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Adverse Childhood Experiences and Child Health in Early Adolescence

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Abstract

Objective—1) Examine the relationship between previous adverse childhood experiences and somatic complaints and health problems in early adolescence, and 2) examine the role of the timing of adverse exposures.

Design—Prospective analysis of the Longitudinal Studies of Child Abuse and Neglect interview data when children were 4, 6, 8, 12 and 14 years old.

Setting—Children reported or at risk for maltreatment in the South, East, Midwest, Northwest, and Southwest United States LONGSCAN sites

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Conflict of interest: EGF, MDE, and DKR have provided expert testimony in cases of alleged child maltreatment. Any monies received for the testimony are paid to their respective institutions. HD has provided expert testimony and sometimes received payment for this testimony. EGF, HD, and DKR have received honoraria and travel reimbursement for speaking at other institutions or conferences. RT, DJE, EMH and LJP have no disclosures.

Participants—933 children.

Main Exposures—Eight categories of adversity (psychological maltreatment, physical abuse, sexual abuse, neglect, caregiver's substance use/alcohol abuse, caregiver's depressive symptoms, caregiver treated violently, and criminal behavior by household member) experienced during the first 6 years of life, the second six years of life, the most recent 2 years, and overall adversity

Outcome Measures—Child health problems including poor health, illness requiring a doctor, somatic complaints and *any health problem* at age 14.

Results—More than 90% of the youth had experienced an adverse childhood event by age 14. There was a graded relationship between adverse childhood exposures and *any health problem*, while 2 and ≥3 adverse exposures were associated with *somatic complaints*. Recent adversity uniquely predicted *poor health, somatic complaints* and *any health problem*.

Conclusions—Childhood adversities, particularly recent adversities, already impair the health of young adolescents. Increased efforts to prevent and mitigate these experiences may improve the health of adolescents and adults.

Keywords

child maltreatment; adverse childhood experiences; health outcomes

Introduction

The incidence of child maltreatment is higher in adolescents than in younger children, but is less likely to be reported.[1] The Fourth National Incidence Survey of Child Abuse and Neglect found that about 21/1000 adolescents ages 12 - 14 were maltreated compared to 8.5/100 children ages 0 – 2 years.[2,3] Only about 8/1000 children in this adolescent age group were actually reported to child protective services (CPS) for maltreatment. Under-reporting may be due to assumptions that maltreatment is less harmful for adolescents than younger children.

Child maltreatment and other adverse childhood experiences (ACEs) have been linked to depressed mood, anxiety, posttraumatic stress disorder symptoms, risk-taking behavior, early pregnancy, eating disorders, weight problems, substance use, STD treatment, suicide attempts, and mental health treatment in adolescents.[4-13] Few studies have examined the relationship between ACEs and adolescent physical health.[10,14]

Previous studies have demonstrated that exposure to ACEs is modestly related to health problems in younger children.[15,16] These associations appear to begin as early as age 6 years[15] and persist at age 12 years,[16] and include somatic complaints as well as poor health.[17] Recent adversities, as opposed to more remote adversities, may have a stronger impact on children's health.[18]

Other studies have found a significant relationship between ACEs and health risk behaviors, health status and disease among adults.[19-26] The CDC-Kaiser ACE studies found a strong dose-response relationship between ACEs and adult health problems including ischemic heart disease, cancer, chronic lung disease, skeletal fractures, and liver disease. The mechanism for the development of some diseases appears to be related to unhealthy behaviors; adults who experienced ACEs were more likely to engage in risky health behaviors including alcohol and drug abuse, smoking, and physical inactivity.[21,27-29]

We sought to examine whether there is a dose-response relationship between ACE's and health problems in early adolescence. This study examined the relationship between both the

overall exposure and the timing of exposure of ACEs to health problems in early adolescence. We hypothesized that a higher number of ACEs would be associated with poor health and/or somatic complaints, that recent adversities would more strongly predict negative health outcomes and that this relationship would be stronger than previously shown for younger children.

