

# A Systematic Review of Trials to Improve Child Outcomes Associated With Adverse Childhood Experiences



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**Context:** The purpose of this systematic literature review was to summarize current evidence from RCTs for the efficacy of interventions involving pediatric health care to prevent poor outcomes associated with adverse childhood experiences measured in childhood (C-ACEs).

**Evidence acquisition:** On January 18, 2018, investigators searched PubMed, PsycInfo, SocIndex, Web of Science, Cochrane, and reference lists for English language RCTs involving pediatric health care and published between January 1, 1990, and December 31, 2017. Studies were included if they were (1) an RCT, (2) on a pediatric population, and (3) recruited or screened based on exposure to C-ACEs. Investigators extracted data about the study sample and recruitment strategy, C-ACEs, intervention and control conditions, intermediate and child outcomes, and significant associations reported.

**Evidence synthesis:** A total of 22 articles describing results of 20 RCTs were included. Parent mental illness/depression was the most common C-ACE measured, followed by parent alcohol or drug abuse, and domestic violence. Most interventions combined parenting education, social service referrals, and social support for families of children aged 0–5 years. Five of six studies that directly involved pediatric primary care practices improved outcomes, including three trials that involved screening for C-ACEs. Eight of 15 studies that measured child health outcomes, and 15 of 17 studies that assessed the parent–child relationship, demonstrated improvement.

**Conclusions:** Multicomponent interventions that utilize professionals to provide parenting education, mental health counseling, social service referrals, or social support can reduce the impact of C-ACEs on child behavioral/mental health problems and improve the parent–child relationship for children aged 0–5 years.

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## CONTEXT

In 1998, Kaiser Permanente, in partnership with the Centers for Disease Control and Prevention, published one of the largest investigations of early life experiences and later life health outcomes.<sup>1</sup> This study surveyed adults about their adverse childhood experiences (ACEs), defined as exposure to child abuse (psychological, physical, or sexual), child neglect (emotional or physical), and household dysfunction (alcoholism, drug abuse, mental illness, domestic violence, incarceration, and divorced or separated parents). The initial and numerous follow-up studies demonstrated a graded relationship between

the number of ACEs and later life risk for a range of poor health outcomes, including suicide, alcoholism, illicit drug use, depression, diabetes, heart disease, stroke, cancer, and premature mortality.<sup>1–3</sup> Additional studies showed that ACEs increase risk for poor health outcomes in

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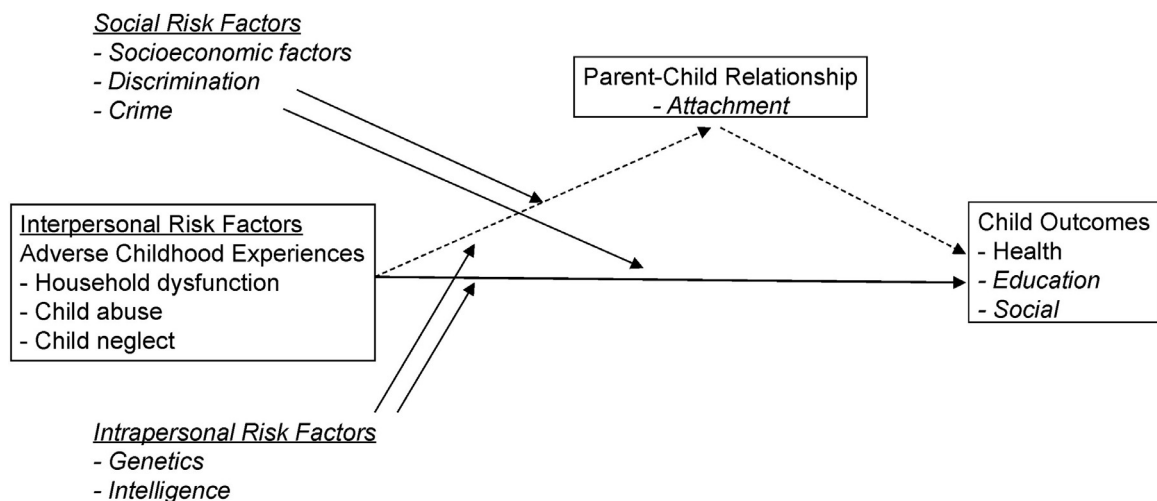
childhood, including language delays, behavior problems, injuries, somatic complaints, and obesity.<sup>4–6</sup> Epidemiologic studies suggest that the majority of the adult population (approximately 60%) have experienced one or more ACEs, and that a significant proportion have experienced four or more ACEs (12%–20% with higher proportions in lower socioeconomic regions).<sup>7,8</sup> Given the prevalence of ACEs and the strong association with poor health outcomes, there is a need for interventions to prevent or mitigate the potentially negative impact of ACEs.

