

Developmental Impacts of Child Abuse and Neglect Related to Adult Mental Health, Substance Use, and Physical Health

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Abstract This study examined the association between officially recorded child abuse and neglect and adult mental health, substance use, and physical health outcomes. Data are from a longitudinal study of more than 30 years in which individuals were interviewed most recently in their mid—30s. Analyses consisted of group comparisons using chi-square tests for categorical variables and independent samples t-tests for continuous measures. Logistic and linear regressions controlled for gender and childhood SES, adult age, marital status, and education. Adults maltreated in childhood reported more symptoms of adult depression, anxiety, and more impairment due to mental and physical health problems. A higher percentage of those with maltreatment histories reported lifetime alcohol problems and appear at greater risk for substance abuse. Most findings of these bivariate analyses remained significant after accounting for gender and childhood socioeconomic status. Somewhat fewer significant results were observed after controlling for adult age, marital status, and education.

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Research shows that various forms of early adversity, including child abuse and child neglect (child maltreatment), can carry long-term developmental consequences for children (Arnow 2004; Bonomi et al. 2008; Herrenkohl et al. 2008; Mercy and Saul 2009; Molnar et al. 2001). Although prospective longitudinal studies are rare (Widom et al. 2004; Widom and Shepard 1996), evidence suggests that child abuse and neglect are linked developmentally to various problems in adolescence and adulthood, which include diagnoses and symptoms of mental health disorders, substance use and abuse, and poor physical health (Bonomi et al. 2008; Cohen et al. 2001; Lynskey and Fergusson 1997; McLeer et al. 1994; McLeer et al. 1998; Shonkoff et al. 2009; Widom et al. 1995).

Lynskey and Fergusson (1997) examined the association between retrospective accounts of childhood sexual abuse (up to age 16) and major depression and anxiety at age 16–18. Results of their study showed that increasingly severe forms of sexual abuse were associated with a greater risk of each outcome. Among those whose abuse involved intercourse, 63.9 % met criteria for later major depression and 44.4 % met criteria for later anxiety disorders. Felitti et al.'s (1998) Adverse Childhood Experiences (ACE) study of adults in a large health maintenance organization showed a significant correlation between retrospectively measured adverse childhood events (including various forms of child abuse) and past-year depression. The more childhood adversities reported, the greater the risk of adult depression.

In a study of randomly sampled women ages 18–64, Bonomi et al. (2008) found a higher prevalence of increasingly severe forms of depression among those who reported having been physically and sexually abused. Analyses of that study controlled for age and income. Links to depression and anxiety, as well as other internalizing problems in

adolescence and adulthood, are also documented in other published reports (Cohen et al. 2001; Thornberry et al. 2010).

Children who experience abuse and neglect are also at higher risk for later illicit substance use and alcohol misuse and dependence (Thornberry et al. 2010; White and Widom 2008). In a prospective study, Thornberry and colleagues (2010) found that officially recorded childhood-limited maltreatment predicted the use of drugs and problems resulting from drug use. Maltreatment during adolescence predicted these and other negative outcomes, such as criminal offending and arrest, in early adulthood. In the ACE study, adults with multiple adversities growing up were significantly more likely than those with fewer adversities to smoke and abuse drugs and alcohol (Anda et al. 1999; Felitti et al. 1998). However, in White and Widom's (2008) longitudinal investigation, only women with substantiated abuse and neglect histories were at higher risk for substance use problems and illicit drug use at age 40.

