, obtaining funding, and study supervision.

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Address correspondence to Melissa Jonson-Reid, PhD, George Warren Brown School of Social Work, Washington University, Campus Box 1196, One Brookings Dr, St Louis, MO 63130. E-mail: jonsonrd@wustl.edu

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WHAT'S KNOWN ON THIS SUBJECT: We lack prospective studies documenting "dosage effects" of chronic child maltreatment for both subsequent adolescent and adult outcomes. It is unknown whether effects are linear, shelving, or exponential, and we lack data across domains of outcomes.

WHAT THIS STUDY ADDS: Chronic child maltreatment reports are a robust indicator of future negative health and behavioral outcomes. There is a dose-response relationship between chronicity and outcomes in adolescence, but this is attenuated in adulthood once adverse child outcomes are controlled.

abstract

OBJECTIVE: To describe how child maltreatment chronicity is related to negative outcomes in later childhood and early adulthood.

METHODS: The study included 5994 low-income children from St Louis, including 3521 with child maltreatment reports, who were followed from 1993–1994 through 2009. Children were 1.5 to 11 years of age at sampling. Data include administrative and treatment records indicating substance abuse, mental health treatment, brain injury, sexually transmitted disease, suicide attempts, and violent delinquency before age 18 and child maltreatment perpetration, mental health treatment, or substance abuse in adulthood. Multivariate analysis controlled for potential confounders.

RESULTS: Child maltreatment chronicity predicted negative childhood outcomes in a linear fashion (eg, percentage with at least 1 negative outcome: no maltreatment = 29.7%, 1 report = 39.5%, 4 reports = 67.1%). Suicide attempts before age 18 showed the largest proportionate increase with repeated maltreatment (no report versus 4+ reports = +625%, $P < .0001$). The dose-response relationship was reduced once controls for other adverse child outcomes were added in multivariate models of child maltreatment perpetration and mental health issues. The relationship between adult substance abuse and maltreatment report history disappeared after controlling for adverse child outcomes.

CONCLUSIONS: Child maltreatment chronicity as measured by official reports is a robust indicator of future negative outcomes across a range of systems, but this relationship may desist for certain adult outcomes once childhood adverse events are controlled. Although primary and secondary prevention remain important approaches, this study suggests that enhanced tertiary prevention may pay high dividends across a range of medical and behavioral domains. *Pediatrics* 2012;129:839–845

It is accepted that chronic maltreatment predicts more negative outcomes than isolated maltreatment.[1] There are serious limitations, however, to our understanding of the sequelae of chronic maltreatment. In common with psychosocial risk research in general, retrospective studies paint a simpler and stronger link between maltreatment and subsequent negative outcomes than prospective studies.[1] Many key studies are based on retrospective accounts of maltreatment from adult samples.[2] Most work does not characterize degree of chronicity and frequently focuses on a single outcome domain, such as mental health.[3–5] This study breaks new ground by disaggregating child maltreatment chronicity according to number of child protective services reports and by prospectively exploring both child and adult negative outcomes across a range of domains (eg, delinquency, substance use, suicide, mental health).

Chronic child maltreatment can be framed as a total number of reports/events, duration between first and last event, number of types of maltreatment, separate developmental stages spanned, or the number of perpetrators involved. Work relating multiple reports to outcomes have generally used rereports as a dichotomized control variable, as an ordinal stage variable, or, rarely, as a continuous variable.[5–8] The concepts of chronicity and severity overlap in many studies.[9,10] Studies including adult outcomes generally use retrospective accounts of maltreatment, which do not include reliable measures of chronicity. Studies with reliable (prospective) measures of chronicity are often brief, terminating before subjects reach adulthood. In the Adverse Child Experiences Study, maltreatment was included in an aggregate variable with other childhood risks.[2]

