Effect of Early Childhood Adversity on Child Health

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Objective: To examine the effect of child abuse and other household dysfunction on child health outcomes.

Design: Data from the Longitudinal Studies of Child Abuse and Neglect collected through interviews and questionnaires administered when target children were 4 years old and 6 years old.

Setting: Children in the South, East, Midwest, Northwest, and Southwest United States.

Participants: One thousand forty-one children at high risk for child abuse and neglect (3 cohorts derived primarily from among children recruited through social service mechanisms, 1 cohort recruited at birth from among high-risk infants, and 1 cohort recruited from a medical setting).

Main Outcome Measures: (1) Association of 7 adverse exposures (3 categories of child abuse [physical abuse, sexual abuse, and psychological maltreatment] and 4 categories of household dysfunction [caregiver problems drinking, caregiver depression, caregiver treated violently, and criminal behavior in the household]) derived from data collected when the child was 4 years old. (2) Indexes of child physical health at age 6 years (caregiver overall assessment of child health and reports of illness requiring medical attention).

Results: Two thirds of the sample had experienced at least 1 adverse exposure. One adverse exposure almost doubled the risk of overall poor health (odds ratio, 1.89; 95% confidence interval, 1.02-3.48), and 4 adverse exposures or more almost tripled the risk of illness requiring medical attention (odds ratio, 2.83; 95% confidence interval, 1.10-7.31).

Conclusion: Adverse environmental exposures, including child abuse and other household dysfunction, are associated with poor health even at an early age, although our data do not support a dose-response relationship.

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Childhood exposure to household dysfunction and abuse correlates with adverse health outcomes in adulthood. The Adverse Childhood Experiences (ACE) Study found a relationship between childhood exposure to abuse and household dysfunction and medical disorders in adulthood, including cancer, liver disease, skeletal fractures, chronic lung disease, and ischemic heart disease. In addition, the ACE Study investigators found relationships between early adverse life events and other health problems such as smoking, suicide, depression, obesity, illicit drug use, alcoholism, teen pregnancy, sexual risk behaviors, and sexually transmitted disease. These later analyses focused more attention on psychosocial outcomes rather than physical outcomes. The importance of childhood adversities to adult health outcomes has been corroborated by smaller investigations examining the long-term consequences of child abuse. A study of middle-class women in a gynecologic practice included an assessment of childhood abuse. Women who reported a history of abuse (approximately half the subjects) also reported more hospitalizations and more physical and psychological problems and rated their overall health as poorer than women who did not report a history of childhood abuse. In a study of undergraduate students in the United Kingdom, a history of childhood physical or sexual abuse was associated with more hospital admissions and surgical procedures. Others have simi-
larly linked childhood abuse to adult physical and emotional problems.19-21

Other investigations have examined the effects of childhood abuse on health in adolescents, typically focusing on health-related behavior or emotional health.22 A US national survey found that adolescent girls reporting both physical and sexual abuse were at risk for having depression symptoms, smoking tobacco, using illicit drugs, and drinking alcohol regularly.23 Several studies11,24,25 confirmed these findings and showed that abused adolescents are more likely to engage in risky behaviors, including running away and having unprotected sex that results in teen pregnancy.

The effect of household dysfunction or child abuse on the physical health of children has rarely been investigated. Most research (including past research involving the sample used for this study) has examined the behavioral and developmental consequences of childhood abuse.25-27 A recently published review of articles about childhood abuse exposure to intimate partner violence found no data that established a clear link between intimate partner violence exposure and child physical health.28

The primary strength of the ACE Study is that it included a comprehensive and sophisticated assessment of health outcomes through medical examinations and medical record reviews of the adult subjects. However, information regarding childhood experiences came only from recall, the value of which has come under question.29 In addition, many chronic diseases begin in childhood, suggesting that it would be useful to evaluate the more immediate effect of household dysfunction and child abuse on children's health.