Most evidence of the adverse physical health effects of child abuse and neglect comes from retrospective studies. Sachs-Ericsson et al. (2005) investigated the association between retrospectively measured childhood physical and sexual abuse and medical problems among adults ages 15–54 in the National Comorbidity Survey (NCS). Analyses showed that both physical and sexual abuse before age 15 were independently associated with a higher past-year prevalence of serious health problems including hypertension and diabetes. Batten et al. (2004) found that child maltreatment increased the risk of cardiovascular disease only for women. In Bonomi et al.'s (2008) study of adult women, physical and sexual child abuse was associated with self-reports of fair to poor health and lower overall functioning according to scores on subscales of the SF-36, a general measure of health and well-being (Ware et al. 2000; Ware and Sherbourne 1992). Walker et al. (1999) found that a history of maltreatment for women was associated with poor overall health and functional disability, also measured by the SF-36. Mechanisms that account for an increased risk for mental health, substance use, and physical health problems among maltreated children are largely untested. However, hypotheses have been centered on the role of chronic stress in relation to brain development and immune functioning (Repetti et al. 2002). It is believed that high levels of stress experienced over extended periods can damage areas of the brain and suppress the body's immune response, thereby increasing an individual's susceptibility to illness and disease (Middlebrooks and Audage 2008; Repetti et al. 2002; Shonkoff et al. 2009). In a practice termed "self-medication" (Anda et al. 1999), child abuse and neglect may also lead some individuals to adopt unhealthy behaviors, such as frequent and excessive alcohol use, as a way to blunt the emotional pain and recurrent memories of past traumas. Depression, anxiety, and use of drugs and alcohol may also

stem, in part, from having experienced insecure attachments and failed relationships, which leave children vulnerable to ongoing relationship failures and poor self-esteem (Batten et al. 2004; Repetti et al. 2002).

Although studies point to wide-ranging developmental effects of child maltreatment, researchers have relied too heavily on cross-sectional studies and retrospective reports, the limitations of which are well established (Herrenkohl et al. 2008; Widom et al. 2004; Widom and Shepard 1996). The use of small convenience samples also weakens research findings and limits their generalizability (Herrenkohl and Herrenkohl 2009). The goal of the current study is to examine the association between prospectively measured child abuse and neglect in relation to previously validated measures of adult mental health, substance use, and physical health.

Method

Data are from the Lehigh Longitudinal Study, which began in 1973–1974 as the evaluation portion of a child abuse and neglect treatment and prevention program in two counties of eastern Pennsylvania. Selection of the sample was accomplished over a 2-year period by the two county child welfare agencies having referred all new and some ongoing cases to the study in which there was at least one abused or neglected child 18 months to 6 years of age in the home. The children served by child welfare agencies participated in one of several group settings (e.g., day care, Head Start). It was from these settings, also within the same two-county area, that children outside of child welfare were recruited.

The study was developed to compare those involved with child welfare for abuse and neglect reports to others in the sample with no known child welfare involvement. The original sample contains five groups and totals 457 children: child welfare abuse ($N=144$), child welfare neglect ($N=105$), Head Start ($N=70$), day care ($N=64$), and middle-income nursery ($N=74$), and is composed of near equal numbers of males ($N=248$) and females ($N=209$) and families from diverse socioeconomic backgrounds.

The racial and ethnic composition of the sample is consistent with the makeup of the two-county area from which participants were drawn: 1.3 % ($N=6$) American Indian/Alaska Native, 0.2 % ($N=1$) Native Hawaiian or Other Pacific Islander, 5.3 % ($N=24$) Black or African American, 80.7 % ($N=369$) White, 11.2 % ($N=51$) more than one race, and 1.3 % ($N=6$) unknown. Just over 7 % ($N=33$) self-identified as Hispanic or Latino and 91.5 % ($N=418$) self-identified as Not Hispanic or Latino. For a small percentage, 1.3 % ($N=6$), the ethnicity of the child was unknown. Eighty-six percent of children were from two-parent households. The income level of 63 % of

families at the time was below \$700 per month. Other families had incomes that ranged to over \$3,000 per month.

The first “preschool” wave of the study took place in 1976–1977 when children recruited to the study were 18 months to 6 years of age. A second “schoolage” assessment was conducted in 1980–1982. A third “adolescent” assessment of all youth participants (91 % of the original sample) was conducted in 1990–1992. When they were assessed in adolescence, participants were 18 years of age on average. An adult wave of the study was completed in 2010, after intensive locating and interviewing efforts. Approximately 80 % of the sample still living ($N=357$) was located and successfully assessed using a comprehensive, interviewer-administered survey of about 3.5 h in length.

The survey was programmed on laptop computers and used assisted personal interviewing (CAPI) technology. Just under a quarter (24 %) of the surveys were completed over the phone because participants were living at a distance and were unable to complete the interview in person. Three participants completed a shortened web-based survey after declining our requests for an in-person interview. A somewhat larger percentage of those who attrited from the study were from the child welfare abuse group (32 % compared to 21 % in the child welfare neglect group, and less than 20 % in other sample groups). Of those who refused the assessment, some did so because they did not want to complete the interview and revisit painful childhood memories. Others declined because they had no recollection of having been previously involved in the study or simply had no interest in continuing to participate. Those not interviewed were actively pursued until numerous interviewing attempts failed or multiple requests were denied.

