

## Mothers' Adverse Childhood Experiences and Their Young Children's Development



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**Introduction:** This study examined how mothers' Adverse Childhood Experiences (ACEs) relate to their children's developmental risk and assessed how the association is mediated through mothers' depressive symptoms and fair/poor health.

**Methods:** Mothers of children aged between 4 months and 4 years were recruited from the emergency department of a children's hospital between March 2012 and June 2015 and interviewed about ACEs, mothers' depressive symptoms and health status, and children's developmental risk (screened via Parents' Evaluations of Developmental Status [PEDS]). Between August and November 2016 a Cochran–Armitage test assessed trend of PEDS by ACEs. Multinomial regression models examined differences in PEDS by ACEs severity. Mediation by mothers' depressive symptoms and self-rated health was also assessed.

**Results:** Of 1,293 mothers, 56.7% reported one or more ACEs. Mothers also reported developmental risk (20.4% overall): 120 (9.2%) reported one concern and 144 (11.2%) reported two or more concerns on the PEDS. Mothers who reported household substance use, mental illness, or an incarcerated household member during childhood were more likely to report at least one child developmental concern on the PEDS. After controlling for covariates, odds of one PEDS concern were 1.86 (95% CI=1.16, 3.00) for ACEs, one to three versus none, and 2.21 (95% CI=1.26, 3.87) for ACEs four or more versus none. Adjusted odds of two or more concerns were 1.70 (95% CI=1.07, 2.72) for ACEs, one to three versus none, and 1.76 (95% CI=1.02, 3.05) for ACEs, four or more versus none. Mothers' depressive symptoms and self-rated health were potential mediators.

**Conclusions:** Mothers' ACEs are significantly associated with their children's developmental risk. If replicated, findings suggest that addressing intergenerational trauma through focus on childhood adversity among young children's caregivers may promote child development.

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### INTRODUCTION

Adverse childhood experiences (ACEs), including exposure to physical, sexual, and emotional abuse, physical and emotional neglect, and household stressors, such as witnessing a mother/step-mother being abused or having an incarcerated parent, are traumatic events linked to lifelong negative adult physical and mental health outcomes<sup>1–6</sup> including chronic diseases,<sup>7,8</sup> adult depression,<sup>9,10</sup> and risk for attempted suicide.<sup>11</sup> Outcomes occur through multiple routes, including epigenetic pathways whereby traumatic events can modify gene expression in the prefrontal

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0749-3797/\$36.00

<https://doi.org/10.1016/j.amepre.2017.07.015>

cortex,<sup>12</sup> cause inflammation,<sup>8</sup> and trigger allostatic responses to stress that alter the nervous, endocrine, and immune systems<sup>13</sup> in ways that may disrupt parenting and economic success.<sup>14–16</sup>

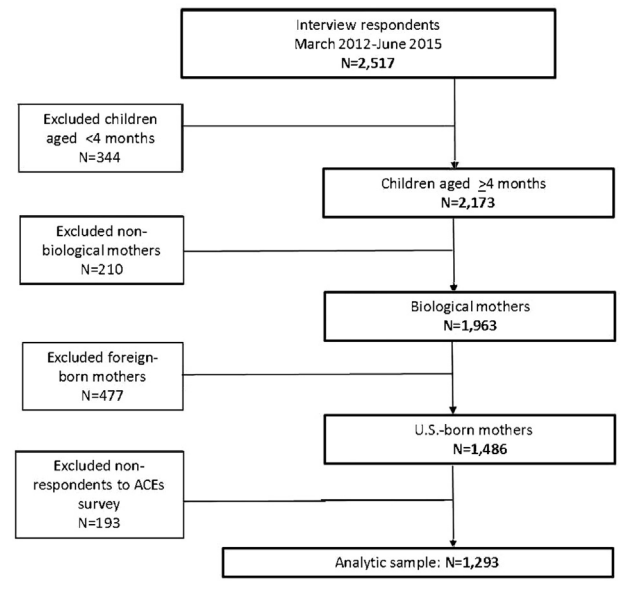
Mothers' ACEs are associated with maternal mental and physical health problems.<sup>17–19</sup> Research has demonstrated that adversity may transfer from one generation to the next in the form of abuse/neglect, housing risk, and poor socioemotional health.<sup>16,20,21</sup> Additionally, mothers' history of adversity is associated with depressive symptoms before and after giving birth, and with their infants' maladaptive socioemotional symptoms.<sup>22</sup> However, the mechanisms underlying these patterns are not clear, particularly because there may be reciprocal effects in two-generation relationships, with mothers' reacting to their infants' maladaptive symptoms.<sup>23,24</sup> Overall, the relationship between mothers' adverse childhood experiences and their children's developmental risk demands further investigation.

