

Adverse Experiences in Early Childhood and Kindergarten Outcomes

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abstract

OBJECTIVE: To examine associations between adverse childhood experiences (ACEs) in early childhood and teacher-reported academic and behavioral problems in kindergarten.

METHODS: We conducted a secondary analysis of data from the Fragile Families and Child Wellbeing Study, a national urban birth cohort. Subjects with primary caregiver-reported information on ACE exposures ascertained at 5 years and teacher-reported outcomes at the end of the child's kindergarten year were included. Outcomes included teacher ratings of academic skills, emergent literacy skills, and behavior. We included 8 ACE exposures on the basis of the original Centers for Disease Control and Prevention Kaiser study and created an ACE score by summing individual adversities. We examined the associations between teacher-reported academic and behavioral outcomes and ACE scores by using logistic regression.

RESULTS: In the study sample, 1007 children were included. Fifty-five percent had experienced 1 ACE and 12% had experienced ≥ 3 . Adjusting for potential confounders, experiencing ≥ 3 ACEs was associated with below-average language and literacy skills (adjusted odds ratio [AORs]: 1.8; 95% confidence interval [CI]: 1.1–2.9) and math skills (AOR: 1.8, 95% CI: 1.1–2.9), poor emergent literacy skills, attention problems (AOR: 3.5, 95% CI: 1.8–6.5), social problems (AOR: 2.7, 95% CI: 1.4–5.0), and aggression (AOR: 2.3, 95% CI: 1.2–4.6).

CONCLUSIONS: In this study of urban children, experiencing ACEs in early childhood was associated with below-average, teacher-reported academic and literacy skills and behavior problems in kindergarten. These findings underscore the importance of integrated approaches that promote optimal development among vulnerable children.



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Dr Jimenez contributed to conceptualization and design of the study and analysis and interpretation of the data, and drafted the initial manuscript; Drs Wade and Reichman contributed to the conceptualization and design of the study and the analysis and interpretation of the data, and critically revised the manuscript; Dr Lin contributed to the design of the study and analysis and interpretation of the data, and critically revised the manuscript; Dr Morrow contributed to the analysis and interpretation of the data and critically revised the manuscript; and all authors approved the final manuscript as submitted.

DOI: 10.1542/peds.2015-1839

Accepted for publication Nov 16, 2015

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WHAT'S KNOWN ON THIS SUBJECT: Adverse childhood experiences (ACEs) are associated with poor health outcomes in children and adults. Little is known regarding links between adverse experiences in early childhood and academic and behavioral outcomes in kindergarten.

WHAT THIS STUDY ADDS: ACEs in early childhood were associated with poor academic skills and behavior problems in kindergarten, which are strong predictors of educational trajectory. These findings underscore the importance of integrated approaches for addressing the developmental needs of vulnerable young children.

To cite: Jimenez ME, Wade R, Lin Y, et al. Adverse Experiences in Early Childhood and Kindergarten Outcomes. *Pediatrics*. 2016;137(2):e20151839

Early childhood experiences lay the foundation for well-being throughout the life course.¹ The rapid pace of child development and brain growth from birth through age 5 make it a critical time period of opportunity and vulnerability.² Several studies have linked adverse childhood experiences (ACEs), broadly defined as household dysfunction and abuse, to poor health outcomes.³⁻⁷ More recent work has linked ACEs with lower levels of school engagement in middle childhood and adolescence.⁸ Most studies linking ACEs to poor outcomes rely on adult recall of events before age 18 and provide limited information about exposures taking place in the critical birth-to-age-5 time period. Although ACEs in early childhood have been linked to poor physical health outcomes,⁹ little is known regarding associations between early childhood ACEs and developmental and behavioral outcomes.

To address this gap, we used a unique birth cohort to explore associations between ACEs and academic skills including literacy and behavior in kindergarten. We focus on these outcomes in kindergarten because academic skills and behaviors at that time point are strong predictors of educational trajectory.¹⁰ We hypothesized that ACEs in the birth-to-age-5 time period would be associated with poor teacher-reported academic skills including emergent literacy and behavior difficulties.

METHODS

Study Design and Data Source

We conducted a secondary analysis of data from the Fragile Families and Child Wellbeing Study (FFCWS). The FFCWS birth cohort consists of nearly 5000 children born between 1998 and 2000 in 20 large US cities.^{11,12} By design, most children in the study were born to unmarried parents. This longitudinal data set includes

postpartum interviews with mothers and fathers, follow-up interviews with parents ~1, 3, 5, and 9 years after the child's birth, and in-home child assessments and educator interviews at key time points. A more detailed description can be found elsewhere.^{11,12} The current study utilizes data on ACEs reported in the mother's 5-year follow-up interview (which took place when the child was 61 months old, on average), as well as data on teacher-reported school performance in the last month of the child's kindergarten year. Because mothers were asked to recall information about past exposures and the teacher interviews occurred well after the mother's interviews, the exposures clearly preceded the outcomes.