Methods

Participants and Study Design

Data collected by the Consortium for LONGitudinal Studies of Child Abuse and Neglect (LONGSCAN), a consortium of a coordinating center and 5 study sites, were analyzed.[30] The LONGSCAN sites are described in more detail in Table 1. The study sites represent different geographical regions with different levels of risk for maltreatment, but share common measures of child and family function, exposure to maltreatment, and health status, collected according to commonly shared age-specific protocols.[30]

Data on LONGSCAN participants who had completed an age 14 interview were analyzed. Of the 1354 children enrolled in the LONGSCAN studies at baseline (either age 4 or 6), 933 (68.9%) had completed an age 14 interview, including health outcomes. The decline in the number of participants from age 4 to age 14 was due primarily to loss to follow-up although there were 8 deaths. Comparison of demographic characteristics revealed no differences between those included in the analyses and those not included. The demographic description of the sample is presented in Table 2.

Human Subjects

Each participating study site, as well as the coordinating center, obtained independent approval from their local Institutional Review Board. Caregivers provided informed consent while youth provided assent for their participation.

Variables and Their Measurement

Using the CDC-Kaiser ACE studies[21] as a model, age-appropriate measures were selected from the available instruments administered to the LONGSCAN sample. There was some variation of the time frame used in each question, because some measures asked about events in the prior year, while others asked about the prior 6 months. Analyses included data collected during interviews at ages 4, 6, 8, 12, and 14. For several variables indicating adversity, different measures were used to assess the variable at different ages. In order to construct a risk profile, each predictor and outcome variable was dichotomized, unless otherwise specified.

Demographic Control Variables

Demographic variables were assessed at each age. Time-invariant demographic variables (child's race/ethnicity, gender, and study site) were collected at age 4 or 6. For time-varying variables (e.g., caregiver's marital status and family income), data collected at the most recent time point, the age 14 interview, were used in the block of control variables. To increase power, child's race/ethnicity was categorized as white, African American, or other, while caregiver's marital status was divided into married, never married, or formerly married. Family income was dichotomized into above $20,000 annually or at or below $20,000 annually.

Adverse Exposures

Analogous to the ACES used in the CDC-Kaiser ACE studies,[21] 4 categories of maltreatment (psychological maltreatment, physical abuse, sexual abuse, and neglect) and 4 measures of other household dysfunction (caregiver's substance use/alcohol abuse, caregiver's depressive symptoms, caregiver being treated violently, and criminal behaviorby household member) were identified as possible adverse experiences. An indicator for each of the measures of adversity was specified. The assessment periods were categorized as adversities occurring in the first 6 years of life (assessed at 4 and 6 years), occurring in the second 6 years of life (assessed at 8 and 12 years), or occurring recently (assessed at age 14). These three age periods of potential adversity were also combined to produce an overall variable noting whether the adverse events had *ever* occurred.

Child maltreatment—Each site reviewed CPS records for all lifetime reports of child maltreatment, at least every two years. Based on prior research suggesting that distinguishing between allegations and substantiations is not useful,[31,32] each site coded all official reports of alleged child maltreatment using a modified[33] version of the Maltreatment Classification Scheme.[34] Reports were coded to allow reports to be linked to the time period of the child's assessment. For each time period, four general indicators of child maltreatment were created, each dichotomized, based on the coding of these allegations:

1. physical abuse (any blows or injury to the body; violent handling, choking, burning, shaking, or nondescript injury);
2. sexual abuse (any sexual exposure, exploitation, molestation, or penetration);
3. psychological maltreatment (any threats to psychological safety and security, lack of acceptance and threats to self-esteem, or failure to allow age-appropriate autonomy), and
4. neglect (any failure to provide for a child's physical needs, or lack of adequate supervision to ensure a child's safety).

Household Dysfunction

Caregiver's Substance Use—The CAGE, a commonly used screening measure of problem alcohol use, was administered at age 4 to caregivers who reported having ever used alcoholic beverages (a caregiver who did not report such usage was coded as not abusing alcohol).[35] Any affirmative response was considered indicative of substance use by the parent when the child was age 4.