The objective of this study is to examine associations between mothers' reports of ACEs and their children's developmental risk as identified via a validated maternal-reported screening instrument. Two hypotheses are tested: (1) a higher number of mothers' ACEs is associated with increased odds of children's developmental risk, and (2) the association between mothers' ACEs and children's developmental risk is mediated by mothers' reported depressive symptoms and fair/poor health. Because the association between maternal ACEs and children's Parents' Evaluations of Developmental Status (PEDS) score has not been examined previously, sentinel sampling—where predictors and outcomes are more prevalent than in the general population<sup>25</sup>—provides a preliminary framework to identify possible relationships that may be replicated in nationally representative samples.

## METHODS

### Study Population

This study used a sentinel cross-sectional sample of families seeking services in the Emergency Department of a large children's hospital in Philadelphia that serves > 50,000 children a year, 86% of whom receive Medicaid and live in high poverty areas. Caregivers of children aged < 4 years not in critical condition were approached (March 2012 to June 2015) by interviewers while families were waiting to be seen by a healthcare professional. Eligibility included English and Spanish speakers, state residency, and knowledge of the child's household. After securing verbal consent, interviewers asked participants about the household, caregiver, and their youngest child, using a computer-based survey. The first phase included questions about demographics, caregiver's depressive symptoms, and caregiver reported concerns of child developmental risk as determined by screening using the



**Figure 1.** Description of analytic sample selection.

PEDS. Following additional consent at the second phase, interviewers asked caregivers to respond to questions related to their childhoods (ACEs) using a paper-based survey. This analysis was limited to respondents who (1) had children aged > 4 months, the earliest age at which the PEDS is consistently sensitive and valid (excluded 344); (2) were the child's biological mother, to reduce variability in knowledge of the child's development (excluded 210); (3) were U.S.-born, to reduce unmeasured variability in mothers' potential exposure to negative life events related to home country or immigration (excluded 477); and (4) responded to the ACEs survey (excluded 193), leaving a final sample of 1,293 participants (Figure 1). This study was approved by the Drexel University IRB.

### Measures

Descriptions of data collection procedures have been published previously<sup>16,26,27</sup> and are summarized here. The survey contains questions about caregiver's demographic characteristics and household public assistance participation. Caregiver and child health were rated by the caregiver with standard questions from National Health And Nutrition Examination Survey.<sup>28</sup> Household food security status was evaluated and categorized using the 18-question Household Food Security Survey Module.<sup>29</sup>

Depressive symptoms were assessed using a three-item validated screening tool that asks about feeling depressed, sad, or blue in the last week,  $\geq 2$  weeks in previous year, and  $\geq 2$  years in one's lifetime. Depressive symptoms were indicated by an affirmative response to at least two questions. This screener has 100% sensitivity, 88% specificity, and 66% positive predictive value of presence of depression when compared with the Rand Screening tool for depressive/dysthymic disorders.<sup>30</sup>

Children's developmental risk was assessed with PEDS, a validated ten question parent-reported screening instrument of children's development.<sup>31,32</sup> PEDS sensitivity and specificity are better for children aged  $\geq 4$  months than for newborns; therefore, the sample was restricted to children aged  $\geq 4$  months to 4 years.<sup>33,34</sup> Parents reported any concerns (*no*, *yes*, or *a little*) in response to questions about the child's development in expressive