In the adult assessment, participants were, on average, 36 years of age (range=31–41). The sample remains gender balanced: 171 (47.9 %) females and 186 (52.1 %) males. Analyses of the currently retained sample showed that, although more of the original child welfare abuse group was lost to attrition, there were no significant group differences in gender, age, childhood SES, or observer ratings of neglect or parent-reported physically abusive discipline. Study procedures were approved by the Human Subjects Division at the University of Washington and the Office of Research and Sponsored Programs at Lehigh University.

Measures

Officially recorded child abuse and neglect was modeled as a dichotomous variable that distinguished individuals in the sample originally recruited from child welfare caseloads for abuse and neglect from those who were recruited to the study from other settings (Head Start, day care, and middle-income nursery). The abuse and neglect group

consists of 180 participants: 82 females and 98 males. The comparison group consists of 175 participants: 87 females and 88 males. The analysis sample ($N=355$) is two less than the fully assessed adult sample. The two cases were dropped from analyses because of incomplete data.

In the area of mental health, depression was measured using the 21-item Beck Depression Inventory (BDI) (Beck et al. 1988). The BDI is a widely used self-report measure of depression severity for which individuals describe on the extent of their feelings, including sadness (0 = I do not feel sad, 1 = I feel sad, 2 = I am sad all the time and I can't snap out of it, 3 = I am so sad or unhappy that I can't stand it) and disappointment (0 = I don't feel disappointed in myself, 1 = I am disappointed with myself, 2 = I am disgusted with myself, 3 = I hate myself). Summed items total a score of 0–9 (minimal or low-level depression), 10–18 (mild depression), 19–29 (moderate depression), and 30–63 (severe depression). In analyses reported here, the moderate and severe depression categories were combined so that individuals with scores that fall in either category are compared to those with scores in the minimal to low-level depression severity categories. The two groups—child welfare abuse/neglect versus other—were also compared on an averaged count of the number of BDI depression symptoms reported by each participant. The scale alpha for the composite measure is 0.91.

Generalized anxiety was assessed using the GAD-7 (Spitzer et al. 2006). On the GAD-7, individuals are asked the frequency over the last 2 weeks (not at all, several days, more than half the days, nearly every day) they had been bothered by the following: feeling nervous, anxious, or on edge; not being able to stop or control worrying; worrying too much about different things; trouble relaxing; being so restless that it is hard to sit still; becoming easily annoyed or irritable; and feeling afraid as if something awful might happen. Items, scored on a scale of 0–3, were summed (range 0–21). Scores in the 0–4 range reflect minimal anxiety, 5–9 mild anxiety, 10–14 moderate anxiety, and 15–21 severe anxiety. Analyses of this study combined the moderate and severe categories, which are then compared to those of the minimal and mild anxiety categories. As with the BDI scores, the two groups were also compared on the average number of anxiety symptoms reported. The scale alpha is 0.89.

Analyses of mental health outcomes included subscales of the Mental Component of the SF-36 (Ware et al. 2000; Ware and Sherbourne 1992). These consist of vitality ($\alpha=.85$), social functioning ($\alpha=.79$), role-emotional functioning ($\alpha=.83$), and overall mental health ($\alpha=.84$). Scores are continuous, with higher values consistent with better mental functioning (range 0–100). Details regarding the SF-36 instrument can be found in publications of Ware and Sherbourne (1992) and Ware and colleagues (2000).

In the area of physical health, participants were asked about their general health (poor/fair versus good/very good/excellent) and their health compared to 1 year ago (somewhat/much worse versus somewhat/much better or about same). Data were also used to derive subscales of the Physical Component of the SF-36 which examines: general health; problems with work or daily activities as a result of physical health; physical functioning (e.g., vigorous activities such as running or lifting heavy objects; moderate activities such as moving a table, pushing a vacuum cleaner, lifting or carrying groceries, climbing stairs, bending, kneeling, stooping, walking various distances, bathing or dressing oneself); and bodily pain or limitations due to pain for the past 4 weeks. Scale alphas for the subscales range from 0.79 for general health to 0.92 for physical functioning.