The Caregiver Substance Use measure, developed by LONGSCAN, was administered at ages 8, 12, and 14.[36] It asked a series of yes/no questions about caregiver's use of common legal (tobacco and alcohol) and illegal substances (marijuana, cocaine, hallucinogens, heroin, and stimulants). Any current use of illicit substances and/or current "daily" use of alcohol were coded as substance use present.

Caregiver's Depressive Symptoms—Caregiver's depressive symptoms were measured using two scales. The Center for Epidemiological Studies Depression Scale (CES-D),[37] which measures symptoms associated with depression in the past week, was administered to caregivers at child ages of 4, 6, 12, and 14. The CES-D has demonstrated good construct validity and reliability. A response score ≥ 16 on the CES-D is considered indicative of significant? depressive symptoms. The Brief Symptom Inventory, administered at child's age 8, measures a broader range of psychological symptoms in the last week including depression.[38,39] Scores were interpreted by comparison to age-appropriate norms.

Caregiver Treated Violently—The partner-to-partner Conflict Tactics Scale[40] was administered to the primary maternal caregiver at child age 6, 8, 12, and 14 to assess intimate partner violence between the caregiver and a partner that had occurred during the previous 3 months. The caregiver was coded as having been treated violently if she had been the victim of one or more of the following: kicking, biting, punching, hit with an object, being beaten up, threatened with a knife or gun or the victim of a knife or a gun.

Criminal Behavior by Household Member—The Child Life Events measure, developed by LONGSCAN[36] and administered to caregivers at ages 6, 8, 12, and 14, asks whether anyone in the child's household was jailed or imprisoned in the past year. Affirmative responses were coded as present for "criminal behavior in the household."

Construction of the Adversity Index: Analogous to the methods used in the CDC-Kaiser ACE studies, the 8 dichotomous scores on the indices of childhood abuse and household dysfunction were summed to produce an overall Adversity Index, with scores ranging from 0 to 8.[21] Separate scores were calculated for adversity during the first 6 years of life (assessed using data collected at ages 4 and 6), during the second six year of life (ages 8 to 12), and in the most recent two years (age 14), as well as overall adversity (occurring at any age).

Assessment of Youth Health at Age 14

Poor Health—The caregiver completed the Child Health Assessment and answered the question "In general, would you say that [child]'s health is excellent, good, fair, or poor. Ratings of poor or fair were coded as poor health and ratings of good and excellent as good health.

Illness Requiring Medical Attention—The Child Life Events report asked the caregiver whether the youth had had a serious illness in the past year.[41] If the caregiver answered yes, she was asked whether the youth had seen a doctor for the illness. If an illness required medical attention, the answer was coded as present. The answers were dichotomized as yes or no; a "don't know/refused response" was coded as "no".

Somatic Complaints—The caregiver completed the Child Behavior Checklist (CBCL), a commonly used measures of child behavior to assess youth somatic complaints.[42] The CBCL includes several items assessing common physical complaints of uncertain origin, including headaches, nausea, dizziness, tiredness, eye problems, aches, skin problems, stomach problems, vomiting, nightmares, and constipation.

Composite Health Outcomes—Children characterized by the caregiver as having *poor health, illness requiring a doctor* or *somatic complaints* were classified as having *any health problem*.

Statistical Analysis

The analyses were conducted using Statistical Package for the Social Sciences (SPSS, Version 15). Preliminary descriptive analyses were conducted for each of the control, predictor, and outcome variables. Missing data (less than 2% of cases) was eliminated in a casewise fashion. For each outcome variable, logistic regression was used to test the relationship of the Adversity Index score (categories 0, 1, 2, and ≥ 3 adversities) to the outcome, after entering the control variables (study site, child's gender, child's race, caregiver's marital status, and family income). Outcomes of interest included poor health, illness requiring a doctor, somatic complaints, and a composite indicator of poor health *(any poor health)*. Analysis first examined the number of different adversities that had ever

occurred, as a composite dichotomous variable, and then examined separately adversities occurring in first 6 years of life, in second 6 years of life, and within the previous two years (age 13 and 14 years). Finally, a multivariate model was created that included control variables, and, as predictors, the number of ACEs occurring in each of these three time periods.