A few studies, including LONGSCAN have examined multiple reports and reports that occur across developmental time periods.[11–13] Many researchers have found that maltreatment chronicity reliably predicts a range of negative behavioral and emotional outcomes, including hospitalizations for various disorders, consistently explaining more variance than a simple reported/not reported dichotomy.[8,10,14,15] English et al explicitly tested different categorizations of chronicity (calendar extent, calendar continuity, developmental extent, and developmental continuity); although some predictive differences were found, "different constructions of chronicity, as defined in this paper, do not account for substantial differences in the amount of variance accounted for."[13]

Recent findings from the Adverse Child Experiences Study have shown that the number of various types of adverse experiences, including but not limited to maltreatment, predicts negative affective, somatic, and behavioral outcomes both in childhood and adulthood in a linear fashion.[2] These findings fit with an allostatic load or accumulated stress mechanism in which chronicity of stressors is the key factor, rather than a critical period or attachment theory perspective, in which early maltreatment causes powerful long-term effects.[5,16] To date, studies capable of prospective analyses have not had sufficient sample size to assess the impact of both chronic maltreatment and other adverse events during childhood on later adult outcomes.

Measurement of chronic maltreatment is subject to various methodologic concerns, for example, the importance of maltreatment type. Manly et al explored maltreatment type and found few statistically significant differences across outcomes.[17] These researchers point out that a key limitation in exploring subtypes of maltreatment is that "pure" subtypes of maltreatment are rare. Among children with multiple reports, pure types become almost nonexistent.[18] Chronic child maltreatment may be assessed in a number of ways. Retrospective accounts are commonly done in early adulthood or through periodic surveying of older children. Measures involving recall have been criticized for introducing potentially serious response bias and recall bias issues.[19] Some research indicates this bias may be lessened for child recall.[20] However, memory issues are still of concern. Child welfare records provide a longitudinal measure that is not dependent on memory, but official reports do not capture all occurrences of maltreatment.[21] This failure to capture all occurrences of maltreatment is somewhat mitigated in the current work by the long time frame.

Research questions and hypotheses:

1. Is there a relationship between chronicity of maltreatment and adverse behavioral, emotional, and health outcomes before age 18? We hypothesized that there would be a strong positive relationship.
2. Does chronicity predict young adult outcomes once adverse childhood outcomes are controlled? We hypothesized that such would be the case. To our knowledge, this is the first attempt to see if repeated maltreatment could have an ongoing, direct impact on adult outcomes while controlling for other negative child outcomes.
3. Although not a hypothesis per se, a primary goal was to characterize the shape of the dose-response relationship. It is possible that a certain number of reports may be required before seeing increased risk (flat initial response) or that a ceiling effect (reduction in slope over time) may mitigate the impact of reports beyond a certain point.[22]

METHODS

Data are drawn from a larger longitudinal project that included children

reported for maltreatment and comparison children.[23] At the time of initial sampling (1993–1994), all children in this study were aged ≤11, lived in a large Midwestern city and county, and had received Aid to Families With Dependent Children (AFDC). All children with AFDC receipt and official maltreatment reports were selected to form the maltreatment group, whereas the comparison group was randomly selected from the larger population of AFDC families with children of similar age and area of residence but no child maltreatment reports. One child per family was randomly selected to be followed in the longitudinal study (n = 12 409). This group was also limited to those who were aged 18 years at the end of August 2009 to ensure we had "lifetime" records of maltreatment reporting, requiring exclusion of children with first reports of maltreatment before 18 months of age. Finally, children who did not survive until age 18 were excluded (n = 24) leaving a sample of 5994.

Data Preparation

Data were obtained from electronic administrative records, including birth (birth weight) and death records (for censoring only), child welfare (report and foster care services), Department of Mental Health Medicaid and non-Medicaid programs (parent and child), emergency department and hospital records, income maintenance data (AFDC and Temporary Assistance to Needy Families), juvenile corrections and juvenile court records, statewide Medicaid and expanded state health coverage for low-income children, and special education eligibility records. Most data sets were linked by using a common state-level identifying number. Others were linked by using a composite name/birth date/gender match variable. We also included 1990 census tract data because this was the available year closest to the sampling period. All data were de-identified before analysis. All procedures involving data collection and management were approved by the Human Research Protection Office of Washington University.