and receptive language, fine and gross motor skills, behavior, social/emotional behavior, self-help, and school. In addition, parents responded to two open-ended questions about concerns in the global/cognitive area and “other.” In standard scoring of the PEDS,<sup>31,32</sup> endorsed items (yes or a little) are classified as clinically important, depending on the child’s age. Children with two or more concerns are considered at high risk for developmental disabilities verified by clinical assessment. More than 50% of children identified through this mechanism may have undetected disabilities, and many of the rest may score below average in school or demonstrate psychosocial behavioral actions, or both. Children with one or more significant concerns require additional screening, monitoring, and intervention and are considered at moderate risk for developmental disabilities. Parents of preschoolers who report one or more parental concerns have 68% sensitivity and 66% specificity of accurately predicting their child’s risk for physical and social emotional problems as assessed by an external observer through clinical assessment.<sup>33</sup> Children with one or more parental concerns in the behavior and social skills domain are at 8.5-fold increased risk of being diagnosed with mental health problems by external clinical assessment, and children with two or more concerns are 20 times as likely to be diagnosed with a disability by clinical assessment than are children with no parental concerns.<sup>32,34</sup>

Mothers’ childhood experiences were determined by their responses to the Adverse Childhood Experiences Scale (ACEs Scale).<sup>35</sup> ACEs Scale is a retrospective ten question survey that inquires about experiences before age 18 years, including physical, emotional, and sexual abuse; physical and emotional neglect; and household challenges including parental separation or divorce, exposure to domestic violence and substance abuse, mental health conditions, and incarceration of a household member.<sup>35,36</sup> A cumulative score was calculated for each participant based on the number of affirmative responses, each corresponding to one point; the score was categorized into zero, one to three, and four or more ACEs.<sup>11,37</sup> Although the ACEs Scale can be analyzed in multiple ways, multiple forms of adversity are interrelated and summary scores are typically used.<sup>36,38,39</sup>

### Statistical Analysis

Data analyses were carried out between August and November 2016. Demographic and health characteristics were compared across PEDS concerns using chi-square tests for categorical variables and Wilcoxon–Mann–Whitney tests for continuous variables. The Cochran–Armitage test for trend was used to assess the number of ACEs among PEDS categories (zero, one, two or more concerns). A multinomial regression model was applied using PEDS outcomes. Backward selection with an  $\alpha$  value of 0.10 to stay in the model and forward selection with a  $\beta$  value of 0.90 to enter the model were used to identify variables for final multivariable models. Selected variables were confirmed by assessing change of magnitude of association of ACEs on PEDS in final models. All adjusted models were tested by Goodness-of-fit statistics and did not result in a significant lack of fit. The Baron–Kenny mediation framework<sup>40</sup> and the Sobel test<sup>41</sup> were applied to assess whether mothers’ depressive symptoms or mothers’ physical health mediated the association between ACEs and PEDS. SAS, version 9.3 was used, with significance set at  $p < 0.05$ .

## RESULTS

Among 1,293 participants (Table 1), 1,029 (79.6%) mothers reported no significant PEDS concerns, 120 (9.2%) mothers reported one PEDS concern, and 144 (11.2%) mothers reported two or more PEDS concerns. Five hundred and sixty mothers (43.3%) reported no ACEs, 488 (37.7%) reported one to three ACEs, and 245 (19%) reported four or more ACEs; 331 (25.6%) reported depressive symptoms; and 361 (28%) reported their own health to be fair/poor. Median maternal age was 25 years (interquartile range, 22–29); mothers reporting two or more PEDS concerns were slightly older (median=26 years, interquartile range, 23–32). Children’s median age was 21.1 months (interquartile range, 11.9–32.8 months). Compared with children with one or zero concerns, children with two or more PEDS concerns were older (median=31.5 months, interquartile range, 18.1–40.3) and were more likely to live in a household where at least one member received Supplemental Security Income ( $p < 0.01$ ). Mothers reporting depressive symptoms or fair/poor physical health were more likely to report child developmental concerns on the PEDS ( $p < 0.01$  for both). There were no significant differences in public assistance participation in relation to PEDS, aside from Supplemental Security Income reported above.

Participants who reported one or more ACEs were more likely to report one child developmental risk concern on the PEDS ( $p_{\text{trend}} < 0.01$ ). Of the ten ACE categories, seven were individually associated with significant differences among PEDS categories (zero, one concern, two or more concerns). As shown in Table 2, mothers who reported emotional abuse, physical abuse, or sexual abuse in their own childhood were more likely to report one or more significant PEDS concern. More than 30% of mothers who reported emotional neglect also reported at least one PEDS concern. Mothers who reported growing up in a household with members experiencing substance abuse ( $p < 0.01$ ), mental illness ( $p < 0.04$ ), or incarceration were more likely to report one or more PEDS concern ( $p < 0.01$ ), compared with mothers who reported none of these experiences.