Study Population

The study sample was limited to children for whom teacher-reported outcomes as well as primary caregiver-report information on 8 ACE exposures on the basis of the Centers for Disease Control and Prevention Kaiser ACE study¹³ were available. Given 98% of primary caregivers in the sample were biological mothers, we refer to them generically as mothers in this article.

Outcomes

Teacher-Reported Academic Outcomes

The children's teachers were asked to rate the child's academic skills during the last month of the child's kindergarten year on a 5-point Likert scale ("far below average" to "far above average") in the following: (1) literacy, (2) science and social studies, and (3) math. We created a dichotomous variable ("far below average" or "below average" versus all others). To explore literacy in depth, we also analyzed teacher-rated emergent literacy skills during the last month of kindergarten. Teachers rated these skills on a 5-point Likert scale ("not yet" to "proficient") and answers

were dichotomized to "not yet" or "beginning" versus all others.

Teacher-Reported Behavior Problems

Teachers were asked to describe child classroom behavior during the last month of kindergarten by using questions from the Child Behavior Checklist.¹⁴ Teachers rated statements about child behavior as "not true," "somewhat or sometimes true," and "very true or often true" for the child. Scores were summed for each of 3 subscales (attention problems, social problems, and aggression) assigning values of 1 for not true, 2 for somewhat or sometimes true, and 3 for very true or often true, with higher scores representing greater behavior difficulties. We created a dichotomous variable for scores in the top 10th percentile versus lower.

Missing data for outcome variables ranged from 0.5% to 2.8%.

Exposures

ACE measures were created from maternal reports at 5 years. These covered 9 out of the 10 ACEs included in the Centers for Disease Control and Prevention Kaiser ACE study,¹³ although emotional and physical neglect were characterized by using a single measure because the available information did not allow us to distinguish between the 2. We did not include parental divorce/separation as an ACE because the FFCWS oversampled nonmarital births, and recent qualitative work with urban youth did not endorse parental divorce/separation as an ACE because many children had parents who were never married.¹⁵ Overall, our measures of ACEs included 4 categories of child maltreatment (physical, sexual, psychological abuse, and neglect) and 4 categories of household dysfunction (substance use, mental illness, caregiver treated violently, and incarceration).

Individual ACEs were dichotomized as exposed or not and then summed

to create a score ranging from 0 to 8. We then created a categorical variable consisting of “0,” “1,” “2,” and “≥3” ACEs on the basis of the sample distribution.

Child Maltreatment

The FFWCS contains information regarding child maltreatment in 2 forms: (1) The mother was directly asked whether Child Protective Services (CPS) had been contacted for the child regarding physical, sexual abuse and/or neglect since the child was born, and (2) mothers completed the Parent-Child Conflict Tactics Scale (CTS-PC)¹⁶ in reference to their own behavior and the child’s secondary caregiver’s behavior (if applicable). The CTS-PC screens for child maltreatment and has 3 relevant domains: psychological aggression, physical assault, and neglect. The FFCWS includes 5 items about physical assault (eg, hit, slapped), 5 items about neglect (eg, failure to provide supervision), and 5 items regarding psychological aggression (eg, threatened). The mother was asked how many times each behavior occurred in the past year. Based on past work,^{17,18} responses were assigned a score (0 for never or not in the past year, 1 for event occurred once, 2 for twice, 4 for 3–5 times, 8 for 6–10 times, 15 for 11–20 times, and 25 for > 20 times), and we created a dichotomous variable considering domain scores in the top 10th percentile as high risk for maltreatment.

Psychological aggression was considered present on the basis of the CTS-PC score for the mother and/or secondary caregiver.

Neglect and physical abuse were considered positive on the basis of the CTS-PC score for the mother and/or secondary caregiver and/or if the mother reported CPS involvement for the relevant domain.

Sexual abuse was considered positive if the mother reported CPS involvement for sexual abuse.

Household Dysfunction

Mental illness: Maternal depressive symptoms, which were included under the “mental illness” category in the original ACE study,¹³ were assessed with the Composite International Diagnostic Interview-Short Form. The Composite International Diagnostic Interview-Short Form has been used in past studies and categorizes respondents as having experienced a depressive episode in the past 12 months on the basis of *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* criteria.¹⁹

Substance use: Mothers were asked, “In the past 12 months, was there ever a time when your drinking or being hung over interfered with your work at school, or a job, or at home?” and “Did you use any of these drugs during the past 12 months?” They were also asked whether the biological father and current partner if applicable “had problems such as keeping a job or getting along with family and friends because of alcohol or drug use?” An affirmative response for the mother, father, or current live-in partner was considered an exposure.