Variables

Child and adult outcome variables represent a range of outcomes across various systems that indicate a range of risky behaviors, developmental barriers, and significant public health concerns.

Childhood Adverse Outcomes

To ensure that outcomes occurred after a first report of maltreatment or first spell on AFDC, childhood outcomes were measured beginning at age 3. Child, emergency department, health, and hospital records were recoded into any health treatment of head injury (skull or brain injury), any health treatment of sexually transmitted disease (STD), or suicide attempt treated in emergency departments. Department of Mental Health, emergency department/hospital records, and Medicaid and *International Classifications of Disease* (Ninth and Tenth Revisions) classifications were recoded into a broader category for analysis: "at least one visit resulting in a diagnosis for a Mental Health condition —not substance abuse." Behavioral outcomes included juvenile court petitions for a violent offense or problematic substance use as indicated by health care records for substance use or juvenile court petition for substance abuse (alcohol and illicit drugs are combined).

Adult Outcomes

Adult outcomes included alleged maltreatment perpetration; this was limited to date of first alleged perpetration of child abuse or neglect of a child for whom they had care, custody, or control. Young teen parents are sometimes not living on their own and therefore still subject to being abuse victims themselves. There were relatively few who gave birth prior to age 17 so we measured perpetration starting at age 17 to be conservative. In addition, mental health treatment after age 18 and problematic substance abuse (either arrest or treatment of substance abuse after age 18) were included.

Independent Variables

The primary independent variable was the number of maltreatment reports the child experienced before age 18. Subsequent reports of maltreatment were ignored if they occurred within 7 days of the previous report to exclude "echo" reports. Exact dates of reports and dependent variables allowed for ordering of independent and dependent variables. Maltreatment type was considered as an independent variable, but because large effects by type of maltreatment were not found, type of maltreatment was not included in the final models, and the emphasis was kept squarely on chronicity. In models of adult outcomes, maltreatment reports were collapsed to 4 categories with the fourth including those with ≥4 reports. In these analyses, the 6 childhood adverse outcomes were recoded into a cumulative risk scale to see if the number of adverse outcomes was a stronger predictor than the accumulated maltreatment events in predicting outcomes after age 18. Because of the sample size, this variable was collapsed, with the highest level being ≥4.

Control Variables

Control variables included parent (age at child's birth, known education status at study start, known parental history of mental health treatment) and child demographics including gender and significant health care risk in infancy (eg, very low birth weight or medical problem with persistent effects). Medical problems with persistent effects were coded in collaboration with a neonatologist and included diagnoses such as fetal alcohol syndrome, conditions requiring long-term hospital

stays in infancy, and chronic conditions such as cerebral palsy. Race/ethnicity was coded according to parental report in AFDC records. Neighborhood socioeconomic status was derived from 1990 census tract median income. Child participation in special education was derived from public school electronic data. These variables either could not change, or subsequent measures were not available within the data. Additional control variables included whether the child had at least 1 stay in foster care or repeat episodes of cash assistance (range 1 to ≥3).

Analyses

SAS 9.2 (SAS Institute, Inc, Cary, NC) was used for analyses. Associations between recurrent reports and outcomes were examined as comorbid (no attempt was made to control for ordering of reports before the outcome) as well as time-ordered after recurrent reports. Bivariate trend analyses were conducted for childhood outcomes and maltreatment reports over time. Multivariate Cox regression models were conducted for adult outcomes to see if a relationship persisted between number of maltreatment reports in childhood and later outcomes while controlling for the occurrence of adverse childhood outcomes. Cox regression was used for multivariate analyses because of the capacity to model a dichotomous outcome, control for time at risk, and potential clustering by census tract.[24] Time at risk (in years) was created for adult outcomes by starting at the child's 17th birthday. Children were censored (no longer at risk) at the time of an outcome, at time of death, or at the end of the study. Analyses were adjusted by using robust SEs because of potential intragroup correlation of subjects within a census tract.

