

# **The Association between Adverse Childhood Experience (ACE) and School Success in Elementary School Children**

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## **Abstract:**

We explored the feasibility of using school personnel as reporters to examine the relationship between the level of Adverse Childhood Experiences (ACE) exposure in a non-clinical sample of public elementary school children and academic risk. A high prevalence of ACE exposure was reported (44%) with 13% of students experiencing three or more ACE. Binary logistic regression analyses revealed a dose-response effect between the number of ACE and risk of poor school attendance, behavioral issues and failure to meet grade level standards in mathematics, reading, or writing. Using elementary school personnel report of child ACE exposure minimized family burden and potential intrusion while producing prevalence estimates consistent with those of caregiver report from the National Survey of Children's Health. Results suggest that understanding and responding to a child's ACE profile might be an important strategy for improving the academic trajectory of at risk children.



The Child and Family Research Unit works with community systems to address the public health challenge of adverse childhood experiences (ACEs) and resulting trauma. Specifically, CAFRU has developed an extensive body of works addressing these public health consequences through several systems-change efforts.

Since 2008, CAFRU faculty and staff have delivered complex trauma training to more than 30,000 professionals, including those in the K-12 education system, early learning, juvenile justice, social work, mental health, primary health care, and communities across Washington, Oregon, Alaska, and California.

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Elementary School Children

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**ABSTRACT**

We explored the feasibility of using school personnel as reporters to examine the relationship between the level of Adverse Childhood Experiences (ACE) exposure in a non-clinical sample of public elementary school children and academic risk. We selected a random sample of 2,101 children from K-6 classroom rosters at 10 elementary schools. Students were 50% male, 78% White, and 55% Free and Reduced Meal program participants. School personnel reported their factual knowledge of 10 ACE and academic risk in a database controlled by the schools. Data were de-identified prior to analysis. A high prevalence of ACE exposure was reported (44%) with 13% of students experiencing three or more ACE. Binary logistic regression analyses revealed a dose-response effect between the number of ACE and risk of poor school attendance, behavioral issues and failure to meet grade level standards in mathematics, reading, or writing. Using elementary school personnel report of child ACE exposure minimized family burden and potential intrusion while producing prevalence estimates consistent with those of caregiver report from the National Survey of Children's Health. Results suggest that understanding and responding to a child's ACE profile might be an important strategy for improving the academic trajectory of at risk children.

Although fewer than half of elementary school students had adverse childhood experiences (ACE) exposure, 13% of students experienced three or more ACE. As ACE exposure increased, students were more likely to have poor school attendance, behavioral issues and failure to meet grade level standards. Staff report of known ACE exposure in students is useful for describing the prevalence of ACE in the school population and detecting academic and behavioral risk.

## The Association between Adverse Childhood Experience and School Success in Elementary School Children

Adverse childhood experiences (ACE) refer to the prolonged exposure of children to potentially traumatic events that may have immediate and lifelong impact (Felitti, Anda, Nordenberg, Williamson, Spitz, Edwards, et al., 1998). ACE can occur across the child, family or community ecologies and include child maltreatment (e.g., verbal, physical, or sexual abuse), family stress or dysfunction (e.g., a family member that is mentally or physically ill, incarcerated or substance abusing; the absence or loss of a parent because of death, divorce or separation, domestic violence) and community violence and natural disasters (van der Kolk, 2005). The public health implications of ACE are supported by a substantial literature that documents the dose-response relationship between ACE exposure and a large variety of negative physical and mental health outcomes in adulthood (Centers for Disease Control (CDC), 2010; Felitti & Anda, 2010). Those studies, however, rely on retrospective adult reports. The proximal effects of ACE exposure on childhood physical health, mental health and academic outcomes have received limited research attention. The current study advances the ACE literature by using school personnel rather than parent or child report to examine the prevalence of ACE exposure in a non-clinical sample of K-6 public elementary school children and the association between student ACE profiles and the risk of academic, behavioral, and attendance problems.

### **ACE Prevalence**

ACE exposure is widespread in the United States. Retrospective recall among a representative adult population using the ACE module of the Behavioral Risk Factor Surveillance System found that 59% reported having one or more ACE with almost 9% reporting

five or more ACE (Bynum, Griffin, Ridings, Wynkoop, Anda, Edwards, et al., 2010). The 2011–12 National Survey of Children’s Health (NSCH) added 9 items to examine ACE exposure in children 0–17 years of age. NSCH, which uses parent report, found that 48 percent of children experienced one ACE and 22.6 percent experienced two or more ACE (Bethell, Newacheck, Hawes, & Halfon, 2014). Economic hardship was the most frequently reported ACE, followed by divorce or separation of a parent and living with a parent who has a substance abuse issue (Sacks, Murphey, & Moore, 2014). No studies were identified that examined ACE prevalence in a representative sample using school personnel reporting.