We hypothesized that exposure to childhood abuse and other household dysfunction would result in poor health or illness even in early childhood and that these exposures would have a dose-response effect. Using the ACE Study as a model, we prospectively examined the same 7 categories of adverse childhood experiences (based on Child Protective Services [CPS] data and caregiver reports) and general health outcomes in a sample of 6-year-old children. We included demographic variables similar to those used in the ACE Study (child's sex and race/ethnicity, caregiver's marital status, and family income).

Table 1. Description of Sampling at 5 Consortium for LONGSCAN Sites

<table>
<thead>
<tr>
<th>Site</th>
<th>No. (% of Study Sample)</th>
<th>Sampling Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>East</td>
<td>203 (19.5)</td>
<td>Children at high risk for abuse (failure-to-thrive children, children at high risk for HIV infection, or low-income families)</td>
</tr>
<tr>
<td>Midwest</td>
<td>189 (18.2)</td>
<td>Family reported to CPS, with neighborhood control subjects</td>
</tr>
<tr>
<td>South</td>
<td>194 (18.6)</td>
<td>Children at high risk for abuse (young mothers, single parents, low birth weight, poverty, or reported to CPS for abuse or neglect), with matched control subjects</td>
</tr>
<tr>
<td>Southwest</td>
<td>230 (22.1)</td>
<td>Maltreated children placed in foster care</td>
</tr>
<tr>
<td>Northwest</td>
<td>225 (21.6)</td>
<td>Maltreated children identified by CPS</td>
</tr>
</tbody>
</table>

Abbreviations: CPS, Child Protective Services; HIV, human immunodeficiency virus; LONGSCAN, Longitudinal Studies of Child Abuse and Neglect.

METHODS

PARTICIPANTS AND STUDY DESIGN

The Consortium for Longitudinal Studies of Child Abuse and Neglect (LONGSCAN)30 is a consortium of 5 study sites that are investigating prospectively the antecedents and consequences of child maltreatment. The study sites, located in different regions of the United States (South, East, Midwest, Northwest, and Southwest), operate under common protocols. The present analysis uses pooled data. At each site, a sample of children who had been maltreated or who were at risk of maltreatment was recruited when children were 4 years old or younger. The samples were distinct and were meant to include children in several categories, including those at risk before any reports of child maltreatment, those reported but whose investigations were not yet complete, those reported and substantiated and left in their homes with or without intervention, and those placed in foster care. The sampling criteria used at each site are given in Table 1.

We collected data at the ages of 4 years and 6 years, using 2-hour interviews conducted face to face with primary female caregivers (mothers or foster mothers). For each child, we reviewed CPS records and coded for official reports of child maltreatment from birth through age 4 years. Of the 1354 caregivers who completed interviews at age 4 years or age 6 years, 1041 (76.9%) had complete data (ie, caregivers completed both interviews and CPS records were reviewed) and were included in the analyses. For 26.7% of the children, someone other than the biological mother was interviewed when the child was 6 years old; in most of these cases, the respondent was another relative (eg, grandmother or aunt), although some respondents were nonrelative foster parents. χ² Analyses revealed no significant demographic differences between those included and those excluded (P>.20 for all).

VARIABLES AND THEIR MEASUREMENT

The LONGSCAN consortium shared common interview procedures and measures across the 5 sites. Data were entered locally and were processed at the LONGSCAN coordinating center at the University of North Carolina at Chapel Hill. A random 10% of the interviews were reentered to verify data entry procedures and coding. Measures were selected, as far as possible, from among available standard instruments previously published in the child abuse literature, as discussed herein. Data periods varied by measure, but each instrument referred to contemporaneous exposures; some measures asked caregivers about events in the prior year or in the prior 6 months. Unless otherwise specified, we dichotomized each predictor and outcome variable to construct a risk profile.

DEMOGRAPHIC CONTROL VARIABLES

The caregiver interview at age 4 years recorded the child's sex, child's race/ethnicity (white, African American, or other), caregiver's marital status (married, never married, or formerly married), and family income. Family income was dichotomized into above the federal poverty level or at or below the federal pov-
property level, based on the total annual household income and the number of people dependent on that income.