The American Academy of Pediatrics recommends that pediatricians screen for ACEs and develop innovative service-delivery adaptations to support children exposed to potentially toxic stressors.<sup>9,10</sup> From the perspective of good patient care, healthcare providers need to be aware of ACEs in order to inform medical decisions about treatment of symptoms. Additional evidence is not needed, for example, to know that in caring for a child with frequent stomachaches and headaches it is important to screen for domestic violence or harsh parenting as potentially contributing causes. However, secondary prevention by screening asymptomatic pediatric patients for exposure to ACEs measured in childhood (C-ACEs) in order to avoid or postpone poor outcomes associated with C-ACEs needs to be supported by what the U.S. Preventive Services Task Force calls a “chain of evidence.”<sup>11</sup> This chain of evidence needs to include demonstration that primary care interventions can improve health outcomes for asymptomatic children exposed to ACEs.<sup>12</sup>

Since publication of the ACE study, there have been discrepancies in how adversity is defined in the scientific and secular literature, which reflects a lack of agreement

about distinguishing different types of risk factors and how they work together. For this review, investigators chose to define adversity by using the same measures of child maltreatment and household dysfunction that were identified in the initial and follow-up ACE studies. One of the key findings of this literature is that ACEs represent a cluster of interpersonal risk factors, such that exposure to one ACE increases the likelihood of exposure to another ACE.<sup>1</sup> As shown in a theoretic framework (Figure 1), ACEs are distinct from social and intrapersonal risk factors. Investigators of this literature review hypothesize that the effect of ACEs on health outcomes is mediated by impact on the parent–child relationship, and therefore improving the parent–child relationship is a key target for interventions to prevent or reduce the impact of ACEs. This is an important insight into how healthcare providers may be able to help families impacted by ACEs, and is distinct from the need for healthcare providers to consider the impact of other social determinants.

Addressing social risk factors, such as childhood poverty, may contribute to the primary prevention of ACEs. Recent literature reviews have summarized best practices for addressing childhood poverty.<sup>13–15</sup> There are a number of clinic-based interventions that reduce the impact of childhood poverty, such as Reach Out and Read, Healthy Steps for Young Children, Medical–Legal Partnership, and Health Leads.<sup>15</sup> There are also public health programs, such as the Nurse–Family Partnership, that can be linked to pediatric practice and improve a range of outcomes for low-income families.<sup>16</sup> However, one of the key findings of the initial and follow-up ACE surveys is that ACEs are prevalent across socioeconomic strata,



**Figure 1.** Theoretical framework for child outcomes.

Note: Italics indicate factors that are not a focus of this literature review.

and so reducing the public health impact of ACEs will require interventions that are applicable across socioeconomic strata. Furthermore, the presence or absence of ACEs may be key to explaining variability in health outcomes within socioeconomic strata. Therefore, it is critical to look specifically at the results of studies that have selected samples based upon ACEs in order to identify interventions that reduce the impact of ACEs.

In order to build the chain of evidence needed by pediatric primary care providers to support screening for C-ACEs, evidence is needed from studies of primary care screening to improve health outcomes for asymptomatic children exposed to ACEs. Given the paucity of such studies, and in order to inform the design of future screening studies, investigators of this literature review looked more broadly at RCTs of pediatric healthcare interventions to prevent poor outcomes associated with C-ACEs. The results of this systematic literature review provide a guide for pediatric healthcare providers and researchers regarding what is known and not known about how healthcare professionals can respond to C-ACEs.