Results of associations between ACEs and PEDS are shown in Table 3. In multivariate regression analysis, backward and forward selection returned the following set of variables: child’s age, mothers’ age, mothers’ marital status, household receipt of Supplemental Security Income, living in subsidized housing, mothers’ ACEs, mothers’ depressive symptoms, and mothers’ physical health. Because mothers’ depressive symptoms and physical health could be potential mediators in the relationship between ACEs and PEDS, these two variables were not included in the final models. After

**Table 1.** Sample Characteristics Stratified by Parent's Evaluation of Developmental Status (PEDS)

Variable	Total (N=1,293)	PEDS			p-value <sup>a</sup>
		No concerns (n=1,029; 79.6%)	1 concern (n=120; 9.2%)	≥ 2 concerns (n=144; 11.2%)	
Child's characteristics					
Child age (months), Median age (25th–75th percentile)	21.1 (11.9–32.8)	19.6 (11.0–31.3)	22.6 (15.1–34.3)	31.5 (18.1–40.3)	< 0.01 <sup>*,b</sup>
Health insurance					
Public insurance	1,208 (93.6)	962 (93.6)	113 (95.0)	133 (93.0)	0.50 <sup>c</sup>
No insurance	20 (1.6)	16 (1.6)	3 (2.5)	1 (0.7)	
Private insurance	62 (4.8)	50 (4.9)	3 (2.5)	9 (6.3)	
Mother's characteristics					
Child's biological mother's age, Median age (25th–75th percentile)	25 (22–29)	25 (22–29)	24 (22–27.5)	26 (23–32)	< 0.01 <sup>***,b</sup>
Race/ethnicity					
Hispanic	498 (38.8)	383 (37.6)	50 (41.7)	65 (45.1)	0.11
Black, not Hispanic	576 (44.9)	475 (46.6)	43 (35.8)	58 (40.3)	
White, not Hispanic	174 (13.6)	137 (13.4)	21 (17.5)	16 (11.1)	
Other	36 (2.8)	25 (2.5)	6 (5.0)	5 (3.5)	
Marital status					
Single	783 (60.6)	628 (61.0)	72 (60.0)	83 (57.6)	0.12
Married or partnered	283 (21.9)	214 (20.8)	35 (29.2)	34 (23.6)	
Separated/divorced/widowed	227 (17.6)	187 (18.2)	13 (10.8)	27 (18.8)	
Education					
Some high school or less	263 (20.3)	209 (20.3)	27 (22.5)	27 (18.8)	0.96
High school graduate	540 (41.8)	430 (41.8)	48 (40.0)	62 (43.1)	
Tech school/college/masters	490 (37.9)	390 (37.9)	45 (37.5)	55 (38.2)	
Employment status					
Currently employed	585 (46.1)	478 (47.2)	48 (41.4)	59 (41.8)	0.27
Currently unemployed	684 (53.9)	534 (52.8)	68 (58.6)	82 (58.2)	
Health status					
Excellent or good	929 (72.0)	767 (74.8)	69 (57.5)	93 (64.6)	< 0.01 <sup>**</sup>
Fair or poor	361 (28.0)	259 (25.2)	51 (42.5)	51 (35.4)	
Depressive symptoms					
Yes	331 (25.6)	238 (23.2)	47 (39.2)	46 (31.9)	< 0.01 <sup>**</sup>
No	961 (74.4)	790 (76.9)	73 (60.8)	98 (68.1)	
Adverse childhood experiences					
0 ACEs	560 (43.3)	476 (46.3)	37 (30.8)	47 (32.6)	< 0.01 <sup>***,d</sup>
1–3 ACEs	488 (37.7)	372 (36.2)	53 (44.2)	63 (43.8)	
≥ 4 ACEs	245 (19.0)	181 (17.6)	30 (25.0)	34 (23.6)	
Household characteristics					
Household food security status					
Food secure	1,042 (80.7)	836 (81.4)	93 (77.5)	113 (78.5)	0.53
Low food secure	161 (12.5)	127 (12.4)	15 (12.5)	19 (13.2)	
Very low food secure	88 (6.8)	64 (6.2)	12 (10.0)	12 (8.3)	
Currently receive TANF					
Yes	464 (36.0)	360 (35.1)	48 (40.0)	56 (38.9)	0.42
No	826 (64.0)	666 (64.9)	72 (60.0)	88 (61.1)	
Currently receive SNAP					
Yes	989 (76.9)	784 (76.6)	97 (80.8)	108 (75.0)	0.50
No	298 (23.2)	239 (23.4)	23 (19.2)	36 (25.0)	