Incarceration: Incarceration was assessed by maternal report of whether the child’s father had spent time in prison or jail in the past 2 years, whether a current live-in partner spent most of the previous week in jail or prison, and whether she had been convicted of a crime during the past 2 years. Although conviction does not always result in incarceration, it still may cause turbulence in the child’s life. An affirmative response for any of these was considered an exposure.

Caregiver treated violently: This information was based on

questions that were drawn from the Conflict Tactic Scale, as well as qualitative interviews with victims of domestic violence²⁰ and have been used in other studies.^{21,22} Questions explored physical and sexual violence (eg, slap or kicks, hits with fist, tries to make you have sex) by the biological father or current partner in the past year. A reply of “sometimes” or “often” to any items as opposed to “never” was considered an exposure. We also considered whether the mother had a physical fight with the biological father or current partner (if applicable) in front of the child in the past 2 years and whether she had been seriously hurt in a fight with the father or current partner (if applicable), with an affirmative response considered an exposure.

Covariates

Guided by past studies,^{6,7,9} we controlled for the child’s age (in months) and gender, the mother’s race and ethnicity, the mother’s education and the relationship status of the parents at the time of child’s birth, and household income at the time of the 5-year follow-up (dichotomized based on the poverty threshold for a family of 4). We used an imputed variable for household income provided by the FFCWS given the degree of missing data (~10%).¹² Supplementary models included birth weight, maternal report of the child’s health status, and the number of siblings as covariates.

Statistical Analysis

First, we computed sample characteristics. Next, we assessed independent variables for collinearity and found none to be highly correlated ($r \geq 0.7$). Then we estimated both unadjusted and adjusted logistic regression models of associations between ACEs and the outcomes of interest. Finally, we assessed sensitivity to construction

TABLE 1 Demographic Characteristics

| Variable | Study Sample (<i>n</i> = 1007), % (No.) | FFCWS Sample (<i>n</i> = 4139), % (No.) ^a |
|---|--|---|
| Gender | | |
| Girl | 51 (511) | 47 (1962) |
| Boy | 49 (496) | 53 (2177) |
| Race | | |
| White | 36 (360) | 31 (1252) |
| African American | 46 (464) | 51 (2071) |
| Other | 16 (160) | 18 (743) |
| Ethnicity | | |
| Not Latino | 75 (759) | 74 (3023) |
| Latino | 24 (246) | 26 (1087) |
| Maternal education ^b | | |
| < High school diploma | 29 (290) | 34 (1388) |
| High school diploma | 28 (286) | 31 (1279) |
| Some college | 30 (302) | 25 (1018) |
| ≥ College | 13 (128) | 11 (449) |
| Parents' relationship status ^b | | |
| Married | 27 (275) | 25 (1012) |
| Cohabiting | 35 (348) | 36 (1488) |
| Visiting | 26 (257) | 26 (1094) |
| Friends | 6 (60) | 6 (255) |
| Infrequent contact ^c | 7 (67) | 7 (289) |
| Income ^d | | |
| <20 000 | 35 (350) | 40 (1636) |
| ≥20 000 | 65 (657) | 60 (2503) |

^a Mothers interviewed during FFCWS 5-y wave.

^b At birth of child.

^c Includes mothers who responded that they "hardly talk" with the biological father, "never talk" talk with the biological father, or the biological father is unknown.

^d Includes imputed data.

of key measures and model specification. We used Stata 13 (Stata Corp, College Station, TX) to conduct all analyses.

The Rutgers Biomedical Health Sciences Institutional Review Board determined this study to be exempt.

RESULTS

Study Sample

Eighty-five percent (4055) of mothers in the original FFCWS sample completed 5-year follow-up interviews. Of those, 1007 (our analysis sample) had available data from their children's kindergarten teachers and mother-reported information on ACEs. At 5 years, 97% of mothers in our sample reported living with their child most of the time, 26% reported a romantic relationship with a new partner, and 56% of mothers with new partners reported living with their current

partner most of the time (results not shown).

Sociodemographic characteristics of the study sample are summarized in Table 1 along with corresponding measures for the full 5-year follow-up sample. Almost half of children in the sample were African American and one quarter were Latino. Although only 27% of the mothers were married to the father of the child at the time of the birth, the majority of parents (93%) had some kind of a relationship. Socioeconomic characteristics were similar for the 2 samples.