## EVIDENCE ACQUISITION

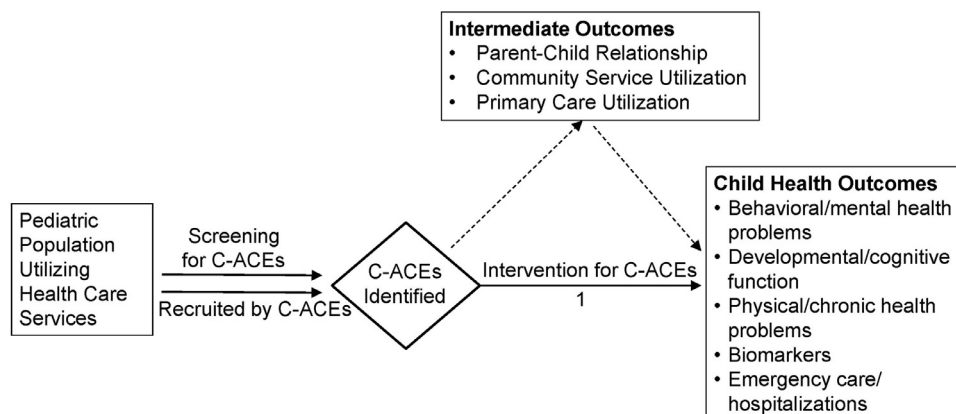
The analytic framework used to guide this systematic review is shown in Figure 2. The key question was: what pediatric healthcare interventions improve health outcomes in children exposed to C-ACEs?

In conjunction with a research librarian, investigators searched the following electronic databases using a standardized protocol: MEDLINE, PsycINFO, SocINDEX, Web of Science, and Cochrane Central Register of Controlled Trials. Search terms were divided into three groups: (1) infants, children, or adolescents; (2) child adverse experiences or stressful events, including specific ACEs (e.g., domestic violence); and (3) pediatric primary care or healthcare services, including maternal–child health, pediatrics, general

practice, and community health nursing. Between groups the Boolean phrase “AND” was used, and within groups the Boolean phrase “OR” was used. The following filters were applied when available: English, human, RCT, and publication date from January 1, 1990 to December 31, 2017. A detailed summary of the electronic search syntax is provided in the Appendix Table 1 (available online). In addition, investigators reviewed reference lists of included papers, summary articles, and personal libraries. Investigators also contacted the primary author of the included studies in order to identify additional potentially relevant published and unpublished studies.

The literature search was for studies of patients that accessed pediatric healthcare services through a maternal–child health, pediatric or general practice clinic, or through a community health nursing program. Studies were included if they (1) conducted an RCT design, (2) collected data on a pediatric population, and (3) recruited or screened that sample based on exposure to C-ACEs, where C-ACEs were defined as child exposure to maltreatment, domestic violence, a household member with depression or mental disorder, a household member with alcohol or drug abuse problem, incarceration of a household member, and divorced or separated parents. Because the key question was about the efficacy of interventions to address C-ACEs, the investigators included both studies that screened pediatric patients for C-ACEs and studies that recruited pediatric patients based upon exposure to C-ACEs. Both approaches used defined criteria to identify C-ACEs (screening studies used a parent-report tool; other studies used a combination of parent report, structured interviews, or medical records). Both approaches evaluated the efficacy of interventions to improve outcomes for pediatric patients after identifying C-ACEs.

Literature search results were uploaded to EndNote, a management software package used to manage bibliographies, citations, and references. Citation abstracts and full-text articles were uploaded during the screening process. Investigators independently screened the titles and abstracts yielded by the search against inclusion criteria. Final articles included were determined by consensus. For each study, the following data were abstracted independently by investigators: study sample and recruitment strategy, C-ACEs used for recruitment or screening, intervention and control description, intermediate and child outcomes measured, and statistically



1. Key Question: What pediatric health care interventions improve health outcomes in children exposed to C-ACEs (Child-Adverse Childhood Experiences)?

Figure 2. Analytical framework for systematic review.

significant associations reported. For child health outcomes, investigators looked for behavioral or mental health problems, developmental or cognitive functioning, physical or chronic health problems, child biomarkers (such as blood pressure or cortisol levels), and emergency or hospital utilization.