### **ACE, Cumulative Risk and Trauma**

Predating the emergence of ACE as a framework for describing risk, the cumulative risk (CR) model suggests that increasing numbers of concurrent risk factors are predictive of a higher prevalence of negative developmental outcomes in children (Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987). Risk factors are conceptualized as dichotomous variables, which are summed to create a CR metric. The model, which focuses on the cumulative number of risks experienced rather than the nature of the risk exposure, has received robust empirical support for its predictive ability, but has been criticized as being atheoretical – lacking the power to explain the observed effects (Evans, Li, & Whipple, 2013). In addition, the CR model permits identification of a variety of specific risks which limits comparability across studies. By contrast, the original ACE questions represent a specific constellation of cumulative risk factors linked by their emergence specifically in childhood and their potential to induce a chronic stress response requiring frequent mobilization of physiological systems. This increased allostatic load can result in disruptions in typical neural development (McLaughlin, Sheridan, & Lambert, 2014).

It is important to note that ACE exposure does not inevitably result in an increased allostatic load, developmental problems or trauma because protective factors such as individual characteristics, safe nurturing relationships and family or community supports can mitigate ACE risk (Hamby, Grych, & Banyard, 2017; Brown & Shillington, 2017). The variable contribution of ACE to trauma risk is further complicated in childhood due to the emergent nature of adjustment problems. These problems may be precursors to mental health disorders from trauma, or they may never meet the diagnostic thresholds, but still interfere with a child's academic success and social skill development.

In education, the discussion of ACE effects often is used interchangeably with discussions of trauma even though the concepts of ACE exposure and childhood trauma disorders are distinct. When referring to trauma-related mental health problems, current DSM V (American Psychiatric Association, 2013) inclusion criteria only align with original ACE questions for direct or witnessed threat of death, severe physical injury, or sexual violence. While not elements in a trauma-related diagnosis, ACE items like caregiver mental health, family member incarceration, and divorce are potential contributors to persistent and damaging stress and disrupted adjustment. The overlap in concepts is reinforced by shared concerns with the neurodevelopmental threats resulting from persisting stress and shared intervention targets to improve affect self-regulation, attachment quality, and resilience in affected individuals. Recognizing the distinct but complementary implications of ACE and trauma can support a continuum of comprehensive and conceptually aligned responses contributing to educational efforts to create multi-tiered systems of support (Freeman, Miller, & Newcomer, 2015) where a common understanding of risk permits consistent responses adjusted to children's needs.

### **Effect of ACE Exposure on Children**

**Health, Behavior and Quality of Life Outcomes.** While a multitude of studies have examined the effects of ACE exposure in adulthood, the literature regarding children remains limited. In a survey conducted by the National Child Traumatic Stress Network, 63 clinicians treating 1,699 children reported that patients had been exposed to a mean of 2.9 childhood traumas - the most frequent types being child emotional abuse, loss, impaired caregiver and domestic violence. Three quarters of the children experienced multiple events or continuing trauma exposure. The most frequent posttraumatic sequelae reported were affect dysregulation, attention/concentration, negative self-image, impulse control and aggression/risk-taking (Spinazzola, Ford, van der Kolk, Blaustein, Brymer, & Gardner, et al., 2002). Although this study did not use the ACE framework, several of the ACE indicators are embedded in the adversity exposures examined.

Two studies used adapted versions of the original ACE questionnaire to assess ACE exposure and the incidence of problematic behaviors during childhood. Both found a positive relationship between ACE exposure in children and developmental or health issues. Higher ACE exposure was positively associated with behavioral problems, a higher incidence of mental health disorders, special health care needs and an increased risk of obesity (Bethell et al., 2014; Burke, Hellman, Scott, Weems & Carrion, 2011).

**Academic Risk, and Demographic Characteristics.** Student demographic differences are known contributors to academic risk and have complex associations with ACE exposure risk. Girls perform better than boys in school with differences in self-regulation as a suggested mechanism contributing to these sex differences (Duckworth & Seligman, 2006). The evidence for sex differences in ACE exposure, however, is inconsistent depending on the specific ACE,

and type of outcome (Mersky, Topitzes, & Reynolds, 2013). Racial group membership has been associated with ACE risk as well as lower academic achievement with non-Hispanic black and Hispanic populations at greatest risk (CDC, 2010; Duncan & Magnuson, 2005). Poverty increases the risk for lower academic achievement (Duncan & Magnuson, 2005) and was positively correlated with ACE exposure (Tomer, 2014).

**Academic Outcomes.** A higher incidence of ACE was associated with greater risk of repeating a grade, absenteeism, and lower school engagement (Bethell et al., 2014). Burke and her colleagues (2011) found that as ACE exposure increased, learning and behavior problems in schools also increased. Single and co-occurring adversities have been shown to negatively affect reading ability (Delaney-Black, Covington, Ondersma, Nordstrom-Klee, Templin, Ager, et al., 2002; Duplechain, Reigner, & Packard, 2008). Multi-level risk factors can have a cumulative effect on school outcomes. In a study involving 10,639 urban third graders, researchers used multilevel modeling to examine how school concentrations of early risk factors affected attendance and achievement in reading and mathematics (Fantuzzo, LeBoeuf, & Rouse, 2014). While the study focused on school concentrations of risk factors rather than individual risk profiles and the risk factors examined were not limited to those associated with ACE, results indicated that high concentrations of children who were experiencing four risks (displacement, homelessness, child maltreatment, or inadequate parental care) were associated with lower reading achievement and school attendance.