(continued on next page)

**Table 1.** Sample Characteristics Stratified by Parent's Evaluation of Developmental Status (PEDS) (continued)

Variable	Total (N=1,293)	PEDS			p-value <sup>a</sup>
		No concerns (n=1,029; 79.6%)	1 concern (n=120; 9.2%)	≥ 2 concerns (n=144; 11.2%)	
Currently receive WIC					0.69
Yes	904 (70.1)	723 (70.5)	80 (66.7)	101 (70.1)	
No	386 (29.9)	303 (29.5)	40 (33.3)	43 (29.9)	
Current subsidized housing					0.10
Yes	133 (12.0)	114 (12.8)	6 (5.7)	13 (11.0)	
No	980 (88.1)	776 (87.2)	99 (94.3)	105 (89.0)	
Current energy assistance					0.06
Yes	492 (45.1)	375 (43.4)	49 (48.5)	68 (54.0)	
No	599 (54.9)	489 (56.6)	52 (51.5)	58 (46.0)	
Any household member receiving SSI					< 0.01**
Yes	209 (16.2)	138 (13.4)	16 (13.3)	55 (38.2)	
No	1082 (83.8)	889 (86.6)	104 (86.7)	89 (61.8)	

Note: Boldface indicates statistical significance (\* $p < 0.05$ ; \*\* $p < 0.01$ ). Data are shown as  $n$  (%) unless otherwise noted.

<sup>a</sup>Chi-square, unless otherwise noted.

<sup>b</sup>Wilcoxon-Mann-Whitney test.

<sup>c</sup>Fisher's Exact test.

<sup>d</sup>Cochran-Armitage test for trend.

ACEs, adverse childhood experience; SNAP, Supplemental Nutrition Assistance Program; SSI, Supplemental Security Income; TANF, Temporary Assistance for Needy Families; WIC, Women Infants and Children Supplemental Nutrition Assistance Program.

adjustment for covariates, participants who reported one to three ACEs were 1.86 (95% CI=1.16, 3.00) times as likely to report one concern for their child, and 1.70 (95% CI=1.07, 2.72) times as likely to report at least two concerns for their child compared with mothers who did not report any ACEs. Mothers reporting four or more ACEs were 2.21 times (95% CI=1.26, 3.87) as likely to report one concern, and 1.76 (95% CI=1.02, 3.05) times as likely to report two or more PEDS concerns, compared with mothers who did not report any ACEs.

The authors conducted analyses that examined the role of mothers' depressive symptoms and physical health as separate mediators between ACEs and PEDS using the Baron-Kenny mediation framework. As shown in Figure 2, the effect of four or more ACEs on PEDS was statistically significant before adjusting for mothers' depressive symptoms (in Step 1). After adjustment for mothers' depressive symptoms (in Step 4), results were no longer statistically significant. The magnitude of the association of one to three ACEs with one PEDS concern decreased when comparing the model before and after adjusting for depressive symptoms, indicating that mothers' depressive symptoms are a potential mediator in the association between ACEs and PEDS. In contrast, the magnitude of the effects between ACEs and PEDS

declined after adjusting for mothers' physical health as a mediator. The relationship remained significant for one to three ACEs and one PEDS concern and two or more PEDS concerns, as well as for four or more ACEs and one PEDS concern, suggesting that mothers' physical health may be a partial mediator. The mediation effect of depression and maternal health is seen especially in one PEDS concern versus no PEDS concern.