CHILD ABUSE AND HOUSEHOLD DYSFUNCTION

We examined the pool of variables from the interviews at age 4 years to identify indicators of adverse childhood experiences. Mirroring the ACE Study, we studied 7 categories of abuse and household dysfunction, including 3 categories of child abuse and 4 categories of exposure to household dysfunction.

Child Abuse

Each site reviewed their local CPS records for alleged and substantiated reports of child abuse. Based on prior research suggesting that distinctions between allegations and substantiations are not useful, official reports of alleged child abuse were coded using a slightly modified version of the maltreatment classification scheme developed by Barnett et al. Three general indicators of child abuse were created, each dichotomized as present or not, based on the coding of the following records: (1) physical abuse (any blows or injury to the head, torso, buttocks, or limbs; and violent handling, choking, burning, shaking, or nondescript injury); (2) sexual abuse (any sexual exposure, exploitation, molestation, or penetration); and (3) psychological maltreatment (threats to psychological safety and security, lack of acceptance and threats to self-esteem, or failure to allow age-appropriate autonomy). Domestic violence exposure was not considered psychological maltreatment in the LONGSCAN version of the maltreatment classification scheme but was examined separately.

Household Dysfunction

The indicators of household dysfunction use the following 4 standardized measures:

Caregiver Problem Drinking. The CAGE ( acronym for cut down on drinking, annoyed by people criticizing, guilty about drinking, and eye-opener or drink first thing in the morning) questionnaire is a widely used alcoholism screening tool. It was administered if the caregiver responded that she had ever drunk alcoholic beverages. The following 4 questions comprising the CAGE alcoholism screening test were asked: Have you ever felt you ought to cut down on your drinking? Have you ever felt annoyed by people criticizing your drinking? Have you ever felt bad or guilty about your drinking? Have you ever drunk first thing in the morning to steady your nerves or get rid of a hangover? Problem drinking was coded as present if the caretaker endorsed more than 1 of the 4 items on the CAGE.

Caregiver Depression. Caregiver depressive symptoms were assessed using the Center for Epidemiological Studies Depression Scale (CES-D). The CES-D questionnaire includes 20 items about symptoms commonly associated with depression. Consistent with typical clinical cutoff points for the CES-D, marked depressive symptoms were coded as present if the CES-D scores exceeded 16. The CES-D is a reliable and valid measure of the number, types, and duration of depressive symptoms.

Caregiver Treated Violently. A widely used and validated measure (partner-to-partner Conflict Tactics Scales) was used to assess the type and level of domestic violence between the caregiver and a partner. Caregivers were asked how many times in the past 3 months a spouse or partner had engaged in violent behavior, including kicking, biting, choking, hitting with a fist or object, threatening with a knife or gun, or beating her up. The caregiver was coded as having been treated violently if she indicated that any of these behaviors was directed at her more than once or if her partner engaged in more than 1 type of specific violent behavior.

Criminal Behavior in the Household. The child life-events report assessed events in the child’s life during the past year. Criminal behavior was coded as present if the caregiver responded yes to the question “Was anyone in the family or household jailed or imprisoned?”

Development of the Adversity Index

The child abuse and household dysfunction variables were dichotomized into 7 indicators of adverse childhood experiences, yielding a score of 0 vs 1 (absent vs present) for each indicator. The 7 dichotomous scores on the indexes of child abuse and household dysfunction were summed to produce an overall adversity index, with scores ranging from 0 (best) to 7 (worse). This adversity index was based on the methods used in the ACE Study.

ASSESSMENT OF HEALTH AND SERIOUS ILLNESS

The caregiver’s overall assessment of the child’s health and serious illness in the past year at the interview at age 6 years was used to assess the outcome variables. Primary outcome variables were dichotomized. The following 2 variables were measured—child health and serious illness.

Child Health

The caregivers described the child’s health using a child health assessment form. Caregivers were asked “How would you describe [your child’s] health compared to other children his/her age? Would you say that his/her health is: excellent, good, fair, or poor?” Using the same approach as that used by Felitti et al to obtain global ratings of health, ratings of poor or fair overall health were coded as indicators of poor health, and ratings of good or excellent health were coded as indicators of good health. Extensive prior work has demonstrated the utility of the global health ratings in predicting hospitalization and mortality.