### **Current Study**

This study contributes to the literature by examining the proximal effect of ACE exposure in a non-clinical, representative sample of K-6 public elementary school children and the risk of academic, behavioral and attendance problems. This study explores the utility of using



educators as reporters of ACE exposure in their students. The use of professionals reporting their knowledge of risk, referred to as sentinel surveillance, is an established practice in the National Incidence Study of Child Abuse and Neglect (Sedlak, Mettenburg, Basena, Petta, McPherson, et al., 2010). We adopted this strategy to examine ACE exposure in schools because it is minimally invasive, relatively low cost, and a strategy local schools could adopt to determine the impact of ACE exposure on their school success. Documenting the utility of professional report would provide an alternative to other assessment strategies such as screening for trauma that could minimize family burden and limit the level of sensitive information maintained in school records. Professional report compiles information that may suggest the need for additional inquiry about whether increasing adversity poses a barrier to individual student and overall school success.

The literature addressing scope of adversity exposure in the general population and the potential school effects is limited. This study provides an added estimation of adversity exposure and impact in elementary-aged children. The prevalence of ACE exposure has been estimated from the NSCH parent survey. While parents are most likely to have knowledge of ACE across contexts, a social desirability confound risks underestimating ACE prevalence. National data may have limited application in local school decision-making, but school collection of local data from families is complicated by mandated reporting requirements and the need to protect sensitive information. School personnel report of factual knowledge of ACE exposure eliminates the possible parent social desirability confound while protecting children and families from intrusive data collection that risks disclosure to mandated reporters.

Two hypotheses guided the current study. 1) A dose effect would be found where the total number of ACE would be positively associated with each of the following: school absence, behavior problems and failure to achieve grade level standards in mathematics, reading, or

writing. 2) The prevalence of ACE exposure determined by local school professional report would underestimate the prevalence of ACE exposure when compared with the NSCH survey.

## Methods

### Sample

The sample consisted of 2,101 children randomly selected from de-identified K – grade 6 classroom rosters provided by 10 elementary schools distributed across four school districts in a medium-sized Northwestern metropolitan area. Five Title 1 (an indicator of high poverty percentages) and five non-Title 1 schools participated. Fifty percent of children were male and 50% female with 78% identifying as White, 6% more than one race, 4% Native American, 4% Hispanic, 3% African American, 2% Asian, 1% Pacific Islander, and 2% not reported or other. Free and Reduced Meal (FRM) program enrollment was used as a proxy measure for poverty. In the total sample, 55% of students were FRM enrolled. Thirteen percent of the students were classified as Special Education students. Demographic characteristics reflect the public school population of the region.

### Measures

**Student Risk.** We adapted the original ACE survey into a 10-item questionnaire (Felitti, et al., 1998). The original ACE survey included 10 questions adapted from previously validated survey instruments (Felitti et al., 1998). With the permission of one of the original ACE study authors, we retained original wording on all questions except for questions addressing neglect, physical abuse, emotional abuse and sexual abuse. A positive answer to any of these four questions could require a mandated report to child welfare by the school with resulting disclosure risk to families. These four questions were replaced with questions addressing any contact with child welfare services, homelessness or homelessness risk, and significant concerns about basic

needs related to food and clothing as proposed indicators of abuse and neglect risk. These items are consistent with the recommendation by Freisthler, Merritt, and LaScala (2006) that specific challenges to resources and supports can serve as indicators of child maltreatment risk. In addition, we added exposure to community violence which was not part of the original ACE questions but was chosen to provide an additional indicator of violence exposure risk. The adapted ACE questions are included in the Appendix.

Prior to data collection, school professionals (teachers, school psychologists and principals) received one hour of training regarding the survey and definition of factual knowledge which included child or parental report of experiences disclosed directly to school personnel or notification by social service agencies such as Child Protective Services (CPS, the term in this community for the child maltreatment response system) to school personnel. The data collected consisted of existing knowledge of school personnel, not suspicions. No additional information was solicited from caregivers or children. The research team did not participate in the reviews of selected children and only received categorical information as de-identified data with a numeric code. School professionals recorded their factual knowledge of the following 10 experiences for two time periods: during the previous 12 months and since the child's birth: (1) has this child ever been homeless or highly mobile (an education term indicating homelessness risk); (2) has this child ever had a CPS referral or out of home placement; (3) has this child ever had unmet basic needs that interfere with school adjustment; (4) have this child's parents been divorced or separated; (5) has this child experienced the death of a primary caregiver; (6) has any member of this child's family ever been incarcerated; (7) has this child ever witnessed or been the victim of domestic violence; (8) has this child ever witnessed or been the victim of community violence; (9) has any member of this child's family been diagnosed with mental

illness; and, (10) has any member of this child's family had a substance abuse problem. An affirmative response was scored as 1 and no known exposure was scored 0. The sum of scores across the 10 questions represented the child's ACE exposure score.