The Sobel-Goodman Test for mediation was used to further test mediation (Appendix Table 1, available online). When using mothers' depressive symptoms as a mediator, the  $p$ -value for mediation effect was <0.0010, and 68.9% of effect for ACEs on PEDS were potentially mediated by mothers' depressive symptoms. When using mother's health as a mediator, the  $p$ -value for mediation effect was 0.0032, and 24.1% of the effect of ACEs on PEDS was potentially mediated by mothers' physical health. These two potential mediators were not entered into the final estimation models because controlling for the mediator in a causal pathway would bias estimation of the effect toward the null.<sup>42,43</sup> Because of the temporal limitations in the cross-sectional data, the potential overlap between depressive symptoms and self-rated health was not investigated, nor were G-computation methods used to assess causal mediation analysis.

**Table 2.** Parent's Evaluation of Developmental Status (PEDS) and Mothers' Adverse Childhood Experiences (ACEs)

Category of adverse childhood experience	Total (N=1,293)	PEDS			p-value <sup>a</sup>
		No concerns (n=1,028; 79.6%)	1 concern (n=119; 9.2%)	≥2 concerns (n=144; 11.2%)	
<b>Abuse</b>					
Emotional. Did a parent or other adult in the household often or very often swear at you, insult you, put you down, or humiliate you? Or act in a way that made you afraid that you might be physically hurt?	201 (15.6)	142 (13.8)	33 (27.7)	26 (18.1)	< <b>0.01**</b>
Physical. Did a parent or other adult in the household often or very often push, grab, slap, or throw something at you? Or ever hit you so hard that you had marks or were injured?	157 (12.2)	105 (10.2)	28 (23.3)	24 (16.8)	< <b>0.01**</b>
Sexual. Did an adult or person at least 5 years older than you ever touch or fondle you or have you touch their body in a sexual way? Or attempt or actually have oral, anal, or vaginal intercourse with you?	155 (12.0)	114 (11.1)	24 (20.0)	17 (11.8)	<b>0.02*</b>
<b>Neglect</b>					
Emotional. Did you often or very often feel that...no one in your family loved you or thought you were important or special? Or your family didn't look out for each other, feel close to each other, or support each other?	326 (25.3)	238 (23.2)	43 (36.1)	45 (31.7)	< <b>0.01**</b>
Physical. Did you often or very often feel that...you didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? Or your parents were too drunk or high to take care of you or take you to the doctor if you needed it?	106 (8.2)	76 (7.4)	13 (10.8)	17 (11.9)	0.31
<b>Household challenges</b>					
Parental separation. Was a biological parent ever lost to you through divorce, abandonment, or other reason?	377 (29.4)	289 (28.3)	35 (29.2)	53 (37.9)	0.07
Domestic violence. Was your mother or stepmother often or very often pushed, grabbed, slapped, or had something thrown at her? Or sometimes, often or very often kicked, bitten, hit with a fist, or hit with something hard? Or ever repeatedly hit for at least a few minutes or threatened with a gun or a knife?	155 (12.2)	115 (11.3)	18 (15.1)	22 (15.8)	0.45
Substance use. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?	266 (20.8)	191 (18.8)	30 (25.0)	45 (32.1)	< <b>0.01**</b>
Household mental illness. Was a household member depressed or mentally ill, or did a household member attempt suicide?	197 (15.5)	150 (14.8)	30 (25.0)	17 (12.2)	<b>0.04*</b>
Household incarceration. Did a household member go to prison?	292 (22.9)	211 (20.8)	44 (36.7)	37 (26.2)	< <b>0.01**</b>

Note: Boldface indicates statistical significance (\* $p < 0.05$ ; \*\* $p < 0.01$ )

<sup>a</sup>p-value chi-square.