Bivariate survival analyses were used to select control variables with the exception that child race, gender, and age at time of sampling were always included. Bivariate survival analyses between each independent variable and dependent variable were also used (not shown) to test the equality of survivor functions (log-rank test for categorical independent variables and simple Cox model for continuous independent variables). The estimated survivor functions from the bivariate tests were graphed to assess the assumption of proportionality. If a violation was found, a time interaction was created. The interaction term was tested in the multivariate model and only retained if it was significant or if it altered the significance of other variables or the overall model fit. The Cox regression output includes a magnitude of effect called hazard ratios (exponentiated parameter coefficients), which are similar to odds ratios in interpretation. A hazard ratio >1 and statistically significant indicates an increased risk, whereas a statistically significant hazard ratio between 0 and 1 reflects decreased risk. For example, a hazard ratio of 2.0 indicates twice the risk, and a hazard ratio of 0.5 indicates half the risk. For continuous variables, the hazard ratio is interpreted as the change per unit of measurement. Two models are presented per outcome, 1 solely controlling for number of reports and a second that also includes number of other adverse outcomes before age 18. Both moderating and mediating effects of childhood adverse outcomes within the model were examined. Because the comparison for the multivariate model for number of reports was no report, linear test statements were included to check for statistically significant changes between the numbers of reports up to ≥4.

RESULTS

Forty-one percent of the low-income sample had no reported maltreatment by age 18. Nineteen percent had only 1 report, 12.7% had 2, 7.9% had 3, and 19.1% had between 4 and 22 reports. Figure 1 shows the association between number of reports and problematic outcomes in childhood (ever mental health diagnosis, emergency department treatment for suicide attempt, health care for head injury or STD, ever a delinquency petition for a violent offense, ever treatment or delinquency petition for substance use) as follows: no maltreatment = 29.7% with problematic childhood outcome (734/2472), 1 report = 39.5% (449/1138), 4 reports = 67.17% (224/334), 7 reports = 79.4% (81/102), ≥12 reports = 91.9% (57/62). The point biserial correlation was 0.33, $P < .0001$.

Figure 2 illustrates the individual childhood and adult outcomes according to the number of reports that occurred before the event of interest. Because it was possible for some children to enter the study period with a preexisting condition, these are indicated as gray or black bars with the legend indicating the outcome occurred "before the study." Chronicity is associated with increasing risk for all but child maltreatment perpetration, violent delinquency, and head or brain injury. In these cases, there is a slight decline in prevalence for the highest category compared with middle categories, but in all cases having reports was associated with higher rates of outcomes. The bivariate trend test was significant for all outcomes at $P < .0001$.

Cox regression analyses were conducted for 3 young adult outcomes: alleged perpetration of maltreatment, mental health treatment, or problematic substance abuse. Models were run first with number of reports (none, 1, 2, 3, ≥4) controlling for child, family, and neighborhood factors. Models were rerun to include the number of childhood adverse outcomes (also 1 to ≥4), which was a summed variable of all the child and adolescent outcomes measured in this study (ever mental health diagnosis, emergency department

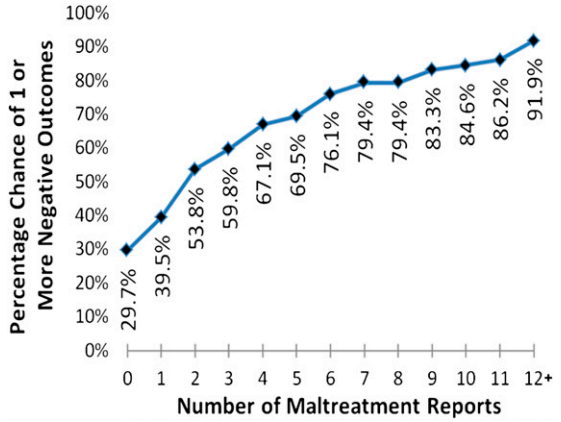

FIGURE 1
Presence of at least 1 negative outcome by number of maltreatment reports.