RESULTS

Youth Health

More than one quarter of the youth (27.2%) had a health problem including reported *poor health, illness requiring a doctor*, or *somatic complaints* (Table 2).

Adverse Childhood Exposures

The prevalence, type, and timing of adverse exposures are shown in Table 3. The majority of the adolescents had been exposed to neglect and to caregiver depression (approximately 57% in each case), the most common adverse exposures. Only 8.7% of the children in the sample had never experienced any of the measured adversities during the first fourteen years of life. The majority had experienced three or more adversities din their life time.

Association of Adverse Childhood Experiences with Health

There was an apparent graded relationship between adverse exposures and *any heath problem*, as shown in Table 4. In addition, 2 and ≥3 adverse exposures showed odds ratios of 8.91 and 9.25 respectively with *somatic complaints*, while an increased number of adverse exposures trended towards a graded relationship with *illness requiring a doctor*.

Separating the effects of adverse exposures during the first 6 years of life, the second 6 years of life, and the most recent two years of life demonstrated some differential effects (Table 5). Greater adversities during the first 6 years of life were inconsistently associated with *illness requiring a doctor*, with *somatic complaints* and with *any health problem*. There was little effect of adversities in the second 6 years of life. Recent adversities, however, had quite strong effects on *poor child health, somatic complaints*, and *any health problem*. There was a strong graded relationship between the number of adversities and *any health problem.* The odds ratio increased for both *poor health* and *somatic complaints* when there were 2 and ≥3 adversities.

Discussion

More than 90% of this sample of young adolescents had experienced some adversity during their 14 years of life and more than a quarter had at least one health problem. Both overall exposure to adversity and concurrent exposure to adversity were associated with poor health. There was a significant relationships between exposure to adversities and any health problem and increasing exposures and somatic complaints and illness requiring a doctor.

This study shows some of the same apparent linear relationship between adversities and child outcomes that was demonstrated in the CDC-Kaiser ACE studies, although our study group was quite different from the CDC-Kaiser ACE group.[27,28,43-48] More than 90% of our high risk group had at least one adverse exposure, compared to only half of the CDC-Kaiser ACE study participants.

Recent advances in neuroscience have provided a framework that begins to explain how childhood adversity may cause these negative health outcomes.[49,50] Exposure to violence and other childhood stress has been associated with a number of neurobiological and

behavioral findings including smaller prefrontal cortex volume, impaired prefrontal cortex functioning, chronic activation of the hypothalamic-pituitary-adrenal axis, impaired responses to psychosocial stressors, and elevated inflammation levels.[51,52] Childhood exposure to violence has been linked to gene modifications.[53-55] Cumulative or chronic exposure to adverse childhood events may lead to allostatic overload, causing neurobiological responses to become pathogenic rather than protective.[51,56] Excessive, prolonged, or frequent activation of the body's stress-response system may result in *toxic stress* for the child impairing long term health.[49,50,56]

We found relatively strong effects of concurrent (age 13 – 14) adversities on *any health problem, somatic complaints*, and caregiver's report of *poor health*. This is consistent with previous research which found the strongest effects for most recent adversities.[16] In a study examining how maltreatment affects certain adolescent behaviors such as drug and alcohol use and delinquency, concurrent maltreatment of the adolescent was more significantly associated with adolescent behavior problems than maltreatment occurring earlier in childhood.[57] These findings suggest that recent ACEs have more negative consequences for the adolescent than has been previously appreciated. The effects of adolescent exposure to adversities are often overlooked or minimized, but can be significant.[58]

The health consequences of adversities occurring during child ages 7 – 12 were limited and this differed from the findings of our previous study of this sample. In that study of outcomes assessed at age 12, the sample's exposure to adversities in the second 6 years of their life was associated with any health problem, child reports of poor health, somatic complaints, and *illness requiring a doctor*.[16] The limited effect found in the current study supports our hypothesis that the most recent adversities more strongly predict negative health outcomes than do adversities occurring at any particular developmental period.