Somatic complaints were assessed using the Somatic Symptom Severity Scale of the Patient Health Questionnaire (PHQ-15, Kroenke et al. 2002). Scores reflect how much an individual was bothered over the preceding 4 weeks by problems such as stomach and back pain, pain in arms, legs, or joints, headaches, chest pain, dizziness, feeling tired or having low energy, and trouble sleeping. The scale alpha for the composite measure is 0.85. Comprehensive data on substance use and abuse were collected in the adult assessment. Past-year binge drinking was defined as the number of times an individual had five or more drinks in one sitting or occasion. Participants were also asked about ever having had alcohol problems (yes/no).

Additionally, the Simple Screening Instrument for Substance Use (SSI-SA, Substance Abuse and Mental Health Services Administration Center for Substance Abuse Treatment 1994) was used to assess substance abuse problems and risk. The SSI-SA is composed of 16 items and covers substance consumption, preoccupation and loss of control related to substance use, adverse consequences, problem recognition (making a link between one's use of substances and the problems that result), and tolerance and withdrawal. Responses are "yes/no," with affirmative responses scored 1 and non-affirmative 0. Fourteen of 16 administered items are summed (providing a range of 0–14). A score of four or more on the scale is taken to represent moderate to high risk of substance abuse; scores in the 0–1 range reflect none to low substance use, 2–3 minimal, and 4–14 moderate to high. In the analyses of this study, the moderate to high category was compared to the none-low and minimal categories. The two groups were also compared on the average count of substance use symptoms reported. The scale alpha for the composite measure is 0.87.

Gender and childhood socioeconomic status (SES) were included in analyses as control variables. Gender was coded "1" for females and "2" for males. SES is a standardized composite measure of parents' occupational status, educational level, family income, and total rooms in the family's

home. The SES variable has a mean of 0 and a standard deviation of 3.29 (minimum: -5.43 and maximum: 9.18). Adult age (range of 31–41 in the recent assessment of the panel) was also examined as a covariate, as was marital status (0 = unmarried and 1 = married) and years of education (0 = no high school degree and 1 = graduated high school). Just more than 46 % of the analysis sample reported they were currently married and about 79 % had earned at least a high school degree or GED equivalent.

Analysis

Analyses consisted of group comparisons (child welfare abuse/neglect compared to others in the sample groups combined) using chi-square tests for categorical variables and independent samples t-tests for continuous measures. Logistic and linear regression models were conducted as a second level of analysis to test the conditional effect of the child welfare independent variable (coded 1 for child welfare and 0 for comparisons), controlling for gender and childhood SES. A third and final series of regression models re-examined the relationships controlling for adult age, marital status, and education. These analyses were conducted to determine if effects were attenuated by adulthood demographics, particularly since marital status and years of education have been shown elsewhere to predict health outcomes (Walker et al. 1999).

Results

As shown in Table 1, significant group differences were found for many of the tested variables across the domains of mental health, substance use, and physical health. Rates of moderate to severe depression in the child welfare group, as measured by the BDI, were more than twice that of the comparison group (24.4 % abuse/neglect versus 6.9 % for no abuse/neglect). The number of BDI depression symptoms also registered higher for the child welfare group compared to others (8.35 versus 5.59 for the comparison groups and 6.99 for the sample overall), as did moderate to severe anxiety as measured by the GAD-7 (24.4 % for child welfare and 8 % for the comparison group) and the average number of anxiety symptoms reported on the GAD-7 (3.55 for child welfare versus 2.74 for the comparison group). With the exception of "vitality," which was marginally significantly different, all subscales of the SF-36 Mental Component differed significantly ($p < .05$) for the two groups in the expected direction. In each case, more impairment was reported by those of the child welfare group compared to those of the comparison group.