**Academic Status.** School staff rated academic concerns as currently true or not true on three separate dimensions producing three ratings of each student reviewed: academic failure, significant attendance concerns, and significant school behavior problems. Academic concerns were based on school records and defined as not meeting grade level standards in reading, writing, or math as reported on the most recent student report card. Attendance and school behavior concerns were based on school staff reporting these issues as existing areas of the school's concerns for the specific student. Attendance problems were defined as a pattern of absent days, late arrivals, or early dismissals that interfered with the student's learning. School behavior problems were defined as a pattern of behavior either in the classroom or the school that interfered with the student's learning or disrupted the classroom environment. School behavior problems were further distinguished as principally internalizing, externalizing or having both internalizing and externalizing characteristics. Student academic, attendance and behavior concerns were based on the categorical designation (concern/not a concern) by the educators that one or more of these three areas was a focus for needed additional supports based on the cumulative professional experience of the child.

### **Procedure**

This study was approved by the Washington State University IRB. Data collection involved de-identified categorical ratings of student status (e.g., known risk exposure, attendance concerns as yes or no responses) based on school records or professional knowledge. Data collected was considered as existing data. The IRB approved a waiver of informed consent from

caregivers and children given there was no contact with either caregivers or children and the research team received de-identified data. Informed consent was required for school personnel participating in the data collection.

Schools were provisionally recruited through the building principal following professional development workshops for elementary schools about ACE. The school district Superintendents' office provided final authorization for schools that volunteered to participate. School leadership, classroom teachers and other educational specialists (counselor, learning support, literacy specialist, psychologist, and non-classroom teachers such as physical education, music or media) who volunteered to participate in the study provided informed consent. Greater than 95% of personnel in the 10 study schools agreed to participate, including 179 classroom teachers as well as an additional 100 school leaders and educational specialists.

Students were randomly selected from de-identified student rosters provided by the schools from consented teachers' classrooms. Half of the students in each classroom were selected based on alternating positions (first, third, etc.) of the students on the classroom roster and given a unique study identifier. The key list linking identifiable student information and the unique study identifier were generated by a Microsoft Excel program provided to the participating school. At no time did members of the research team have access to identifiable student information. The lists of selected students were then entered in a Microsoft Access database that allowed the schools to re-identify students for reporting while assuring that the research team did not have access to identifying student data. The staff then used the Access data collection tool on school computer systems to respond to the student risk and academic status questionnaire for each selected student. The resulting student data reports were exported from the Access database as individually de-identified data sets for analysis.

School professionals received a one hour training regarding the survey and definition of factual knowledge. In order to reduce the burden of data collection and maximize flexibility, schools determined how data would be collected. Some schools had the classroom teachers complete the reports individually with supplemental information then added for each student by other personnel (principals, educational specialists). In other schools, data collection was integrated into student planning meetings in which several staff and building leadership completed the data reporting in small groups. Regardless of data reporting strategy, the classroom teacher first provided their responses and school leadership and education specialists then added information but could not change the reports of the classroom teacher.

### **Statistical Analyses**

Student demographic, academic success measures, and adversity exposure were analyzed using SPSS version 22 to describe the nature of ACE exposure in the sample and explore the predictive utility of ACE exposure in understanding academic risk. The scope of risk exposure was assessed using descriptive and nonparametric statistical tests to examine the interaction of ACE and student demographic characteristics. The explanatory utility of ACE as a correlate of student concerns was tested separately for academic success, attendance, school behavior and total concerns using binary logistic regression analyses, analysis of variance (ANOVA), and Generalized Estimating Equations (GEE) analyses. Binary logistic regression permitted examining the unique predictive power of ACE after accounting for the risk contributions of school program enrollment and student demographics. GEE is a related regression strategy that is particularly useful for controlling group effects (school districts, schools, teachers) that are highly correlated with the variables we are interested in testing (Hanley, Negassa, Edwardes, & Forester, 2003). For the GEE analyses, school district, school site and teacher were entered as the

fixed effects and the level of ACE exposure was compared in turn with student grade level, student gender, student race (white or other race), FRM enrollment status and special education enrollment as other variables of interest. District, school, and reporting teacher were included as fixed factors in the GEE analyses with the goal of controlling for possible policy and practice differences across the 10 schools and participating classroom teachers. Student demographic characteristics and educational program status are routinely collected data known to correlate with academic success or the incidence of behavior and attendance concerns.

For academic success, school attendance and school behavior concerns, the predictive significance of each variable was represented as an odds ratio controlling for the other variables. Odds ratios for ACE reflect the relative risk of academic, attendance or school behavior concerns after controlling for the school program enrollment and demographic variables. The odds tables represent the relative risk of the school concerns by comparing children with increasing known ACE to children for whom there were no known ACE.