Investigators defined intermediate outcomes as factors that might be associated with C-ACEs and influence the likelihood of poor child health outcomes. These included changes in parent risk factors (e.g., parent depression), as well as community service utilization (e.g., referrals for psychosocial needs) and primary care utilization (e.g., immunizations). Investigators also categorized measures of the parent–child relationship, including child maltreatment, as intermediate outcomes. Child maltreatment was defined as child physical, emotional, or sexual abuse, as well as child physical or emotional neglect. Actual measures of child maltreatment used by each study are shown in [Appendix Table 2](#) (available online). Although child maltreatment could have been categorized as a child health outcome, the investigators chose to categorize it as an intermediate outcome because the measures of child maltreatment did not always provide sufficient information to determine the impact on the child's health. For example, a reduction in Child Protective Service (CPS) reports may or may not have meant a reduction in child health problems. By considering child maltreatment measures as intermediate outcomes, the investigators were able to identify studies that demonstrated an impact on child behavioral, developmental, or physical outcomes.

Reviewers outlined the key information and findings from each study in a table format. Studies were divided into two major categories: (1) those that directly involved a pediatric primary care provider, and (2) those that did not involve a pediatric primary care provider but did involve pediatric healthcare services. Studies were also subcategorized by impact on child health outcomes, impact on intermediate outcomes only, and no impact. For each study, an intervention intensity was assigned as follows: high-intensity interventions were multicomponent interventions including home visits that extended over 3–5 years, medium-intensity interventions were multicomponent interventions that included home visits or multiple follow-up visits over 4–18 months, and low-intensity interventions targeted at least one component (e.g., parenting, social services) and included up to seven follow-up assessments. Data analysis focused on contrasting and comparing methods and findings across studies. Because of the heterogeneity of measures, a meta-analysis was not feasible.

## EVIDENCE SYNTHESIS

The initial electronic search identified 2,044 potentially relevant articles after excluding duplicates. [Figure 3](#) illustrates a flowchart of the article selection following PRISMA guidelines.<sup>17</sup> After review for study criteria, a total of 22 articles describing results of 20 RCTs were kept for inclusion. All included studies were evaluated by both reviewers using the U.S. Preventive Services Task Force quality rating guidelines<sup>18</sup> and findings were consistent with a related previous review by the U.S. Preventive Services Task Force.<sup>19</sup> Specifically, two studies were evaluated as good quality<sup>20,21</sup> and the remainder were identified as fair quality.

[Appendix Table 2](#) (available online) divides the literature review results into “studies that directly involved a pediatric primary care provider” and “studies that did not directly involve a pediatric primary care provider but did involve pediatric healthcare services.” Within each of these categories, studies are further divided into those that improved child health outcomes, those that improved intermediate outcomes only, and those that did not improve child health or intermediate outcomes. Individual studies are presented in order from highest- to lowest-intensity intervention.

## General Results

[Appendix Table 2](#) (available online) lists the types of C-ACEs used by each study for subject selection or screening. Parent mental illness/depression was the most common C-ACE measured (16 studies), followed by parent alcohol or drug abuse (15 studies) and domestic violence (12 studies). Studies varied in the identification of subjects from one C-ACE<sup>22–27</sup> to five C-ACEs.<sup>28–33</sup>