## DISCUSSION

These findings build on research showing that childhood adversities increase risk for adult chronic disease, poor behavioral health, and economic insecurity,<sup>44</sup> by demonstrating that mothers' exposure to ACEs increases likelihood of their report of their children's developmental risk as measured by a validated screening instrument. These findings are also consistent with recent evidence

that ACEs are associated with perinatal depression, and socioemotional problems for infants <6 months.<sup>14,22</sup>

In analyses investigating each ACE separately, results show that mothers who experienced parental incarceration, substance use, or household mental illness were more likely to have a child with at least one developmental risk factor, compared with mothers with zero ACEs. Consistent with theories of risk accumulation, ACEs were categorized based on the number of

**Table 3.** Associations Between Adverse Childhood Experiences (ACEs) and Parent’s Evaluation of Developmental Status (PEDS)

ACEs	Unadjusted		Adjusted <sup>a</sup>	
	1 PEDS concern, OR (95% CI)	2 or more PEDS concerns, OR (95% CI)	1 PEDS concern, OR (95% CI)	2 or more PEDS concerns, OR (95% CI)
0 ACEs	(ref)	(ref)	(ref)	(ref)
1-3 ACEs	<b>1.83 (1.18-2.85)</b>	<b>1.72 (1.15-2.56)</b>	<b>1.86 (1.16-3.00)</b>	<b>1.70 (1.07-2.72)</b>
≥ 4 ACEs	<b>2.13 (1.28-3.56)</b>	<b>1.90 (1.19-3.05)</b>	<b>2.21 (1.26-3.87)</b>	<b>1.76 (1.02-3.05)</b>

Note: Boldface indicates statistical significance ( $p < 0.05$ ).

<sup>a</sup>Model adjusted for children’s age, mothers’ age, mothers’ marital status, SSI, subsidized housing. Models were tested in multinomial logistic regression models, where 1 PEDS concern and 2 or more PEDS concerns are tested in the same model and compared to those who with no PEDS concern.

SSI, Supplemental Security Income.

experiences reported. This analysis found that both individual ACEs and the cumulative number of ACEs are associated with developmental risk in the next generation. A higher number of PEDS concerns is associated with increased risk for delayed school readiness and greater risk for disability,<sup>32,34</sup> illustrating a potential intergenerational extension of the association between a mother’s ACEs and her children’s risk for developmental problems. Associations between children’s developmental risk and their mothers’ previous exposure to adverse childhood experiences is plausible because children’s developmental risk is associated with

caregivers’ current mental and physical health status through multiple social and biological pathways including epigenetic changes related to early adversity.<sup>14,45,46</sup>

This study’s strength is in identifying associations between mothers’ childhood exposure to adversity and their children’s developmental risk, demonstrating that the correlates of early adversity are apparent not only in mothers’ lifetime health, but also among their children. Other strengths include the study’s recruitment from a children’s hospital emergency department, in a high-poverty area, constituting a sentinel sample.

Step	Diagram	Description <sup>a</sup>	ACE Score	Mediator	OR PEDS, 1 concern	OR PEDS, ≥2 concerns
1		Effect of ACEs on PEDS Model unadjusted for mediators	1-3 vs 0		<b>1.86 (1.16-3.00)</b>	<b>1.70 (1.07-2.72)</b>
			≥4 vs 0		<b>2.21 (1.26-3.87)</b>	<b>1.76 (1.02-3.05)</b>
<b>Mothers’ depressive symptoms mediate the association between ACEs and PEDS</b>						
2		Effect of ACEs on depressive symptoms (potential mediator)	1-3 vs 0	OR: <b>2.71 (1.92-3.84)</b>		
			≥4 vs 0	OR: <b>7.51(5.10-11.08)</b>		
3		Effect of depressive symptoms on PEDS			<b>2.38 (1.55-3.65)</b>	1.15 (0.73-1.82)
4		Effect of ACEs on PEDS Model adjusted for depressive symptoms (mediator)	1-3 vs 0		1.63 (1.00-2.66)	<b>1.71 (1.06-2.75)</b>
			≥4 vs 0		1.64 (0.91-2.98)	1.77 (0.99-3.17)
<b>Mothers’ self-reported health mediates the association between ACEs and PEDS</b>						
2		Effect of ACEs on self-report health status (potential mediator)	1-3 vs 0	OR: <b>1.63 (1.21-2.20)</b>		
			≥4 vs 0	OR: <b>2.35 (1.65-3.35)</b>		
3		Effect of self-rated fair or poor physical health on PEDS			<b>2.5 (1.64-3.80)</b>	1.32 (0.86-2.03)
4		Effect of ACEs on PEDS Model adjusted for fair or poor physical health (mediator)	1-3 vs 0		<b>1.69 (1.04-2.74)</b>	<b>1.67 (1.04-2.66)</b>
			≥4 vs 0		<b>1.89 (1.07-3.34)</b>	1.69 (0.97-3.00)

**Figure 2.** Mediation framework for depressive symptoms and self-rated health.

Note: Boldface indicates statistical significance ( $p < 0.05$ ). <sup>a</sup>All models adjusted for children’s age, mother’s age, mother’s marital status, Supplemental Security Income, subsidized housing.