Analyses of adult substance use showed differences for past-year marijuana use (20.0 % for the child welfare group

Table 1 Comparison of group differences on adult mental health, substance use, and health

Scales and indicators	Full sample (N=355)	Child welfare (N=180)	Comparison (N=175)	Test of significance and p-value	Controlling for SES and gender
Mental health					
BDI: moderate/severe depression	15.8 %	24.4 %	6.9 %	$\chi^2=20.66$ ***	***
BDI: depression symptom count	6.99	8.35	5.59	$t=-5.10$ ***	***
GAD-7: moderate/severe anxiety	16.3 %	24.4 %	8.0 %	$\chi^2=17.66$ ***	***
GAD-7: anxiety symptom count	3.15	3.55	2.74	$t=-3.22$ **	**
SF-36 mental component					
Vitality ^a	60.0	57.8	62.1	$t=1.84$ +	+
Social functioning	85.2	81.9	88.6	$t=2.81$ **	**
Role-emotional	82.5	77.9	87.2	$t=2.72$ **	**
Mental health ^a	75.6	71.7	79.5	$t=3.81$ ***	***
Substance use/abuse					
Past-year binge drinking	48.7 %	46.1 %	51.4 %	$\chi^2=1.00$	
Past-year marijuana use	16.1 %	20.0 %	12.0 %	$\chi^2=4.21$ *	*
Lifetime alcohol problems	14.9 %	19.4 %	10.3 %	$\chi^2=5.86$ *	*
SSI-SA substance abuse symptom count	1.38	1.91	0.83	$t=-4.26$ ***	***
SSI-SA: moderate/high risk for substance abuse	13.2 %	19.4 %	6.9 %	$\chi^2=12.24$ ***	**
Health					
SF-36 physical component					
Physical functioning	88.6	86.2	91.0	$t=2.31$ *	*
Role-physical	80.8	77.1	84.7	$t=2.14$ *	+
Bodily pain	78.9	74.8	83.2	$t=3.33$ **	**
General health	72.3	67.1	77.5	$t=4.67$ ***	***
General health fair/poor ^b	17.2 %	24.4 %	9.7 %	$\chi^2=13.53$ ***	***
General health compared to 1 year ago: somewhat/much worse	13.5 %	16.1 %	10.9 %	$\chi^2=2.10$	
PHQ-15 somatic symptom count	5.11	5.66	4.54	$t=-3.09$ **	**
PHQ-15: medium/high somatic severity	22.8 %	30.0 %	15.4 %	$\chi^2=10.70$ **	**

Group comparisons (child welfare versus comparison) are chi-square analyses for categorical variables and independent samples t-tests for continuous measures; + $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$; degrees of freedom (df) are 1 for chi-square tests and 353 for t-tests unless otherwise noted; ^a the degrees of freedom for these tests are 351 due to missing data on indicator variables; ^b this variable is also used as an indicator of general health on the SF-36 subscale

versus 12.0 % for the comparison group), lifetime alcohol problems (19.4 % versus 10.3 %), substance abuse symptoms, and moderate/high risk for substance abuse (19.4 % versus 6.9 %) according to the SSI-SA. A statistically significant difference was not shown for past-year binge drinking.

In the area of physical health, significant differences were found on the subscales of the SF-36: Those in the child welfare group reported lower physical functioning, more bodily pain, and poorer general health on the SF-36. Indeed, a significantly larger percentage of participants in the child welfare group reported their current health as poor/fair (24.4 % for child welfare versus 9.7 % for the comparison group), although groups did not differ with respect to the percentage of participants reporting declines (somewhat/much worse) in general health from the previous year. Finally, those in the child welfare group reported

significantly more somatic symptoms (5.66 on average versus 4.54 for the comparison group) and a higher (medium to high) score for somatic symptom severity (30.0 % versus 15.4 %).

The next series of analyses used logistic and linear regression models to test the conditional relationship of child welfare group status (entered as a 0/1 dummy variable) and each adult outcome, controlling for gender and SES. Results (shown by the asterisks in the last column of Table 1) indicate that the results remained largely the same; that is, outcomes for which group differences were detected in the first set of unconditional tests remained statistically significant in this series of follow-up tests.

The third and final series of regression models re-examined the predictive relationships between the child welfare variable and adult outcomes, controlling for age at the time of the adult assessment, marital status (0 = currently

unmarried and 1 = married), and high school graduation (0 = no high school degree and 1 = high school degree or GED equivalent). Results of these model tests, shown in Tables 2, 3 and 4, suggest that several of the relationships found in earlier analyses are attenuated or lost once these adult demographic variables are taken into account—yet others remain. In the area of mental health, child welfare predicted BDI moderate/severe depression, BDI symptoms, GAD-7 moderate/severe anxiety, and overall mental health measured by the SF-36. For moderate/severe depression and anxiety, significant coefficients of the two models translate to odds ratios of greater than 2.0, indicating that the odds of these outcomes for those with histories of child welfare involvement were more than double those of the comparison group.