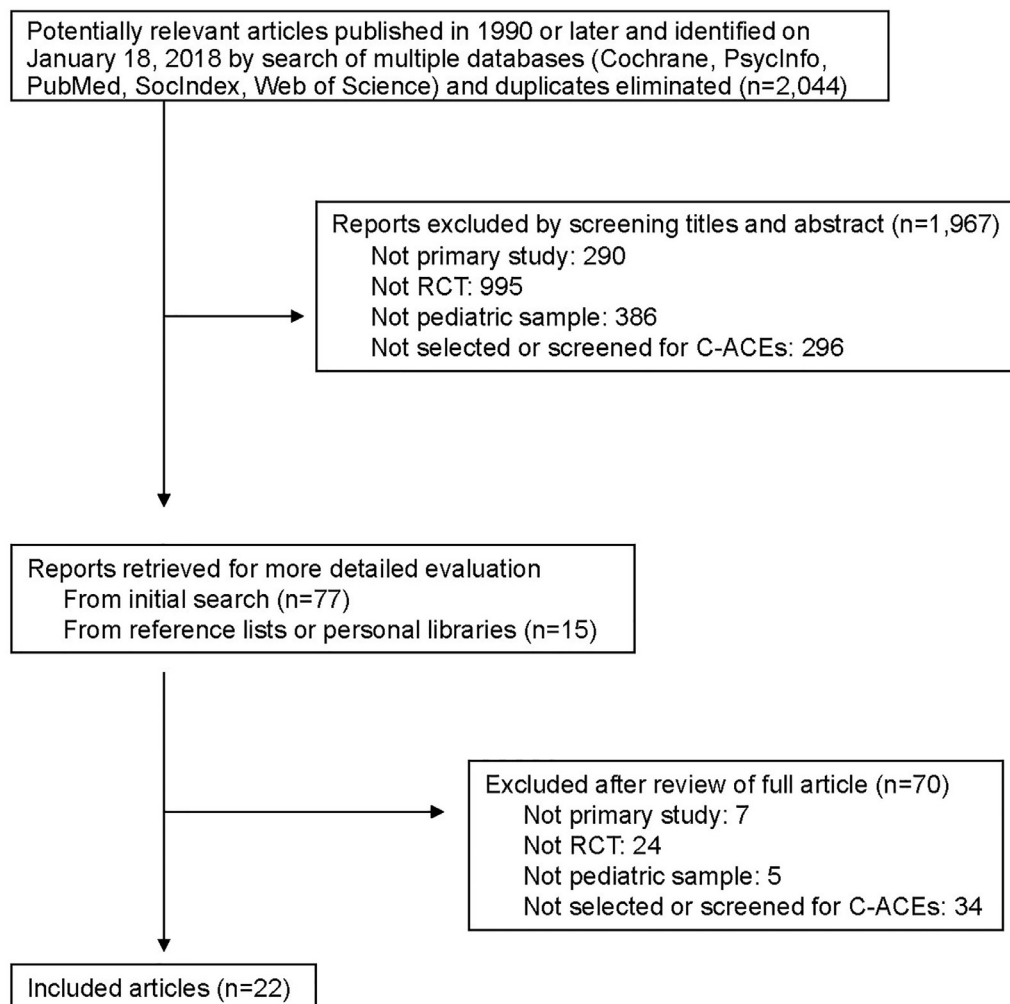
The majority of studies collected data on infants and children up to age 5 years, but three studies included older children.<sup>25,32,34</sup> Most studies combined parenting education, social service referrals, and social support as intervention components. Six studies utilized mental health professionals for counseling or therapy.<sup>20,24,26,27,35,36</sup>

A range of measures were used to assess child health outcomes, including parent report using structured instruments for child psychosocial symptoms, parent report by interview, medical records, and professional assessment of child development. None of the identified studies measured child biomarkers. A range of measures were used to assess intermediate outcomes, including parent report about relationships, professional observations of the parent–child relationship, CPS and medical record reports of child maltreatment, parent report of mental health symptoms, stress or drug use, professional observations of the home environment, and parent and medical record reports about use of pediatric services.

Intervention intensity by itself did not guarantee efficacy. That is, investigators found examples of low-intensity interventions that demonstrated a significant impact on child health outcomes,<sup>37</sup> as well as examples of high-intensity interventions with limited impact.<sup>30</sup> However, larger effect sizes were observed for medium- to high-intensity interventions.

## Results for Studies That Involved a Pediatric Primary Care Provider

Six interventions directly involved pediatric primary care practices, of which two were medium intensity<sup>20,22</sup>



**Figure 3.** Flow diagram of inclusion and exclusion criteria. C-ACEs, child-adverse childhood experiences.

and four were low intensity.<sup>21,34,38,39</sup> One of the three studies that measured child health outcomes included mental health treatment and demonstrated a reduction in infant bruising.<sup>20</sup> The three trials that involved screening for C-ACEs did not measure child health outcomes as defined in this review, but did reduce CPS reports,<sup>38</sup> reduced psychological aggression,<sup>39</sup> and increased community resource utilization.<sup>34</sup> One study of the comparability of group well-child care to individualized well-child care did not improve child health or intermediate outcomes.<sup>21</sup>