ACEs, adverse childhood experiences; PEDS, Parents’ Evaluations of Developmental Status.

Although additional research is required to fully understand the intergenerational effects of ACEs, there may be some preliminary steps that the clinical and public health community can take to help minimize ACEs and provide comprehensive care to families that helps to ameliorate adversity, depression, and child developmental risk. The clinical care provided during pregnancy and early childhood offer opportunities for potential intervention. Health professionals providing maternity care may consider screening for ACEs and current adversities, depressive symptoms, and caregiver health, and in response provide services or refer to other providers before delivery.<sup>47,48</sup> Examples of such would be home visiting services to help alleviate the stress of parenting and to foster mother–child attachment.<sup>49,50</sup> With mothers' consent, maternity care providers may also consider communicating with the infants' pediatricians about maternal exposure to adversity, because pediatric settings can often connect families to social and economic supports that may prevent further risks.<sup>51,52</sup> Pediatric clinical settings may also use evidence-based screeners to assess parents for risk factors known to be associated with ACEs, such as intimate partner violence, substance abuse, and mental health problems.<sup>48</sup> Beyond the clinic, attempts to promote positive parenting include Triple P (Positive Parenting Program) and the Nurse-Family Partnership.<sup>53</sup> If future studies can identify clear evidence that depression and maternal health mediate the association between ACEs and PEDS, providing comprehensive treatment for mothers with depression and with overall fair/poor health may also mitigate associations between maternal ACEs and her child's developmental risk.

There is widespread recognition, however, that interventions may need to be more systemic, going beyond the family unit, to effectively promote economic wellbeing and create opportunities for families to avoid economic hardship, substance use, incarceration, and low educational attainment.<sup>54,55</sup> Investments in early childhood education, such as Early Head Start and Early Intervention programs, two-generation programs, and publicly-funded supports, such as housing subsidies, nutrition assistance, and access to behavioral health care have been shown to promote health and wellness among families with young children.<sup>26,45,56–59</sup> Intervention and systems-improvement research is needed to identify the most effective ways to support families through challenging circumstances. There have been attempts to integrate such approaches in state administrations within the Agency for Children and Families serving child welfare programs and other assistance programs,<sup>60</sup> and in national policy interventions, including a two-generation framework currently being proposed in Congress.<sup>61</sup>

However, these investments are not system-wide and have not reached a substantial proportion of population at risk, despite urgent calls from health professionals for scalable systems-based programs.<sup>62</sup>

Programs that strengthen families and reduce precursors to substance abuse and depression (such as low-quality housing and inadequate educational opportunities<sup>63–68</sup>) may reduce ACEs and their negative consequences. With a focus on preventing adversity among America's children, health professionals may be able to promote the wellbeing of current and future generations. More research is also needed, however, to identify the most remediable concurrent pathways between mothers' ACEs and offspring's developmental risk.

### Limitations

Limitations include the cross-sectional design with concurrent data gathered on ACEs, depressive symptoms, maternal health, and children's developmental risk by a single respondent. In this design, parental depressive and physical health symptoms may precede, follow, or co-occur with reports of the children's developmental risk. Because mothers report on all outcomes, there is potential bias through shared method variance. Despite these potential biases, this study opens new research avenues, including studies that utilize independent assessments of children's development by observers who are masked to mothers' ACEs, and longitudinal data to investigate associations between maternal ACEs and children's development and behavior.

### CONCLUSIONS

ACEs are serious clinical and public health problems that may cross two generations; young children's experiences today have lifelong consequences that may affect the next generation. Even though more research is recommended to disentangle the pathways between ACEs, depression, maternal health, and child development, addressing childhood adversity through promoting family strength can promote child wellbeing.

### ACKNOWLEDGMENTS

No financial disclosures were reported by the authors of this paper.

### SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at <https://doi.org/10.1016/j.amepre.2017.07.015>.



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