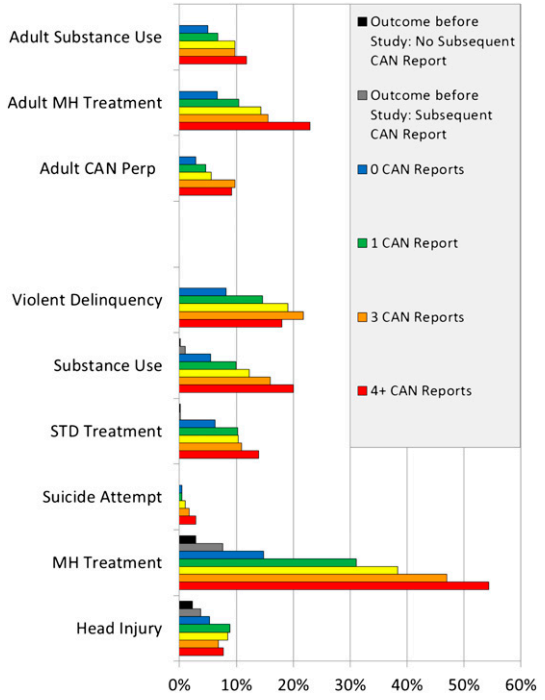

FIGURE 2
Time ordered child and adult outcomes by number of child maltreatment reports. CAN, child abuse and/or neglect; MH, mental health.

treatment of suicide attempt, health care for head injury or STD, ever a delinquency petition for a violent offense, ever treatment or delinquency petition for substance use). Model fit, hazard ratios, and significance levels can be found in Table 1.

In models that controlled for number of maltreatment reports but did not include controls for adverse childhood outcomes, there was a dose-response pattern between reports of maltreatment in childhood and adult outcomes. In models of alleged maltreatment perpetration and problematic substance abuse, however, there was no statistically significant difference between young adults with no history of maltreatment reports and those with only a single report. Linear tests (not shown) indicated that in models not controlling for childhood outcomes, having ≥3 reports was always associated with a higher level of risk than no or single reports. Having ≥4 reports was also always associated with higher risk than having 2 reports. When the number of childhood adverse outcomes was entered into the models, however, the association between number of reports and problematic substance abuse disappeared, whereas the association with mental health treatment was significantly attenuated. Adult perpetration of maltreatment remained the most strongly associated with childhood maltreatment history. Even after controlling for other adverse child outcomes, children with ≥3 reports remained at approximately twice the risk of later alleged child abuse or neglect perpetration compared with those with ≤2 reports.

DISCUSSION

The number of maltreatment reports is a strong general predictor of negative outcomes in both childhood and adulthood, although the relationship between repeated reports of maltreatment and problematic substance abuse in young adulthood did not persist once adverse childhood outcomes were controlled. These findings are consistent with studies that have controlled for multiple reports, clinical investigations, and qualitative reports.[4,9,10] Our work suggests that emerging findings regarding chronic child maltreatment (eg, the Adverse Child Experiences Study, LONGSCAN) can be confidently generalized to the segment of the population that is most severely at risk for child maltreatment: socioeconomically disadvantaged children.[25,26]

Although this study has a nonmaltreated comparison group and is longitudinal, it is impossible to establish clear causal relationships given the lack of random assignment. There is also some risk of false-positives or false-negatives attendant to the use of official reports, although the risk of false-negatives is

TABLE 1 Final Cox Regression Models: Hazard Ratios for Predictors of 3 Adult Outcomes