Forty-five percent of the children had no ACEs, 27% had 1 ACE, 16% had 2 ACEs, and 12% had ≥3 (Table 2). The most common ACEs were exposure to incarceration and physical and psychological abuse. African American children and children with family income <\$20 000 were more likely than their non-African

TABLE 2 Adverse Childhood Experiences (*n* = 1007)

| Variable | % (No.) |
|------------------------|----------|
| Child maltreatment | |
| Psychological | 16 (162) |
| Neglect | 13 (132) |
| Physical | 15 (154) |
| Sexual | 0.6 (6) |
| Household dysfunction | |
| Maternal depression | 12 (121) |
| Substance use | 15 (149) |
| Incarceration | 18 (181) |
| Violence toward mother | 11 (111) |
| Total ACEs | |
| 0 | 45 (451) |
| 1 | 27 (275) |
| 2 | 16 (158) |
| 3 | 8 (84) |
| 4 | 3 (25) |
| 5 | 1 (11) |
| 6 | 0.3 (3) |

American and higher income counterparts to experience at least 1 ACE (Supplemental Table 6).

Approximately one quarter of the children had below-average teacher-rated literacy skills and math skills (Table 3). Not yet or beginning ratings by teachers ranged from 10% to 26% for emergent literacy skills (Table 4). A general pattern of worse academic, literacy, and behavior outcomes with increased number of ACEs is apparent (Tables 3, 4, and 5). The average number of ACEs for children with poor academic and behavioral outcomes was higher for all outcomes examined (1.2–1.54) compared with those without (0.92–0.97).

Logistic Regression Analysis

In unadjusted models, experiencing 1 ACE was associated with poor teacher-reported language and literacy skills (odds ratio [OR]: 1.5, 95% confidence interval [CI]: 1.1–2.1), science and social studies skills (OR: 1.6, 95% CI: 1.1–2.4), and math skills (OR: 1.6, 95% CI: 1.1–2.3), as well as not yet or beginning to understand and interpret a story or other text read to the child (OR: 1.6, 95% CI: 1.04–2.4). We also found that 1 ACE was associated

TABLE 3 Association Between ACEs and Teacher-Reported Academic Outcomes

| Outcome | No. of ACE Exposures | Sample Size ^a | Prevalence, % | OR (95% CI) | Adjusted OR (95% CI) ^b |
|---|----------------------|--------------------------|---------------|----------------|-----------------------------------|
| Teacher rating of academic skills | | | | | |
| Below average language and literacy skills | 0 | 449 | 20.9 | Referent | Referent |
| | 1 | 273 | 28.2 | 1.5 (1.1–2.1) | 1.3 (0.9–1.9) |
| | 2 | 157 | 31.9 | 1.8 (1.2–2.6) | 1.5 (0.99–2.4) |
| | ≥ 3 | 123 | 35.8 | 2.1 (1.4–3.2) | 1.8 (1.1–2.9) |
| | Total | 1002 | 26.5 | — | — |
| Below average science and social studies skills | 0 | 446 | 13.9 | Referent | Referent |
| | 1 | 273 | 20.9 | 1.6 (1.1–2.4) | 1.4 (0.9–2.1) |
| | 2 | 156 | 19.9 | 1.5 (0.95–2.5) | 1.3 (0.8–2.1) |
| | ≥ 3 | 123 | 22.8 | 1.8 (1.1–3.0) | 1.5 (0.9–2.5) |
| | Total | 998 | 17.8 | — | — |
| Below average mathematical skills | 0 | 448 | 19.6 | Referent | Referent |
| | 1 | 271 | 28.0 | 1.6 (1.1–2.3) | 1.4 (0.97–2.0) |
| | 2 | 155 | 27.8 | 1.6 (1.03–2.4) | 1.3 (0.9–2.1) |
| | ≥ 3 | 121 | 34.7 | 2.2 (1.4–3.4) | 1.8 (1.1–2.9) |
| | Total | 995 | 25.0 | — | — |

^a Sample sizes not equal because of missing data.

^b Adjusted for child age, gender, race, ethnicity, and income, as well as maternal education and parent relationship status at birth of child.