Child welfare involvement was also marginally significantly related to the Role Emotional subscale of the SF-36 in the expected direction (i.e., lower scores and more impairment). Being married and having graduated high school were significantly (negatively) associated with later reports of adult depression (ORs of 0.37 and 0.30, respectively), suggesting less risk for those who were currently married and further along in their education at the time of the adult interview. These same variables also lowered the risk of impairment on the Social Functioning and Mental Health subscales of the SF-36. High school graduation, but not marital status, was associated with less anxiety, as measured by the GAD-7.

After accounting for adult age, marital status, and education, child welfare status was no longer predictive of past-year marijuana use, nor lifetime alcohol problems (Table 3). However, it remained predictive of substance abuse

symptoms and moderate/high risk of substance abuse, as measured by the SSI-SA. The odds of being at moderate to high risk of substance abuse were over 3 times greater for those in the child welfare group compared to others.

Finally, Table 4 shows the results for physical health of these conditional tests. Here, the addition of adult age, marital status, and high school graduation accounted for previously shown child welfare effects for physical functioning and bodily pain. However, scores for general health and somatic symptom severity (OR: 1.84) are still significantly different for the two groups. A group difference was also detected for the count of somatic symptoms, although this result was marginally significant ($p < .10$).

Discussion

This study sought to test the association between prospectively measured and officially recorded child abuse and neglect and outcomes in the areas of adult mental health, substance use, and physical health. With a few exceptions, results convincingly show that the longstanding adverse effects of child maltreatment on later adult functioning are independent of gender and childhood socioeconomic status. However, after accounting for adulthood demographics of age, marital status, and years of education (high school graduation), several previously shown significant findings were reduced to non-significance. In all analyses, child welfare effects persisted for outcomes of self-reported adult depression, anxiety, substance use risk, and general health, among others.

Table 2 Regression coefficients (and standard errors) for mental health, controlling for adult age, marital status, and years of education

Independent variables	BDI: moderate/severe depression	BDI: depression symptom count	GAD-7: moderate/severe anxiety	GAD-7: anxiety symptom count	SF-36 vitality	SF-36 social functioning	SF-36 role-emotional	SF-36 mental health
Child welfare	1.05 (0.38)** OR=2.88 [1.36–6.11]	1.68 (0.58)** $\beta = .16$	0.89 (0.36)* OR=2.44 [1.19–4.97]	0.45 (0.28) $\beta = .09$	-2.29 (2.62) $\beta = -.05$	-3.50 (2.56) $\beta = -.08$	-7.39 (3.88)+ $\beta = -.11$	-4.60 (2.22)* $\beta = -.12$
Age (in adulthood)	0.26 (0.09)** OR=1.29 [1.08–1.55]	0.17 (0.14) $\beta = .07$	0.09 (0.08) OR=1.10 [0.93–1.30]	0.06 (0.07) $\beta = .05$	-0.64 (0.63) $\beta = -.06$	-1.67 (0.62)** $\beta = -.15$	-2.00 (0.93)* $\beta = -.12$	-0.69 (0.53) $\beta = -.07$
Married	-1.00 (0.35)** OR=.37 [.17–.80]	-1.46 (0.58)* $\beta = -.14$	-0.53 (0.36) OR=.59 [0.29–1.20]	-0.43 (0.27) $\beta = -.09$	3.22 (2.58) $\beta = .07$	6.63 (1.52)** $\beta = .15$	7.35 (3.82)+ $\beta = .11$	5.80 (2.19)** $\beta = .15$
HS graduate	-1.20 (0.35)** OR=.30 [0.15–0.60]	-2.59 (0.71)*** $\beta = -.20$	-1.30 (0.34)*** OR=.27 [0.14–0.53]	-0.71 (0.34)* $\beta = -.12$	5.66 (3.18) $\beta = .10+$	7.41 (3.10)** $\beta = .13$	5.27 (4.70) $\beta = .06$	8.76 (2.69)** $\beta = .18$