Serious Illness

Caregivers were also asked “Did [your child] have a serious illness in the past year?” If the response was yes, the caregiver was asked if the child saw a physician. An illness that received professional attention was coded as present if the caretaker selected this response on the child life-events report.

STATISTICAL ANALYSIS

The analyses were conducted using Statistical Package for the Social Sciences (SPSS 12.0.1; SPSS Inc, Chicago, Ill) software. Preliminary descriptive analyses were conducted for each of the control, predictor, and outcome variables. In addition, bivariate relationships between the control and predictor variables were examined. Similar to the ACE Study analyses, for each outcome variable, a binary logistic regression was applied to test the relationship of the adversity index score (0, 1, 2, 3, or ≥4) to the outcome, after entering the control variables (child’s sex, child’s race/ethnicity, caregiver’s martial status, and family income). Subsequently, the adversity index score was entered as a categorical predictor. This allowed for examination not only...
of the possibility of a simple linear relationship but also of the possibility that particular levels of adversity were especially harmful. The adjusted odds ratios and 95% confidence intervals reported for these logistic regression analyses represent the increased likelihood of the outcome of interest, compared with having experienced no adversities.

**ASSESSING THE POSSIBLE EFFECT OF EXCLUSIONS**

We examined whether the results were affected by excluding those with incomplete data on childhood exposure. We performed separate analyses that included those participants with missing data (n = 313), but we assumed that those with missing data on a given childhood exposure did not have that category of childhood exposure. In these reanalyses, there were no significant differences from the results reported herein. The direction and strength of the associations between the number of childhood exposures and the outcomes were almost identical (data not shown). Therefore, the results appear to be unaffected by the exclusion of those with missing data on childhood exposure.

**HUMAN SUBJECTS**

Each site followed informed consent procedures approved by their institutional or local human subjects review committee. The coordinating center data handling and analysis procedures were approved by the School of Medicine, University of North Carolina at Chapel Hill, committee for the protection of human subjects. The primary caregiver gave informed consent to participate. Caregivers were reimbursed for their time and effort.

**RESULTS**

**ADVERSE CHILDHOOD EXPOSURES**

The prevalence of adverse exposures at age 4 years is given in Table 2. Two thirds of the children had at least 1 adverse exposure. Caregiver depression was the most prevalent household dysfunction, present in about one third of the maternal caregivers. Twenty-five percent of the children had experienced psychological maltreatment, while 7.9% of caregivers had a history of domestic violence in the past 3 months (which represented the lowest prevalence among the 7 indicators of adverse childhood experience in our sample).

The prevalence of adverse exposures varied as a function of some demographic characteristics (Table 3). Children whose race/ethnicity was other than white or African American were less likely to have had no adverse exposures; African American children were less likely than other children to have had at least 3 adverse exposures ($\chi^2=45.62, P<.05$). Children whose mothers had previously been married were more likely than other children to have had at least 1 adversity ($\chi^2=21.20, P<.05$). Child sex and economic status were not associated with adverse exposures.

There were some significant site differences (Table 3). Almost half of the southern participants had no adverse exposures, while 92.4% of the northwest participants had 1 or more adverse exposures ($\chi^2=174.04, P<.05$). These differences were expected given the differences in the sampling frame: the southern sample consisted of children considered at high risk for abuse, while the northwest sample consisted of children who had been identified by CPS as maltreated (Table 1).

**RELATIONSHIP BETWEEN CHILDHOOD EXPOSURES AND HEALTH**

The relationship between adverse exposures and negative health outcomes is summarized in Table 4. The relationship between numbers of adverse exposures and adjusted odds ratios of health outcomes is summarized in Table 5. Two significant relationships emerged. The odds ratio for general health to be rated as poor was 1.89 (95% confidence interval, 1.02-3.48) when there was 1 vs 0 adverse childhood exposures, and the odds ratio was 2.83 (95% confidence interval, 1.10-7.31) that a child...
would have an illness that required medical attention when there were 4 or more adverse exposures. Several relationships between the number of adverse exposures and health approached significance, including 2 vs 0 adversities on overall health and 1 vs 0 adversities on illness requiring medical attention. Based on the overall pattern of odds ratios for poor health and illness, there was some support for the hypothesized relationship between the extent of exposure to adverse factors and negative health outcomes (ie, odds ratios tended to increase relative to 1 vs 0 to 4 vs 0 adversities).