### Results for Studies That Involved Other Pediatric Healthcare Services

Fourteen interventions did not involve a pediatric primary care provider, but did include other pediatric healthcare services and, of these, four were high intensity,<sup>29-33</sup> one was low intensity,<sup>37</sup> and the remainder

were medium intensity. Seven of 12 studies that measured child health outcomes (such as child behavior problems, developmental delays, injuries, and illnesses) demonstrated a statistically significant improvement.<sup>20,23,24,26,28,32,36,37</sup> Six of seven studies that used a structured instrument for child psychosocial symptoms demonstrated a reduction in child behavioral/mental health problems.<sup>23,24,26,32,33,36,37</sup> One of four studies that measured child development demonstrated improvement.<sup>36</sup> The largest effect sizes were observed for multifactorial medium- to high-intensity interventions that utilized professionals and measured outcomes in children aged 1–5 years.<sup>23,32,33,36</sup> Studies that included a mental health treatment component demonstrated improvements in child health outcomes,<sup>20,24,26,36</sup> except for one study that measured child development only<sup>35</sup> and one pilot trial with inadequate power.<sup>27</sup> One high-intensity home-visiting model reduced hospital or emergency utilization.<sup>32,33</sup>

With regard to intermediate outcomes, 12 of 14 studies that assessed the parent–child relationship demonstrated improvements. These improvements included more positive parenting, reduced harsh punishment, improved mother–child interactions, and increased maternal sensitivity. Four studies assessed impact on CPS reports: three used paraprofessionals and did not impact CPS reports,<sup>29–31</sup> one used professionals and did reduce CPS reports.<sup>36</sup> Only one study evaluated mediation by the parent–child relationship, and this study found that decreased child behavior problems were mediated by increased positive behavioral support from the parent.<sup>37</sup>

Two studies did not improve child health or intermediate outcomes: one was attempting to prevent the recurrence rather than the incidence of poor child outcomes in a sample of families with one index child exposed to physical abuse or neglect,<sup>25</sup> and another was a pilot study.<sup>27</sup>

## DISCUSSION

This systematic literature review evaluated current evidence for pediatric healthcare interventions that can improve outcomes for children exposed to C-ACEs. The results suggest that multicomponent medium- to high-intensity interventions that utilize professionals can reduce child behavioral/mental health problems associated with exposure to C-ACEs and improve parent–child relationships for children aged 1–5 years. For example, Lowell and colleagues<sup>36</sup> utilized mental health clinicians to provide a two-generation intervention that involved home visits over a year for parents of children aged 6–36 months, and included connection to community-based services, as well as parenting education based upon parental need. In another successful intervention by Butz et al.,<sup>23</sup> community health nurses provided home visits over 18 months for toddlers aged 24–36 months, and included parenting curriculum according to parental need. All of the studies that improved child health outcomes included parenting education, mental health counseling, or both, and all but one delivered services via home visits (the one exception was by Dishion and colleagues,<sup>37</sup> who used home visits for the initial and follow-up evaluations only). Studies that measured but did not impact child health outcomes were delivered by paraprofessionals, which is consistent with other studies that have found greater efficacy for home-visitation programs that utilize staff with graduate-level training.<sup>40</sup>

The results of this review can help guide innovation in pediatric primary care practice. The number of C-ACEs identified varied across studies and did not appear to have a clear relationship to intervention efficacy, which may be because of the clustering of ACEs.<sup>1</sup> That is, it may be that the identification of any C-ACEs during pediatric

primary care screening is more important than the number of C-ACEs identified. The three studies that involved pediatric primary care screening for C-ACEs were low intensity. Despite being low intensity, the two trials that included parenting education along with social service referrals demonstrated an improvement in the parent–child relationship.<sup>38,39</sup> Findings from the broader literature included in this review suggest that pediatric primary care interventions may be able to significantly impact child outcomes if including expanded education about child development and parenting skills along with social support for the parent. The value of having the pediatric primary care provider incorporate parenting education and social support into well-child care is that it directly addresses the impact of C-ACEs on the parent–child relationship, underscores the importance of relationships to health promotion, and is consistent with a two-generation model of pediatric care.<sup>41</sup> Of note, none of the studies that directly involved a pediatric primary care provider were evaluated as high intensity due to lack of a home-visiting component or short duration, or both. Findings from this review suggest that longitudinal primary care–public health partnerships that integrate use of nurse home visitors and mental health professionals into interdisciplinary care teams are needed to have the largest effect on child health outcomes, especially outcomes that are challenging to impact, such as child developmental delays. Lastly, pediatric researchers should note the importance of measuring the parent–child relationship and child psychosocial symptoms in order to enable evaluating mechanisms and impact of pediatric primary care interventions.