TABLE 4 Association Between ACEs and Teacher-Reported Emergent Literacy Skills

| Outcome | No. of ACE Exposures | Sample Size ^a | Prevalence, % | OR (95% CI) | Adjusted OR (95% CI) ^b |
|--|----------------------|--------------------------|---------------|----------------|-----------------------------------|
| Teacher rating of emergent literacy skills | | | | | |
| Not yet or beginning to understand and interpret a story or other text read to him/her | 0 | 449 | 12.9 | Referent | Referent |
| | 1 | 271 | 18.8 | 1.6 (1.04–2.4) | 1.4 (0.9–2.2) |
| | 2 | 153 | 20.9 | 1.8 (1.1–2.9) | 1.5 (0.9–2.5) |
| | ≥ 3 | 121 | 26.5 | 2.4 (1.5–4.0) | 2.2 (1.3–3.7) |
| | Total | 994 | 17.4 | — | — |
| Not yet or beginning to easily and quickly name all upper- and lower-case letters | 0 | 448 | 7.6 | Referent | Referent |
| | 1 | 273 | 10.3 | 1.4 (0.8–2.4) | 1.2 (0.7–2.0) |
| | 2 | 157 | 12.7 | 1.8 (0.99–3.2) | 1.4 (0.7–2.6) |
| | ≥ 3 | 123 | 17.9 | 2.7 (1.5–4.7) | 2.1 (1.1–3.9) |
| | Total | 1001 | 10.4 | — | — |
| Not yet or beginning to read simple books independently | 0 | 446 | 22.7 | Referent | Referent |
| | 1 | 271 | 26.9 | 1.3 (0.9–1.8) | 1.1 (0.8–1.6) |
| | 2 | 155 | 27.7 | 1.3 (0.9–2.0) | 1.1 (0.7–1.7) |
| | ≥ 3 | 120 | 33.3 | 1.7 (1.1–2.7) | 1.4 (0.8–2.2) |
| | Total | 992 | 25.9 | — | — |
| Not yet or beginning to demonstrate understanding of some of the conventions of print | 0 | 447 | 18.3 | Referent | Referent |
| | 1 | 272 | 22.8 | 1.3 (0.9–1.9) | 1.1 (0.8–1.7) |
| | 2 | 157 | 26.1 | 1.6 (1.02–2.4) | 1.4 (0.9–2.1) |
| | ≥ 3 | 122 | 34.4 | 2.3 (1.5–3.6) | 2.0 (1.2–3.1) |
| | Total | 998 | 22.8 | — | Referent |

^a Sample sizes not equal because of missing data.

^b Adjusted for child age, gender, race, ethnicity, and income, as well as maternal education and parent relationship status at birth of child.

with teacher-reported attention problems (OR: 1.9, 95% CI: 1.1–3.3) and aggressive behavior (OR: 1.9, 95% CI: 1.1–3.2). With few exceptions, increased ACEs were associated with increased odds of below-average academic skills and behavior problems. Exposure to ≥ 3 ACEs was associated with

below-average academic skills (Table 3), literacy skills (Table 4), and behavior problems (Table 5) for all outcomes examined. Although many associations between ≤ 2 ACEs and outcomes were no longer statistically significant, adjusting for potential confounders changed the ORs only minimally. Treating ACEs

as a continuous variable resulted in statistically significant associations between ACEs and all outcomes examined in unadjusted analyses with ORs ranging from 1.18 to 1.45 and minimal change after adjusting for potential confounders.

Results were insensitive to treating missing ACE information

TABLE 5 Association Between ACEs and Teacher-Rated Behavior

| Outcome | No. of ACE Exposures | Sample Size ^a | Prevalence, % | OR (95% CI) | Adjusted OR (95% CI) ^b |
|----------------------------------|----------------------|--------------------------|---------------|---------------|-----------------------------------|
| Teacher rating of behavior | | | | | |
| Attention problems ^c | 0 | 438 | 6.6 | Referent | Referent |
| | 1 | 267 | 12.0 | 1.9 (1.1–3.3) | 1.8 (1.01–3.1) |
| | 2 | 157 | 19.1 | 3.3 (1.9–5.8) | 3.2 (1.8–5.7) |
| | ≥3 | 118 | 21.2 | 3.8 (2.1–6.8) | 3.5 (1.8–6.5) |
| | Total | 980 | 11.8 | — | — |
| Social problems ^c | 0 | 439 | 7.1 | Referent | Referent |
| | 1 | 270 | 10.0 | 1.5 (0.9–2.5) | 1.4 (0.8–2.5) |
| | 2 | 156 | 12.8 | 1.9 (1.1–3.5) | 2.0 (1.1–3.6) |
| | ≥3 | 120 | 18.3 | 3.0 (1.6–5.3) | 2.7 (1.4–5.0) |
| | Total | 985 | 10.2 | — | — |
| Aggressive behavior ^c | 0 | 437 | 6.0 | Referent | Referent |
| | 1 | 267 | 10.5 | 1.9 (1.1–3.2) | 1.6 (0.9–2.8) |
| | 2 | 155 | 15.5 | 2.9 (1.6–5.2) | 2.5 (1.3–4.7) |
| | ≥3 | 120 | 14.2 | 2.6 (1.4–5.0) | 2.3 (1.2–4.6) |
| | Total | 979 | 9.7 | — | — |

^a Sample sizes not equal because of missing data.

^b Adjusted for child age, gender, race, ethnicity, and income, as well as maternal education and parent relationship status at birth of child.