Adverse childhood exposures seem to already begin to affect a child’s health early in childhood. Our results suggest a relationship between adverse childhood exposures and negative health indicators by age 6 years. In our sample, having 1 adverse exposure almost doubled the odds that these children would have overall poor health compared with children who had no early adverse exposures. Furthermore, the presence of 4 adverse exposures or more almost tripled the likelihood of childhood illness for exposed children compared with children who did not experience adversities.

The presence of a single adverse environmental exposure early in life affected children’s health. Very young children may be more susceptible to poor health or illness because of their almost complete dependence on the presence, attentiveness, and reasonable actions of their caregivers. Measurable household dysfunction, including child abuse, likely affects the ability of the caregiver to parent a child well. Parents’ inability to respond quickly and adequately to emerging health problems may lead to complications. In addition, stressed parents may be less able to carefully supervise young children, jeopardizing their safety. Some aspects of household dysfunction (eg, problem drinking) may have predated the birth of the child. The vulnerability of children in these families to early poor health speaks to the need for timely help for young families.

The baseline prevalence of adverse exposures in our sample deserves comment. Two thirds of the sample of 6-year-old children had at least 1 adverse environment-

### Table 4. Relationship Between Adverse Exposures and Negative Health Outcomes

<table>
<thead>
<tr>
<th>Variable, %</th>
<th>Poor Health</th>
<th>Illness Requiring Professional Care</th>
<th>Poor Health or Illness Requiring Professional Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall rate</td>
<td>7.2</td>
<td>6.7</td>
<td>12.1</td>
</tr>
<tr>
<td>Indicator of child abuse</td>
<td>4.2</td>
<td>8.0</td>
<td>10.6</td>
</tr>
<tr>
<td>Psychological maltreatment</td>
<td>5.0</td>
<td>9.6</td>
<td>12.5</td>
</tr>
<tr>
<td>Physical abuse</td>
<td>4.5</td>
<td>7.1</td>
<td>9.8</td>
</tr>
<tr>
<td>Sexual abuse</td>
<td>8.5</td>
<td>6.3</td>
<td>14.2</td>
</tr>
<tr>
<td>Caregiver problem drinking</td>
<td>11.9</td>
<td>10.4</td>
<td>19.0</td>
</tr>
<tr>
<td>Caregiver depression</td>
<td>4.9</td>
<td>6.1</td>
<td>11.0</td>
</tr>
<tr>
<td>Caregiver treated violently</td>
<td>4.3</td>
<td>6.4</td>
<td>12.1</td>
</tr>
</tbody>
</table>

### Table 5. Relationship Between Numbers of Adverse Exposures and Adjusted Odds Ratios (OR) of Negative Health Outcomes

<table>
<thead>
<tr>
<th>Health Outcome</th>
<th>No. of Adverse Exposures</th>
<th>Prevalence, %</th>
<th>Adjusted OR (95% Confidence Interval)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>5.5</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>9.9</td>
<td>1.89 (1.02-3.48)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8.5</td>
<td>1.84 (0.90-3.73)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4.5</td>
<td>0.96 (0.30-3.00)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4.5</td>
<td>1.38 (0.38-5.10)</td>
<td></td>
</tr>
<tr>
<td>Illness requiring professional care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>4.7</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>7.9</td>
<td>1.72 (0.88-3.35)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6.6</td>
<td>1.36 (0.62-2.96)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>6.3</td>
<td>1.20 (0.45-3.20)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>13.6</td>
<td>2.83 (1.10-7.31)</td>
<td></td>
</tr>
<tr>
<td>Poor health or illness requiring professional care</td>
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<td></td>
</tr>
<tr>
<td>0</td>
<td>9.0</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>14.9</td>
<td>1.79 (1.09-2.95)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>13.1</td>
<td>1.64 (0.92-2.90)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10.7</td>
<td>1.33 (0.62-2.88)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15.2</td>
<td>2.31 (1.01-5.28)</td>
<td></td>
</tr>
</tbody>
</table>