## **Results**

### **Demographic Characteristics and ACE Exposure Prevalence**

A frequency analysis was conducted to examine the prevalence of known exposure for each of the ten types of adversity reported. Among children with reported ACE exposure, divorce was the most frequent ACE (36%) and loss of a primary caregiver (2%) the rarest. Table 1 presents the ACE frequency percentages.

ANOVA analyses examined mean ACE exposure for five child demographic characteristics (race, grade level, gender, special education enrollment, and free and reduced meal enrollment). ACE exposure was coded as no known ACE (56%, N=1,170), one ACE (22%, N=457), two ACE (10%, N=209), three ACE (5%, N=112), and four or more ACE (7%, N=153).

ACE exposure was not significantly related to grade level or student gender. However, ACE risk was significantly related to student's race (white/other racial groups), special education enrollment, and FRM enrollment. Table 2 presents the results of ANOVA comparisons of mean ACE scores for these variables.

### **School Performance Concerns and the Dose Effect of ACE Exposure**

Fifty-one percent of the students had no reported school performance concerns (academic failure, attendance problems, school behavior problems) while 27% had one of the three areas of concern, 17% had two areas of concern, and five percent had all three areas of concern identified. Table 3 summarizes the ANOVA comparisons for mean ACE score by level of school performance concern.

Thirty-four percent of students were failing to meet grade level standard in one or more of the three learning areas. Students with two and three areas of school performance concerns were combined because of the comparatively small number of students ( $N=97$ ) with all three areas of concern.

Thirteen percent of students had significant attendance problems. Students with identified attendance problems had a significantly higher ACE score ( $M = 1.8$ ;  $SD = 1.3$ ) compared to students without attendance concerns ( $M = 0.8$ ;  $SD = 1.9$ ). Twenty-eight percent of students had significant school behavior concerns; 16% of the overall sample were identified with externalizing behaviors, 6% with internalizing behaviors, and 6% with both internalizing and externalizing behaviors. The type of school behavior concern was significantly related to known ACE exposure. ACE exposure increased for all types of school behavior concerns but was greatest for the children identified with both internalizing and externalizing behavior concerns.



**ACE as an Indicator of Academic Risk**

Increasing ACE exposure was associated in a linear fashion with greater rates of academic failure, attendance problems, and school behavior problems after controlling for the school the student attended, grade level, gender, race, FRM enrollment and special education enrollment. As ACE levels increased, the percent of children with two or more areas of school problems increased. Twelve percent of students with no known ACE had two or more areas of school problems compared to 52% of students with three or more ACE. Academic failure was meaningfully correlated with both attendance  $r(2101) = 0.24, p < .001$  and school behavior concerns  $r(2101) = 0.34, p < .001$ . Attendance and school behavior concerns were weakly correlated  $r(2101) = 0.16, p < .001$ . As the number of school performance concerns increased, the mean ACE scores of children also increased  $F(1, 2,098) = 169.9, p < .0001$ . The mean scores by level of school problems were 0.47 ACE with no reported school concerns, 1.04 ACE with one area of school problem, and 1.75 ACE with two or more areas of school problems.

Schools in the study differed significantly in terms of ACE exposure with higher mean ACE scores in Title 1 schools ( $F(1, 2,091) = 23.2, p < .0001$ ). The range in mean ACE scores by school was 0.17 to 1.5 ACE. In the Generalized Estimating Equations, the students' school was used as the grouping variable to control for potential differences across the 10 schools.

Comparing students with four or more ACE to students with no known ACE, the observed odds ratios were: academic failure (OR = 3.4,  $p < .0001$ ), attendance problems (OR = 4.9,  $p < .0001$ ), and school behavior problems (OR = 6.9,  $p < .0001$ ). Table 4 presents the progressive ACE level's odds ratios for academic failure, attendance problems, and school behavior problems.

## **Discussion**

Recent studies provide limited confirmation that children's ACE exposure is associated with academic success (Bethell, et al., 2014; Fantuzzo, et al., 2014). The present study results replicate this relationship and provide a more nuanced description of the relationship between ACE and academic failure in elementary school children - as known ACE increase, the risk of a broad range of school related problems also increases. The results suggest that an understanding of ACE risk is not only useful for the most vulnerable children but may be productively used to understand and respond to children who struggle with academic success as a critical developmental process, but who may never be formally diagnosed or referred for services.

### **The Utility of and Constraints on Educator Report of Adversity**

The original ACE questions have demonstrated significant construct and predictive validity across multiple research studies. While adult retrospective recall of childhood events has been criticized as an assessment method, the principal impact according to Hardt and Rutter (2004) is under-reporting of experiences. Examining adversity exposure in children presents several complications because of mandated reporting laws regarding child maltreatment and the complexities of safely introducing the purpose of these questions in ongoing relationships between schools and parents.