We did find some evidence of an emerging effect of very early (i.e., through age 6) adversity, which has also been seen in research examining psychosocial outcomes.[59] Other studies have demonstrated that the type of maltreatment or adversity experienced at particular developmental stages may play a role in determining particular outcomes.[57,60]

Limitations and Comparison with Other Research

There are several cautions to be considered in interpreting these results. Because we examined ACEs similar to those used in the CDC-Kaiser studies, exposures to other adversities or risks were not included that may have influenced the health outcomes. Also, because we used the CDC-Kaiser study as a model for our study, we did not examine the cumulative effects of adversities over time; rather we simply examined whether particular adversities had occurred either over particular time frames or over the whole course of the period examined. For that same reason, we used simple logistic regression modeling. Future research might use more sophisticated approaches to modeling that allow for a more nuanced capturing of the degree to which exposure to adversities changes over time. As well, future research should include a more detailed assessment of health outcomes, including the effects of earlier health problems as controls.

Because the study tools examining household dysfunction did not assess the whole time period since the previous caregiver-child interview, the ACE exposure may have been even greater than the identified exposure. Finally, our reference group for analyses was the relatively small number of youth who had no exposure to adversities as assessed, and this is a challenge to generalizability.

Conclusion

Childhood adversities including child maltreatment influence young adolescents' health, illness and somatic complaints, beginning in childhood and continuing into adolescence. These findings suggest that greater efforts to minimize or ameliorate childhood adversities, especially those occurring during adolescence, should enhance the health of adolescents and adults. Further research should focus on developing prevention programs that improve and enhance parenting as well as intervention programs to address common adversities.

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Abbreviations

ACE	Adverse childhood experience
CPS	Child protective services
LONGSCAN	LONGitudinal studies of Child Abuse and Neglect
CES-D	Center for Epidemiological Studies Depression Scale
CBCL	Child Behavior Checklist
OR	Odds ratio
CI	Confidence interval

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Table 1

Description of LONGSCAN Samples

Site (N)	Geographic Location	Risk Group	Comparison Group
East (197) EA	Urban	Either failure to thrive at <2 years of age or mother with prenatal drug use or HIV infected.	Same pediatric clinic, adequate growth, and no special risk factors.
South (173) SO	Urban, Suburban, and Rural	At-risk child reported to CPS by age 4.	Matched controls not reported to CPS.
Midwest (176) MW	Urban	Family reported to CPS and either 6 months of family intervention or usual CPS intervention.	Neighborhood controls
Northwest (183) NW	Urban & Rural	Children with substantiated report to CPS before age 5 years and judged to be at moderate risk.	Children with unsubstantiated report to CPS before age 5 years and judged to be at moderate risk.
Southwest (204) SW	Urban	Children removed from families and placed in foster care.	Children returned home by age 4 years.

Table 2
Description of Sample and Youth Health Outcomes (N =933)

Variable	N (%)
Gender	
Male	457 (49.0%)
Female	476 (51.0%)
Race	
White	232 (24.9%)
African American	528 (56.6%)
Other	173 (18.5%)
Site	
EA	197 (21.1%)
SO	173 (18.5%)
MW	176 (18.9%)
NW	183 (19.6%)
SW	204 (21.9%)
Marital Status (Age 14)	
Never married	317 (34.0%)
Married	354 (37.9%)
Formerly Married	258 (27.7%)
Unknown	4 (0.4%)
Family Income (Age 14)	
Below $20K	372 (39.9%)
$20K Above	521 (55.8%)
Unknown	40 (4.3%)
Health Outcomes (Age 14)	
Poor health	70 (7.5%)
Somatic complaints	86 (9.2%)
Illness	109 (11.7%)
Any reported health problem	254 (27.2%)

Table 3

Frequency of Adverse Childhood Exposures from the first 6 years of life through age 14.