^c Score in top 10th percentile on teacher-rated Child Behavior Checklist subscales.

as no exposure and incorporating additional covariates.

DISCUSSION

In a national urban sample, experiencing ACEs in early childhood was associated with poor teacher-reported academic and behavioral outcomes in kindergarten. Relative to children with no ACEs, children who experienced ACEs had increased odds of having below-average academic skills including poor literacy skills, as well as attention problems, social problems, and aggression, placing them at significant risk for poor school achievement, which is associated with poor health.²³ Our study adds to the growing literature on adverse outcomes associated with ACEs^{3–9,24–28} by pointing to ACEs during early childhood as a risk factor for child academic and behavioral problems that have implications for education and health trajectories, as well as achievement gaps and health disparities.

Our findings add insight into the pathways linking early childhood adversity to poor adult wellbeing.²⁹ Complementing past work that focused on physical health,⁹ our findings provide information

about links between ACEs and early childhood outcomes at the intersection of learning, behavior, and health.²⁹ We found that ACEs experienced in early childhood were associated with poor foundational skills, such as language and literacy, that predispose individuals to low educational attainment and adult literacy, both of which are related to poor health.^{23,30–33} Attention problems, social problems, and aggression were also associated with ACEs and also have the potential to interfere with children's educational experience given known associations between self-regulatory behavior and academic achievement.^{34,35} Consistent with the original ACE study and subsequent research, we found that exposure to more ACEs was associated with more adverse outcomes, suggesting a dose-response association.^{3–8} In fact, experiencing ≥3 ACEs was associated with below-average performance or problems in every outcome examined.

Our findings highlight the cross-sector nature of the associations between ACEs and wellbeing. Given their frequent contact with children,³⁶ pediatricians are uniquely positioned to detect

both ACEs and associated adverse developmental and behavioral outcomes and to link families to community resources that can provide necessary assistance and foster resilience. *Bright Futures*, the AAP health promotion initiative, provides resources for pediatricians to detect both ACEs and adverse developmental outcomes.³⁶ Programs like *Reach Out and Read*, in which pediatricians distribute books and model reading, simultaneously promote emergent literacy and parent-child relationships through shared reading.^{37,38} However, ACEs cannot be addressed in isolation and require collaborative efforts with partners in the education, home visitation, and other social service sectors in synergistic efforts to strengthen families.²⁹ In this way, programs like *Help Me Grow*³⁹ that create streamlined access to early childhood services for at-risk children can play a critical role in building an integrated system that connects families to needed resources to enhance the development of vulnerable children.

Our study is subject to limitations. Causality cannot be inferred from our findings. Although we controlled for several confounders

that had little impact on the observed associations, there may be unmeasured factors that account for the associations between ACEs in early childhood and end-of-year kindergarten outcomes. The study sample was from large cities; our findings therefore do not necessarily generalize to all settings. For example, in a national sample of kindergarteners in the spring of the academic year, 95% were considered proficient in letter recognition.⁴⁰ In our sample, ~10% could not yet or were just beginning to easily recognize letters. We limited our sample to children with available information on ACEs. Although our estimates were insensitive to including children with missing ACEs information and coding them as not exposed, it is possible that we underestimated ACEs in our study. Similarly ACE information relied on maternal reports and we used relatively high thresholds for the standardized scales assessing child abusive behavior, both of which could have underestimated ACEs. We did not include direct assessments of academic skills. However, teachers are professionals, observe many children, and are independent reporters from the

mothers, and previous work revealed that teacher assessments of reading skills in kindergarten are predictive of outcomes on direct reading assessments in first and third grade.⁴¹ Finally, richer data would have enriched the analyses. Information from the 1- and 3-year follow-up interviews had insufficient detail to allow us to incorporate ACEs ascertained at those time points. Information on the nature and characteristics ACEs (eg, timing, chronicity) was also unavailable. We were unable to distinguish between emotional and physical neglect with our data, and because emotional neglect is independently associated with poor outcomes, future work would benefit from distinguishing the 2.⁴² Also we were unable to consider fathers' and partners' reports of the mother being violent against them without a large sample loss; given that violence often occurs in both directions,^{43,44} future work would benefit by incorporating this information. Despite these limitations, the current study assesses both ACEs and developmental outcomes by using several standardized instruments at important points during a critical stage of the life course that has been understudied in this context.

CONCLUSIONS

This study revealed strong links between ACEs in early childhood and poor academic readiness by the end of kindergarten, which place children at elevated risk for poor educational achievement and subsequent health. Thus, adverse outcomes associated with ACE exposure begin in early childhood and impact multiple aspects of children's lives. The findings from this study underscore the need for integrated cross-sector approaches to enhance the development of vulnerable children.