The present strategy using educators as reporters is likely to under-report the scope of adversity in the lives of children, particularly those functioning well in the school environment. Parents and children may be careful about disclosure. Staff receptiveness to and recall of adverse disclosures may vary. Despite these constraints, the present study suggests researchers can use professional reporting to identify relative risk in a manner that minimizes burden, potential intrusion, and unintended consequences in families. Because the reporting strategy employed in

this study organized information already known to educators, school burden concerns were minimized and the ethical duty to protect participants when collecting new information was maintained. However, we strongly caution that schools should consider similar efforts to understand the impact of ACE in their students only after careful planning to protect the resulting information and prepare educators to understand ACE as a population description of risk. Particularly, educators need to understand that the evidence for population risk cannot be used to describe individual risk. Finally, we strongly endorse the principle that understanding adversity requires understanding the social and material resources that build resilience and mitigate the effects of adversity. A constraint of the present study is that we focused on establishing the value of ACE as a risk indicator but did not incorporate resilience measures in this initial study.

Known ACE did not differ meaningfully across grade levels. This appears to contradict the NSCH data that found ACE exposure increased with child age (Sacks et al., 2014). The current study, however, included a more restricted age range that excluded adolescents. Another discrepancy with the NSCH data was that divorce rather than economic hardship was the most prevalent ACE. Instead of using generalized poverty, the current study used two specific indicators of economic hardship, homelessness and a failure to meet basic needs. This is not intended to negate the profound potential impact of poverty but rather to align with predominant practice in the ACE literature where poverty is considered an important environmental stressor but is not listed as an ACE. This treatment of poverty differs from the CR model and the NSCH survey. Given the high rate of FRM enrollment in our schools, it is likely that poverty would have been the most common risk if we had included it as an ACE. The consistent finding that just under half of elementary school students have experienced one or more ACE is notable as

the studies used different data collection methods - NSCH relied on caregiver report and the current study used school personnel report of factual data.

A noteworthy result was that the association between ACE exposure and school success remained significant even after accounting for some of the most widely accepted threats to school success including gender, variability across schools, race, and overall school poverty. While these factors remain important considerations, accounting for ACE reduced their respective explanatory power in the current study. This finding at the individual level is similar to results of the school level analysis conducted by Fantuzzo and his colleagues (2014). Focusing on the individual students' ACE profile may provide an effective framework for practice and policy changes in education to potentially alter the academic and developmental trajectories associated with ACE exposure (Gutman, Sameroff, & Cole, 2003).

ACE risk and childhood trauma disorders are distinct, but complementary concepts with the potential to inform a multi-layered, continuum of response to student academic and social challenges. Schools respond to normal development variations, adaptive behaviors that are barriers to development but do not meet criteria for diagnosis, and severe disruptions where formal diagnosis and mental health intervention are needed. Estimates of children who struggle with adjustment problems are twice as high with an estimated 10% of children experiencing severe emotional disorders compared to an additional 20% of children with functional limitations that do not meet diagnostic standards (American Academy of Pediatrics, 2009). From educators' perspectives, students' trauma disorder risk is a critical student outcome, but one considered in addition to concerns with academic achievement, attendance, and school behavior problems that are markers of both trauma and ACE effects. Because of the emergent nature of many children's mental health needs and that the effects of ACE are on a gradient, linking the ACE and trauma

conversation may provide a coherent conceptual framework for risk mitigation and intervention targets that addresses the needs of the most affected children and the adaptive struggles of children with subclinical problems.

### **Implications**

Given the prevalence of adversity in childhood, the present findings indicate that educators will benefit from broad literacy and skills in managing the developmental challenges that can result from ACE exposure. Our findings demonstrate a dose-related risk affecting over a fifth of the general school population. Many children who have significant ACE are at risk for academic problems but likely will not meet the diagnostic and access to care standards that define most of our intervention systems. While access to specialized services needs to be part of the continuum of response, adoption of trauma-informed responses and resilience building experiences within natural systems supporting children is likely to be the most practical and effective way to respond to the scope of ACE exposure.

Exposure to adversity is a risk not a guarantee that problems will emerge. Educators need to be careful not to assume that school success challenges are inevitably related to ACE exposure. Rather, this study confirms the broader finding in the ACE literature that ACE exposure is an indicator of risk and may provide useful concepts about the needs of children that in turn may guide more effective school responses. Understanding the protective assets and resilience of the individual child and family are critical mediators of whether adversity results in significant barriers to school success.

The K-12 and early education systems are well positioned to meet the developmental needs of children whose ACE exposure has caused distress by implementing trauma informed practices system-wide (Biliias-Lolis, Gleber, Rispoli, Bray, & Maykel, 2017). Well-established

treatments for the developmental and behavioral effects of adversity are available (National Child Traumatic Stress Network, n.d.). The Trauma and Learning Policy Initiative (TLPI) identified four trauma-impacted domains that can interfere with school success: self-regulation, physical functioning, relationships, and academics (Tishelman, Haney, Greenwald O'Brien, & Blaustein, 2010). TLPI suggests adopting a "trauma lens" that uses the four domains as a framework for school-focused child assessments. Cognitive-Behavioral Intervention for Trauma in Schools (Jaycox, 2004) and Support for Students Exposed to Trauma (Jaycox, Langley, & Dean, 2009) are examples of evidence-based intervention programs designed for school delivery (Jaycox, Langly, Stein, Wong, Sharma, Scott, et al., 2009; Kataoka, Jaycox, Wong, Nadeem, Langley, Tang, et al., 2011).