ADVERSITY	Age			Ever
	0-6	6-12	13-14	
Physical Abuse	22.0%	16.0%	6.5%	33.4%
Sexual Abuse	9.9%	5.8%	1.9%	15.1%
Psychological Abuse	24.3%	13.8%	5.6%	33.3%
Neglect	50.5%	21.9%	6.1%	57.3%
Caregiver Substance Use	15.3%	13.2%	9.8%	31.9%
Caregiver Depression	41.9%	25.3%	24.9%	56.6%
Caregiver Treated Violently	5.8%	23.7%	16.5%	36.2%
Criminal Behavior in Home	20.9%	29.5%	12.9%	42.6%
TOTAL #				
0	20.5%	32.8%	50.2%	8.7%
1	26.4%	24.9%	28.2%	16.3%
2	22.6%	20.2%	13.4%	17.8%
3+	30.5%	22.2%	8.3%	57.2%

Table 4

Multivariate analysis number of ACEs (ever) and adjusted odds ratios of age 14 health outcomes (N=933).

Health outcome	Number Categories	Adjusted Odds Ratio	95% CI
Poor Health	0	1.00	
	1	1.85	0.50-6.92
	2	2.66	0.74-9.52
	3+	1.55	0.54-9.97
Illness Requiring Doctor	0	1.00	
	1	*3.12*	*0.87-11.30*
	2	*3.40*	*0.96-12.09*
	3+	**3.68**	**1.11-12.16**
Somatic Complaints	0	1.00	
	1	4.19	0.50-34.90
	2	**8.91**	**1.15-68.83**
	3+	**9.25**	**1.25-68.23**
Any Problem	0	1.00	
	1	**3.09**	**1.22-7.84**
	2	**3.61**	**1.44-9.02**
	3+	**3.91**	**1.65-9.26**

Note: Adjusted for child's gender, child's ethnicity, caregiver marital status and family income.

Boldface indicates significance at $p < .05$

ACEs, adverse childhood experiences

CI, confidence intervals

Table 5

Number of ACEs during age period and adjusted odds ratios of health outcomes; multivariate analyses (N=933).

Health outcome	#	Early (0-6)	Later (6-12)	Concurrent (13-14)
		OR (CI)	OR (CI)	OR (CI)
Poor Health	0	1.00	1.00	1.00
	1	1.31 (.060-2.87)	1.18 (0.58-2.40)	*1.87 (0.98-3.57)*
	2	0.94 (0.40-2.24)	0.92 (0.42-2.00)	**2.59 (1.16-5.79)**
	3+	0.83 (0.35-1.93)	0.83 (0.35-1.93)	**3.78 (1.59-8.97)**
Illness Req. Doctor	0	1.00	1.00	1.00
	1	1.64 (0.80-3.36)	1.12 (0.63-2.01)	1.24 (0.74-2.07)
	2	1.59 (0.75-3.34)	1.14 (0.62-2.10)	1.47 (0.77-2.78)
	3+	**2.21 (1.09-4.50)**	0.81 (0.42-1.59)	1.16 (0.52-2.61)
Somatic Complaints	0	1.00	1.00	1.00
	1	1.90 (0.81-4.47)	1.50 (0.74-3.02)	*1.67 (0.92-3.03)*
	2	1.29 (0.52-3.24)	1.46 (0.71-3.01)	**2.27 (1.13-4.59)**
	3+	*2.12 (0.90-5.00)*	1.08 (0.51-2.31)	**3.47 (1.61-7.50)**
Any Problem	0	1.00	1.00	1.00
	1	*1.66 (0.98-2.82)*	1.06 (0.67-1.67)	**1.71 (1.16-2.53)**
	2	1.57 (0.90-2.74)	1.08 (0.67-1.73)	**1.86 (1.12-3.07)**
	3+	**1.91 (1.12-3.28)**	0.82 (0.50-1.37)	**2.38 (1.32-4.31)**

Note: Adjusted for child's gender, child's ethnicity, caregiver marital status and family income. All adversities were entered simultaneously; thus, reported effects for adversities from one time frame include controls for adversities from the other time frames.

Boldface indicates significance at p > .05

ACEs, adverse childhood experiences

OR, odds ratio

CI, confidence intervals