ACKNOWLEDGMENTS

We thank Paul Dworkin, MD, and Brian L. Strom, MD, MPH, for their thoughtful feedback during the development of this article.

ABBREVIATIONS

ACE: adverse childhood experience

CI: confidence interval

CPS: Child Protective Services

CTS-PC, Conflict Tactics Scale: Parent-Child Version

FFCWS: Fragile Families and Child Wellbeing Study

OR: odds ratio

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

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FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: The project described was supported by Award Numbers R25HD074544, P2CHD058486, and 5R01HD036916 awarded by the Eunice Kennedy Shriver National Institute of Child Health & Human Development. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Eunice Kennedy Shriver National Institute of Child Health & Human Development or the National Institutes of Health. Dr. Jimenez was supported by the Chancellor's Scholars Program, Rutgers Biomedical Health Sciences.

POTENTIAL CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

REFERENCES

1. Shonkoff JP. Building a new biodevelopmental framework to guide the future of early childhood policy. *Child Dev.* 2010;81(1):357–367
2. Shonkoff JP, Phillips D, National Research Council; US Committee on Integrating the Science of Early Childhood Development. *From Neurons to Neighborhoods: the Science of Early Child Development.* Washington, DC: National Academy Press; 2000
3. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med.* 1998;14(4):245–258
4. Anda RF, Croft JB, Felitti VJ, et al. Adverse childhood experiences and smoking during

- adolescence and adulthood. *JAMA*. 1999;282(17):1652–1658
5. Brown DW, Anda RF, Tiemeier H, et al. Adverse childhood experiences and the risk of premature mortality. *Am J Prev Med*. 2009;37(5):389–396
 6. Flaherty EG, Thompson R, Dubowitz H, et al. Adverse childhood experiences and child health in early adolescence. *JAMA Pediatr*. 2013;167(7):622–629
 7. Flaherty EG, Thompson R, Litrownik AJ, et al. Adverse childhood exposures and reported child health at age 12. *Acad Pediatr*. 2009;9(3):150–156
 8. Bethell CD, Newacheck P, Hawes E, Halfon N. Adverse childhood experiences: assessing the impact on health and school engagement and the mitigating role of resilience. *Health Aff (Millwood)*. 2014;33(12):2106–2115
 9. Flaherty EG, Thompson R, Litrownik AJ, et al. Effect of early childhood adversity on child health. *Arch Pediatr Adolesc Med*. 2006;160(12):1232–1238
 10. Rouse C, Brooks-Gunn J, McLanahan S. Introducing the issue. Future of children. *Spr*. 2005;15(1):5–14
 11. Reichman N, Teitler J, Garfinkel I, McLanahan S. Fragile families: sample and design. *Child Youth Serv Rev*. 2001;23(4/5):303–326
 12. Introduction to the Fragile Families Public Use Data. Available at: www.fragilefamilies.princeton.edu/documentation.asp. Accessed October 3, 2014
 13. Felitti VJ, Anda RF. The relationship of adverse childhood experiences to adult medical disease, psychiatric disorders and sexual behavior: implications for healthcare. In: Lanius RA, Vermetten E, Pain C, eds. *The Impact of Early Life Trauma on Health and Disease: The Hidden Epidemic*. New York, NY: Cambridge University Press; 2010:77–88
 14. Achenbach TM. *Integrative Guide for the 1991 CBCL/4-18, YSR, and TRF Profiles*. Burlington, VT: Department of Psychiatry, University of Vermont; 1991
 15. Wade R Jr, Shea JA, Rubin D, Wood J. Adverse childhood experiences of low-income urban youth. *Pediatrics*. 2014;134(1):e20132475
 16. Straus MA, Hamby SL, Finkelhor D, Moore DW, Runyan D. Identification of child maltreatment with the Parent-Child Conflict Tactics Scales: development and psychometric data for a national sample of American parents. *Child Abuse Negl*. 1998;22(4):249–270
 17. Berger LM. Socioeconomic factors and substandard parenting. *Soc Serv Rev*. 2007;81(3):485–522
 18. Berger LM, McDaniel M, Paxson C. Assessing parenting behaviors across racial groups: Implications for the child welfare system. *Soc Serv Rev*. 2005;79(4):653–688
 19. Fragile Families Core Scale Documentation. Available at: www.fragilefamilies.princeton.edu/documentation.asp. Accessed October 3, 2014
 20. Lloyd S. The effects of domestic violence on women's employment. *Law Policy*. 1997;19(2):139–167
 21. Boynton-Jarrett R, Fargnoli J, Suglia SF, Zuckerman B, Wright RJ. Association between maternal intimate partner violence and incident obesity in preschool-aged children: results from the Fragile Families and Child Well-being Study. *Arch Pediatr Adolesc Med*. 2010;164(6):540–546
 22. Suglia SF, Enlow MB, Kullowatz A, Wright RJ. Maternal intimate partner violence and increased asthma incidence in children: buffering effects of supportive caregiving. *Arch Pediatr Adolesc Med*. 2009;163(3):244–250
 23. Fiscella K, Kitzman H. Disparities in academic achievement and health: the intersection of child education and health policy. *Pediatrics*. 2009;123(3):1073–1080
 24. Anda RF, Brown DW, Felitti VJ, Bremner JD, Dube SR, Giles WH. Adverse childhood experiences and prescribed psychotropic medications in adults. *Am J Prev Med*. 2007;32(5):389–394
 25. Anda RF, Felitti VJ, Chapman DP, et al. Abused boys, battered mothers, and male involvement in teen pregnancy. *Pediatrics*. 2001;107(2):e19
 26. Dietz PM, Spitz AM, Anda RF, et al. Unintended pregnancy among adult women exposed to abuse or household dysfunction during their childhood. *JAMA*. 1999;282(14):1359–1364
 27. Dube SR, Anda RF, Felitti VJ, Chapman DP, Williamson DF, Giles WH. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA*. 2001;286(24):3089–3096
 28. Hillis SD, Anda RF, Felitti VJ, Marchbanks PA. Adverse childhood experiences and sexual risk behaviors in women: a retrospective cohort study. *Fam Plann Perspect*. 2001;33(5):206–211
 29. Shonkoff JP, Garner AS; Committee on Psychosocial Aspects of Child and Family Health; Committee on Early Childhood, Adoption, and Dependent Care; Section on Developmental and Behavioral Pediatrics. The lifelong effects of early childhood adversity and toxic stress. *Pediatrics*. 2012;129(1). Available at: www.pediatrics.org/cgi/content/full/129/1/e20112663
 30. Walker D, Greenwood C, Hart B, Carta J. Prediction of school outcomes based on early language production and socioeconomic factors. *Child Dev*. 1994;65(2 Spec No):606–621
 31. Young AR, Beitchman JH, Johnson C, et al. Young adult academic outcomes in a longitudinal sample of early identified language impaired and control children. *J Child Psychol Psychiatry*. 2002;43(5):635–645
 32. Berkman ND, Dewalt DA, Pignone MP, et al. Literacy and health outcomes. *Evid Rep Technol Assess (Summ)*. 2004;(87):1–8
 33. Dewalt DA, Berkman ND, Sheridan S, Lohr KN, Pignone MP. Literacy and health outcomes: a systematic review of the literature. *J Gen Intern Med*. 2004;19(12):1228–1239
 34. Duckworth AL, Seligman ME. Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychol Sci*. 2005;16(12):939–944
 35. McClelland MM, Cameron CE, Connor CM, Farris CL, Jewkes AM, Morrison FJ. Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Dev Psychol*. 2007;43(4):947–959