The prevalence of ACE exposure suggests prevention strategies aimed at the school level might yield even greater benefits and reach those children whose ACE exposure is undetermined. Such changes in practice are typically referred to as trauma-sensitive or trauma-informed school practices. Creating a responsive educational climate that understands the potential effects of adversity necessitates a paradigm shift based on a deeper consideration of how adversity may affect child development. Changing the complex school organizational culture will require commitment from leadership, educators and other personnel who interact with children and their families as well as intensive, ongoing training and technical support (Walkley & Cox, 2013). Studies suggest that teachers vary in their need for additional skills development to identify how ACE exposure and possible trauma-related symptoms may manifest in their classroom (O'Neill, Guenett, & Kitchenham, 2010) and are uncertain about how to assist children effectively (Alisic, Bus, Dulack, Pennings, & Splinter, 2012). The promise of a trauma sensitive whole school approach is illustrated by Lincoln High School in Walla Walla, Washington. After a year of

ongoing trauma sensitive training, the alternative school saw school suspensions drop 85% (Stevens, 2014). It is important to note that the empirical foundation for a trauma-sensitive approach within the education system has yet to be established as the literature contains very few controlled evaluation studies. This is a critical area for future research. In the context of public health, several states are implementing trauma-sensitive child and family systems (Kramer, Sigel, Connors-Burrow, Worley, Church, & Helpenstill, 2015; Overstreet & Mathews, 2011; Walkley & Cox, 2013). While the extant literature is sparse, these system level approaches appear promising.

### **Limitations**

There are limitations to the present study. While using educator report of known ACE has several benefits with respect to minimizing risk, it is likely a conservative strategy with a resulting underestimate of ACE prevalence, especially among students who are functioning well. Despite this constraint, the level of known exposure is consistent with other published results. Both the independent and dependent variables are based on educator report. To mitigate the possibility of introducing bias, educators were trained to report factual knowledge based either on objective reports (e.g., child welfare involvement, standardized performance measures, attendance records) or family self-report (e.g., disclosure of violence exposure). Although we employed six of the 10 questions from the original ACE study, four new questions were introduced, and the psychometric characteristics of the revised assessment were not tested. To increase consistency, common operational definitions were provided for the ACE items and school performance measures. Because multiple school personnel contributed to each child report, the study design did not allow computation of interrater reliability as different informants contributed different information. When there was a discrepancy school personnel met and

reached consensus. In addition, it is likely that students who struggle in school are more likely to be students for whom risks are better understood with the resulting risk that teachers may over-report for high need students and under-report for students who are less challenging. Studies indicate that classroom teachers are more accurate reporters of student externalizing behaviors and that internalizing behavior often goes undetected (Bradshaw, Buckley, & Ialongo, 2008). This suggests that report of student internalizing behaviors is likely an underestimate (Bradshaw, et al., 2008). The study and its reporting strategy are limited to elementary schools. It is likely that the structure and level of teacher-student relationships in middle and high schools may limit the extension of this data collection strategy. Also, while the study includes a large randomly selected group of students, the community in which the study was conducted is not racially or ethnically diverse and generalization of results to more diverse communities may be restricted. Finally, this study did not address resilience and protective factors in the lives of children and the moderating effects of these personal resources were not addressed in the design.

## **Conclusion**

The current study confirmed that the incidence of ACE exposure within the general elementary school population is relatively common with nearly half of children experiencing one or more ACE. Higher numbers of reported ACE exponentially increased children's risk of poor school attendance, behavioral issues and failure to meet grade level standards in mathematics, reading, or writing. Results suggest that understanding a child's ACE profile and associated risk for the development of persisting trauma-related problems, and the potential impact of adversity on school success may be important strategies for improving the academic trajectory of at risk children.



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Table 1

*Percent of Children with Reported Lifetime Exposure to 10 Adverse Experiences*

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Type of Adverse Experience	<i>n</i>	%
Residential Instability	182	9
CPS Involvement	188	9
Basic Needs	164	7
Parents Divorced	762	36
Primary Caregiver Died	41	2
Family Member Mental Health	100	5
Family Member Substance Abuse	153	7
Domestic Violence	180	9
Parent Incarcerated	76	4
Community Violence	54	3

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Note: N = 2101

Table 2

*ANOVA by Demographic Variables*

Student Demographics	Groups	n	Mean ACE			
			Score	F	DF	p
Race	White	1,647	0.9	20.3	1, 2099	0.0001
	Other Racial Groups	454	1.2			
Grade Level	Grades K	298	0.75	2.3	1, 2094	0.03 <sup>1</sup>
	Grade 1	335	0.76			
	Grade 2	298	0.94			
	Grade 3	299	1.00			
	Grade 4	328	1.04			
	Grade 5	326	0.89			
	Grade 6	217	0.99			
Gender	Male	1,055	1.41	2.60	1, 2100	ns
	Female	1,046	1.32			
Special Education Enrolled	Yes	1,824	0.9	41.8	1, 2099	0.0001
	No	277	1.5			
Free and Reduced Meal Enrollment	Yes	938	0.4	287. 6	1, 2099	0.0001
	No	1163	1.4			

<sup>1</sup> Because of the large sample size, statistical test results greater than  $p < .01$  were considered non-significant.