Several gaps in the literature were apparent from this literature review. Only three studies involved pediatric primary care screening, which indicates a need for more studies of asymptomatic patients in order to determine whether screening for C-ACEs can reduce poor outcomes associated with C-ACEs. There were very few studies on children aged 6 years and older. Only one study examined potential mediators in order to help identify effective components of the intervention. There were no trials that measured child biomarkers that could be used to assess the efficacy of a pediatric intervention and a potential link to adult health outcomes. In addition, although mental illness/depression was the most commonly identified C-ACE used to select subjects in the included studies, and substance use disorder was the second most common C-ACE used for selection, none of the trials included parent substance use disorder treatment as a core intervention component, and only a few studies included parent mental health treatment.

The dearth of evidence on a family-based approach to pediatric practice is disappointing, given prior reports highlighting the importance of family functioning to child

health.<sup>42</sup> There is evidence that treating maternal depression reduces symptoms in children.<sup>43</sup> There is also evidence that interventions for parents with mental health problems do not have to be elaborate or intensive to impact child health. For example, Beardslee et al.<sup>44</sup> showed that a brief, clinician-based intervention including child assessment and a family meeting reduced internalizing symptoms for parents with mood disorders and their children up to 4.5 years after the intervention, along with improving parental child-related behaviors and child-reported understanding of parental mood disorder. Both the American Academy of Pediatrics and the American Academy of Child and Adolescent Psychiatry support developing models of integrated behavioral health services for pediatric patients,<sup>45</sup> which is important for treating children with symptoms of traumatic stress. However, for prevention, such integrated behavioral health service models would optimally include adult mental health and substance use treatment programs, as well as mental health-promotion programs for pediatric patients.

This literature review was intentionally limited to RCTs that screened or recruited based upon exposure to C-ACEs. Some potentially effective pediatric interventions were not included in this review because the studies did not select samples based upon child exposure to ACEs. For example, Nurse-Family Partnership<sup>46</sup> and Healthy Steps<sup>47</sup> have been shown to be effective for low-income patients and may show higher efficacy for low-income children exposed to ACEs. A recent quasi-experimental study in a low-income sample supports this hypothesis based upon mother's exposure to ACEs. Specifically, this study showed that children of mothers with childhood trauma had worse socioemotional scores than children of mothers without childhood trauma, but that participation in Healthy Steps had the greatest impact for children of mothers with childhood trauma.<sup>48</sup> In other words, parent or child exposure to ACEs may be useful for determining which low-income children may benefit most from an intervention. Recent studies corroborate the potential utility of screening for parent ACEs in order to identify high-risk families and implement early intervention to prevent poor developmental outcomes,<sup>49,50</sup> and demonstrate feasibility of screening for parent ACEs in pediatric practice.<sup>51</sup>

### Limitations

Like other systematic literature reviews, findings from this study may be influenced by publication bias or the tendency for studies without a significant result to be unpublished. Investigators attempted to reduce this bias by contacting the primary author of included studies to request unpublished results. Nonetheless, results of this review may be skewed toward interventions that

demonstrated improvements in child health or the parent–child relationship.

## CONCLUSIONS

This paper adds to other reviews of studies to prevent child maltreatment<sup>19</sup> by considering a specifically high-risk population because of exposure to C-ACEs, a broader range of child outcomes, and a detailed analysis of intervention components to help guide clinicians and researchers. The greatest support was found for the feasibility of reducing child behavioral/mental health problems and improving the parent–child relationship for children aged 1–5 years. Multicomponent medium- to high-intensity interventions that utilized professional home visitors to provide parenting education or mental health counseling demonstrated the largest effects. Investigators found a relative lack of studies that involved screening for C-ACEs by pediatric primary care providers. Investigators also found a relative lack of studies that included children ages 6 years and older, evaluated potential mediators, measured child biomarkers, and incorporated parent mental health or substance use counseling. Future research is recommended to evaluate the impact of pediatric primary care screening and referral for C-ACEs, and the integration of additional intervention components into pediatric practice, including expanded parenting education, expanded social support for families, integration of behavioral health services for both parents and children, and linkages to home-visiting programs.

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Dr. Marie-Mitchell conceptualized and designed the study, supervised and assisted with data collection, reviewed and revised the analyses, and wrote and revised the manuscript. Ms. Kostolansky collected data, carried out the initial analyses, and reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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## SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at <https://doi.org/10.1016/j.amepre.2018.11.030>.

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