*** $p < .001$; ** $p < .01$; * $p < .05$; + $p < .10$

ORs are shown for binary outcomes; [] are 95 % CIs for ORs

Table 3 Regression coefficients for substance use, controlling for adult age, marital status, and years of education

Independent variables	Past-year binge drinking	Past-year marijuana use	Lifetime alcohol problems	SSI-SA substance abuse symptom count	SSI-SA: moderate/high risk for substance abuse
Child welfare	-0.03 (0.24) OR=.97 [0.60–1.56]	0.51 (0.34) OR=1.66 [0.85–3.26]	0.51 (0.34) OR=1.66 [0.86–3.20]	1.0 (0.29)** β =.20	1.20 (0.39)** OR=3.32 [1.55–7.14]
Age (in adulthood)	-0.13 (0.06)* OR=.88 [0.78–0.99]	-0.03 (0.08) OR=.97 [.83–1.14]	0.12 (0.08) OR=1.25 [.96–1.32]	-0.001 (0.07) β =-.001	-0.01 (0.09) OR=.99 [0.83–1.17]
Married	-0.23 (0.24) OR=.79 [0.50–1.27]	-0.64 (0.35) OR=.53 [0.27–1.04]	0.08 (0.33) OR=1.09 [0.57–2.07]	-0.43 (0.28) β =-.09	-0.20 (0.36) OR=.82 [0.41–1.65]
HS graduate	0.57 (0.30)+ OR=1.77 [0.99–3.17]	-0.15 (0.38) OR=.87 [0.41–1.82]	-0.69 (0.35)* OR=.50 [0.25–1.00]	-0.04 (0.35) β =-.001	0.15 (0.41) OR=1.16 [0.52–2.61]

*** $p < .001$; ** $p < .01$; * $p < .05$; + $p < .10$

ORs are shown for binary outcomes; [] are 95 % CIs for ORs

Results of this study are important because there have been so few longitudinal studies that have comprehensively investigated these topics (Cohen et al. 2001; Widom et al. 2004; Widom and Shepard 1996) and there has been a heavy reliance on cross-sectional data in which data on child maltreatment and other adversities are retrospectively reported. Cross-sectional findings from projects like the ACE Study previously mentioned (see Felitti et al. 1998) point to a strong, generalized correlational link between recalled adverse childhood events and adult risk markers for disease. Results of that and other similarly designed studies align with those of the current investigation; although

here, adverse events are limited to child maltreatment (abuse and neglect) which is prospectively measured.

Findings also support prior research on adult mental health and substance use problems, although some differences are worth noting. For example, Cohen and her colleagues (2001) found a relatively strong association between official record reports of abuse and neglect and anxiety in early adolescence, but the association was far less evident when participants reached early adulthood. Depression, however, remained more prevalent in early adulthood for those with officially recorded child maltreatment. Alcohol abuse was elevated in adulthood for those with official

Table 4 Regression coefficients for physical health, controlling for adult age, marital status, and years of education

Independent variables	SF-36 physical functioning	SF-36 role-physical	SF-36 bodily pain	SF-36 general health	General health fair/poor	General health (vs. prior year)	PHQ-15 somatic symptom count	PHQ-15: somatic severity
Child welfare	-2.49 (2.19) β =-.07	-2.31 (3.90) β =-.03	-4.08 (2.66) β =-.09	-7.00 (2.37) ** β =-.16	0.93 (0.36)** OR=2.54 [1.26–5.09]	0.36 (0.36) OR=1.43 [.71–2.89]	0.69 (0.40)+ β =.10	0.61 (0.30)* OR=1.84 [1.03–3.29]
Age (in adulthood)	-1.07 (0.53)* β =-.12	-1.88 (0.93)* β =-.12	-1.61 (0.64)* β =-.14	-1.42 (0.57)* β =-.14	0.19 (0.09)* OR=1.21 [1.02–1.43]	-0.003 (0.09) OR=1.00 [0.84–1.18]	0.20 (0.10)* β =.12	0.17 (0.07)* OR=1.19 [1.03–1.37]
Married	3.37 (2.16) β =.09	3.96 (3.84) β =.06	2.29 (2.62) β =.05	2.25 (2.33) β =.05	0.22 (0.34) OR=1.25 [0.64–2.44]	0.02 (0.35) OR=1.02 [0.51–2.03]	-0.94 (0.39)* β =-.14	-0.37 (0.30) OR=.69 [0.38–1.23]
HS graduate	5.17 (2.66)+ β =.11	17.28 (4.73)*** β =.21	13.54 (3.23)*** β =.23	12.49 (2.87)*** β =.24	-1.38 (0.34)*** OR=.25 [0.13–0.49]	-0.52 (0.39) OR=.59 [0.28–1.27]	1.0 (0.48)* β =-.12	-0.68 (0.31)* OR=.51 [0.28–0.94]