36. Hagan JF, Shaw JS, Duncan PM. *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*, 3rd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2008
37. Zuckerman B. Promoting early literacy in pediatric practice: twenty years of reach out and read. *Pediatrics*. 2009;124(6):1660–1665
38. Zuckerman B, Khandekar A. Reach Out and Read: evidence based approach to promoting early child development. *Curr Opin Pediatr*. 2010;22(4):539–544
39. Bogin J. Enhancing developmental services in primary care: the Help Me Grow experience. *J Dev Behav Pediatr*. 2006;27(suppl 1):S8–S12; discussion S17–S21, S50–S52
40. US Department of Education. *National Center for Education Statistics. America's Kindergartners: Findings from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99, Fall 1998, NCES 2000-070*, by Jerry West, Kristin Denton, and Elvie Germino-Hausken. Washington, DC: Project Officer, Jerry West; 2000
41. Valdez A. Teacher Judgment of Reading Achievement: Cross-Sectional and Longitudinal Perspective. *Journal of Education and Learning*. 2013;2(4):186–200
42. English D, Thompson R, White CR, Wilson D. Why should child welfare pay more attention to emotional maltreatment? *Child Youth Serv. Rev Mar*. 2015;50:53–63
43. English DJ, Graham JC, Newton RR, et al. At-risk and maltreated children exposed to intimate partner aggression/violence: what the conflict looks like and its relationship to child outcomes. *Child Maltreat*. 2009;14(2):157–171
44. Archer J. Sex differences in aggression between heterosexual partners: a meta-analytic review. *Psychol Bull*. 2000;126(5):651–680

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Pediatrics 2016;137;

DOI: 10.1542/peds.2015-1839 originally published online January 14, 2016;

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