Table 3

*ANOVA of Mean ACE Scores by Level of School Performance Concerns*

	n	Mean ACE Score	F Statistic	DF	p
<b>Total School Performance Concerns</b>					
No Reported Concerns	1,078	0.5	180.5	2, 2098	<.00001
One Concern	562	1.1			
Two or Three Concerns	461	1.9			
<b>Academic Failure</b>					
Meeting grade level standards	1,375	0.7	137.3	1,2099	<.0001
Not meeting grade level standards	726	1.4			
<b>Attendance Concerns</b>					
None reported	1,831	0.8	141.7	1,2099	<.00001
Attendance concerns	270	1.8			
<b>Behavior Concerns*</b>					
None reported	1,546	0.6	93.6	3,2097	<.00001
Externalizing only	325	1.7			
Internalizing only	115	1.6			
Externalizing and Internalizing	115	1.9			

\*For behavioral concerns, internalizing, externalizing, and both internalizing and externalizing behaviors were all significantly different from no reported concerns but were not different in ACE histories from each other.

Table 4

*Odds Ratios for Child ACEs as a Predictor for Three Measures of Academic Risk*

	Wald	p	Odds Ratio	95% CI Lower	CI Upper
<u>Academic Failure</u>					
ACES Total	63.4	0.0001			
Four or more ACEs	30.8	0.0001	3.4	2.2	5.2
Three ACEs	26.6	0.0001	3.1	2.0	4.8
Two ACEs	24.9	0.0001	2.5	1.8	3.7
One ACE	12.7	0.001	1.6	1.2	2.0
Special Education	172.0	0.001	12.5	8.6	18.3
Gender	11.1	0.001	1.4	1.2	1.7
Free and Reduced Meal Enrollment	17.9	0.0001	1.7	1.3	2.2
<u>Attendance Problems</u>					
ACES Total	70.1	0.0001			
Four or more ACEs	48.7	0.0001	4.9	3.1	7.6
Three ACEs	40.6	0.0001	4.5	2.9	7.2
Two ACEs	20.8	0.0001	2.7	1.8	4.1
One ACE	15.8	0.0001	2.0	1.4	2.8
Special Education	8.9	0.003	1.7	1.2	2.4
Race	10.9	0.001	1.6	1.2	2.0
Free and Reduced Meal Enrollment	9.8	0.002	1.8	1.3	2.7
<u>School Behavior Problems</u>					
ACES Total	130.8	0.0001			
Four or more ACEs	80.1	0.0001	6.9	4.5	10.5
Three ACEs	44.3	0.0001	4.8	3.0	7.7
Two ACEs	61.2	0.0001	4.8	3.2	7.1
One ACE	44.0	0.0001	2.4	1.9	3.2
Special Education	49.7	0.0001	3.4	2.4	4.8
Gender	83.2	0.0001	2.8	2.3	3.6
Free and Reduced Meal Enrollment	8.5	0.004	1.5	1.2	2.1

## Appendix 1

## School Success and ACE Exposure Questions

School Success Questions:

1. Is this child enrolled in Special Education? Y/N
2. Does this child have a 504 Plan? Y/N  
504 plans are individualized plans for accommodation in education practice to meet student needs.
3. Does this child have academic problems? That is, the child is not meeting standard in reading, writing, or math based on the most recent report card.
4. Does this child have attendance problems? That is, does the student have a pattern of absences, tardies, or early dismissals (or any combination of these) that interfere with the students learning?
5. Does this child have school behavioral problems? That is, does this child demonstrate behavior either in the classroom or the school that interferes with the student's learning or disrupt the classroom environment? IF YES:  
Are these behaviors internalizing? (e.g., withdrawn, depressed, anxious)  
Are these behaviors externalizing? (e.g., disruptive, aggressive, impulsive)

ACE questions:

\* A substitute question introduced for this study.

1. Has this child ever been homeless or highly mobile?\*
2. Has this child ever had a CPS referral or state placement?\*
3. Has this child ever had unmet basic needs that interfere with school adjustment? That is, in the area of nutrition, clothing, or hygiene?\*
4. Have this child's parents been divorced or separated?
5. Has this child experienced the death of a primary caregiver?
6. Has any member of this child's family ever been incarcerated?
7. Does this child have a caregiver with a mental health problem?
8. Does this child have a caregiver with a substance abuse problem?

9. Has this child ever witnessed or been the victim of domestic violence?
10. Has this child ever witnessed or been the victim of community violence? (e.g., family gang involvement, child or family victim of neighborhood violence, or child witnessing neighborhood violence.)\*