*** $p < .001$; ** $p < .01$; * $p < .05$; + $p < .10$

ORs are shown for binary outcomes; [] are 95 % CIs for ORs

records of physical abuse but not those who had been neglected. Additionally, substance use findings reported by White and Widom (2008) differ from those of the current investigation in that links to child maltreatment in our data are not limited to females; that is, effects of officially recorded child maltreatment on various measures of substance use and abuse remained after gender (and SES) was taken into account. In the White and Widom (2008) study (and in other studies of the same longitudinal dataset) it was shown that, for women only, a documented history of abuse and neglect was predictive of substance use problems and illicit drug use at age 40.

In that declines in physical health may increase with age, the long-term effects of child abuse and neglect may become increasingly evident in this sample at later assessment points. Some research suggests that mental health problems may also contribute to the worsening of physical health problems (Batten et al. 2004). Thus, given the relatively high rate of depression and anxiety found among those with maltreatment histories, a worsening in physical health and role functioning would on that basis also be expected.

Research focused on the prevention of child abuse and neglect shows that primary prevention programs such as the Nurse-Family Partnership (NFP) home-visiting program of Olds and colleagues (Olds et al. 1997) can effectively lower rates of child maltreatment in particularly vulnerable families, while improving life outcomes for abusive parents and their offspring. Benefit-cost studies have shown significant economic savings associated with the NFP and similar approaches (Center for the Study and Prevention of Violence [CSPV] 2008). However, some research suggests that program findings may not generalize beyond the sampled populations and that variations of the NFP home-visiting model may benefit recipients less (Chaffin 2004).

There are several other prevention models that hold promise for reducing the long-term mental health, substance use, and physical health effects of child maltreatment (Cicchetti et al. 2000). For example, Cicchetti et al. (2000) advocate for greater use of programs that promote school readiness and academic achievement for abused children. Parent training programs to lessen abuse potential and increase the use of positive, nonviolent discipline strategies are also recommended (CSPV 2008; Hawkins et al. 1999; Herrenkohl et al. 2004). Cognitive behavioral therapies have benefitted abuse survivors (Cicchetti and Toth 1998; Haugaard and Feerick 2002), although their value for improving mental health over the long term is unknown. Finally, as noted by Luthar and Brown (2007), service providers and policymakers must look at ways to strengthen and reorganize fragmented service delivery systems so that vulnerable children and families at all stages—before, during, and after child abuse and neglect are disclosed—have access to essential services.

Limitations

Although this study contributes important information to the literature on the long-term effects of child maltreatment, analyses test neither the associations among variables of abuse type, severity, or duration, nor variation in adult outcomes that might emerge were these issues considered. Such tests are recommended for future research. Additionally, developmental mechanisms that can help explain the link between early maltreatment and later adult functioning were not included; these will be phased in to subsequent analyses of the dataset. Analyses of longitudinal datasets, including the one used in this study, are needed to examine the ways in which abused and neglected children are resilient to the effects of adversity at the point of disclosure and beyond. Studies of resilience in maltreated children are tremendously important for the advancement of prevention and intervention programs (Herrenkohl 2011).

Finally, in that child welfare involvement was used as a proxy for child maltreatment, it is possible that factors other than the experience of having been abused or neglected are responsible for the differences observed. For example, it may be that being involved with the child welfare system carries additional risks of unstable living environments and insecure attachments to adult caregivers, which may, in turn, compound the risks associated with child maltreatment. However, analyses offer important insights that can be used to shape future research investigations and advance practice and policy to improve the lives of vulnerable children and families.

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