*Adjusted for site, child’s sex, child’s race/ethnicity, caregiver’s marital status, and family income.
tual exposure, and almost one third of families had evidence of caregiver depression. This is not surprising, given the LONGSCAN consortium’s selection criteria; children in the study had been maltreated or were considered at risk for child abuse.

This high prevalence of exposures may help explain why our study did not find a dose-response relationship between the number of adverse exposures and overall child health. Although the presence of 1 adversity and of 4 or more adversities was associated with poor child health, this effect did not hold in cases in which there were 2 or 3 adverse exposures.

There are other possible explanations why we did not find a significant relationship between different levels of adversity compared with no adversity. Our subjects were only 6 years old when we assessed their health. Larger or dose-related effects may become clearer over time. Our global measurement of health outcomes may not have been sensitive enough to detect important differences. The effect of adverse exposures at this early age may manifest as psychosocial problems rather than physical health problems, or the model of adverse exposures may not be the most useful construct in younger age groups. It is also possible that children in our sample with more adversities were more likely to receive interventions to ameliorate the effects of these adversities. A high number of adversities (ie, ≥4) may have negated the helpful effects of the intervention.

Some of these children may have had congenital disorders or other medical conditions that predisposed them to poor health and illness. Certain disabilities, chronic health problems, and prematurity increase the risk that a child will be maltreated. Although we might postulate that these health problems would be evenly distributed among families with and without adverse exposures, we have no information that supports that hypothesis.

Only 7.9% of the caregivers described domestic violence as occurring in the prior 3 months. Although this number may appear somewhat low, most caregivers had no partner at the time of the interview, resulting in a lack of opportunity for domestic violence to occur during that 3-month period. Other adversities were assessed during a longer period (ie, during the past year), and the use of different measurement periods constitutes a weakness of our data.

A strength of our study is that we prospectively documented the presence of the adverse exposures. This may explain some of the differences between the ACE Study findings and our results. The ACE Study subjects may not have accurately recalled early childhood experiences, and those with later problems may have been more inclined to recall childhood adversity. Our prospective design minimizes such recall bias. On the other hand, we relied on the parent or full-time caregiver for information about the child’s health, whereas the health of ACE Study participants was ascertained from medical records or self-reports. Negligent or abusive caregivers may not accurately assess their children’s health or seek medical care for illnesses needing medical treatment. Our dependence on the caregiver’s assessment of the child’s health and health care may not clearly reflect childhood health status. This population of caregivers may deny that children living in their homes experience adverse effects of their behaviors, or they may have less capacity to empathize with the children and to assess child health. Illness data may more accurately depict child health status than caregiver assessment in these households. We were unable to review medical records or conduct independent assessments of the health of the children in this study. Using caregivers’ assessments of child health is supported by studies showing that adults fairly accurately rate their health, although the use of such ratings in dysfunctional households may require further examination.

**CONCLUSIONS**

Findings from this study suggest that a relationship between adverse childhood experiences and negative health indicators begins early in childhood. Because the effect on the child’s health becomes evident early in childhood, physicians may have a window of opportunity to intervene and prevent the long-term medical complications described in the ACE Study. We speculate that, as children age, the negative health effects of these adverse childhood experiences and child maltreatment will increase. These negative childhood exposures may play a role in the development or exacerbation of certain childhood diseases such as asthma, diabetes mellitus, and obesity. Family, environment, and community intervention may have a mediating effect on these adverse childhood experiences. Further research is needed to examine a link between adverse childhood experiences and specific childhood illnesses, to understand the mechanisms underlying such a link, and to identify interventions that mediate or ameliorate negative health consequences.

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