	CA/N Perpetration		Mental Health		Substance Abuse	
	Model 1A	Model 1B	Model 2A	Model 2B	Model 3A	Model 3B
Black	0.81	0.80	0.68***	0.67***	0.86	0.84
Female	2.26***	2.43***	1.46***	1.64***	0.42***	0.47***
Older (9–11 y at sampling)	1.00	—	1.00	—	1.00	—
Middle (5–8 y at sampling)	0.65**	0.68*	1.25	1.43*	0.16***	0.17***
Young (1.5–4 y at sampling)	0.47**	0.53*	0.78	0.96	0.15***	0.18***
Child health problem at birth					2.07**	0.81
Income in tract (per $1000)	0.99*	0.99	0.99	0.99	0.99	2.14***
No CAN Report	1.00	—	1.00	—	1.00	—
1 CAN Report	1.35	1.20	1.38*	1.10	1.20	1.04
2 CAN Reports	1.70*	1.32	1.98***	1.27	1.71**	1.20
3 CAN Reports	2.93***	2.35***	2.16***	1.37*	1.77*	1.31
≥4 CAN Reports	3.10***	2.03***	3.38***	1.70***	2.41***	1.31
Services						
AFDC or TANF1 (per spell: 1, 2, 3+)	1.17*	1.16*	1.01	0.97	1.15*	1.13*
Special education	1.75*	1.55	1.91***	1.57***	1.50***	0.99
Foster care services	1.26	1.15	1.58***	1.31*	0.90	1.01
Parent factors						
No parental mental health service	1.00	—	1.00	—	1.00	—
Parental mental health early	1.42	1.34	1.15	1.09	0.95	1.18
Parental mental health late	1.11	1.03	0.99	0.88	1.54*	0.86
Parent graduated high school	0.68**	0.68*	0.99	1.03	0.95	1.37*
Time interactions retained						
Special education * time	0.99	0.99*				
Middle * time			0.98***	0.98***	1.08***	1.08***
Young * time			0.99	0.99*	1.19***	1.19***
1 childhood adverse outcome		1.87***		5.32***		2.10***
2 childhood adverse outcomes		2.40***		9.03***		3.84***
3 childhood adverse outcomes		3.70***		9.47***		5.79***
≥4 childhood adverse outcomes		4.14***		12.22***		8.95***

Model fit statistics: 1A: Wald $\chi^2 = 193.35$, degrees of freedom (df) = 16, $P < .0001$. Model 1B: Wald $\chi^2 = 240.76$, $df = 20$, $P < .0001$. Model 2A: Wald $\chi^2 = 383.89$, $df = 17$, $P < .0001$. Model 2B: Wald $\chi^2 = 594.35$, $df = 21$, $P < .0001$. Model 3A: Wald $\chi^2 = 515.81$, $df = 18$, $P < .0001$. Model 3B: Wald $\chi^2 = 774.49$, $df = 22$, $P < .0001$. CAN, child abuse and/or neglect. 1 TANF = Temporary Aid to Needy Families.

* $P = .05$.

** $P < .001$.

*** $P < .0001$.

somewhat mitigated when long time frames are considered.[21,27] Strengths of the study include its longitudinal nature, the range of data sources, and the reliance on clinically relevant outcomes. Corresponding limitations include underestimations of the prevalence of outcomes, particularly those of a nonclinical or borderline nature.

CONCLUSIONS

Our findings suggest that although any report of maltreatment is undesirable, chronic maltreatment predicts worse outcomes across a number of domains. Early detection and increased service provision to prevent recurrence seem warranted. Our findings also suggest the importance of not only assuring child safety but addressing behavioral and developmental needs within a reported population. Beyond maltreatment, observed adverse childhood outcomes had an independent association with adult untoward outcomes. Successful tertiary prevention may provide significant long-term benefits for maltreated children.

Our findings also have significance for etiological research. It is important to discriminate between children who have single and multiple maltreatment events. Dichotomous ("present/absent") measures are likely missing important variation that could better guide clinical intervention. There is also a need for a better understanding of how the timing and quality of intervention may help alter negative trajectories associated with experiencing abuse and neglect. Finally, chronic maltreatment generally includes a preponderance of neglect allegations. Although research on neglect is growing, it remains an area of significant weakness in the prevention and intervention literature.

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